5. *In vitro* induction of haploid plants from the gametophytes of lily and tulip

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1. General introduction

As a result of sporophytic cell division and proliferation of the male or female gametophytes in culture, embryos or calli may develop from which haploid plantlets may be regenerated. The first haploid plant from the *in vitro* culture of anthers was verified in 1964 for *Datura innoxia* (Guha & Maheshwari, 1964), whereas the first haploid plant from unpollinated ovaries was obtained in 1976 for *Hordeum vulgare* (San Noeum, 1976). The induction of haploid plants from male or female gamethophytes by *in vitro* culture is now possible for many species (Yang & Zhou, 1990; Sangwan & Sangwan-Norreel, 1990). *In vitro* culture of anthers has been the most efficient method for regenerating (doubled) haploid plants, especially for brassicaceous, graminaceous, or solanaceous species. In the last decade, microspore culture has become an important technique to obtain haploid or doubled haploid plants. The culture of isolated microspores has several advantages over culture of whole anthers. Regenerated plants will undoubtedly have been derived from the microspores and not from anther tissue. Also, microspores can be isolated in large numbers and are promising targets for *in vitro* manipulation and ontogenetic studies. Moreover, for some crops, e.g., *Hordeum vulgare* (Hoekstra *et al.*, 1992) and *Brassica napus* (Siebel & Pauls, 1989), a higher efficiency of haploid production can be reached with microspore culture. When anther or microspore culture cannot be applied, e.g., when microspores are not formed due to male-sterility, or when androgenesis is hampered by low response or albinism of regenerated plants, culture of

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