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Somatic embryogenesis and plant regeneration in *Lilium longiflorum* Thunb

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Abstract Friable callus was obtained from styles and flower pedicels of *Lilium longiflorum* Snow Queen and the Oriental lily hybrid Star Gazer on Murashige and Skoog (MS) media containing either 2 μM dicamba or 2 μM picloram. Cell suspension cultures were established by suspending the callus of *L. longiflorum* Snow Queen in liquid medium containing 2 μM dicamba. Through a purification process, a fine fast-growing cell suspension was obtained. This suspension was composed of a homogenous population of small dense cells, which tended to organise into embryo like structures (ELS). In liquid culture with the auxin dicamba, the ELS underwent continuous callus formation. When transferred to solidified hormone-free MS medium, the ELS germinated, forming complete plantlets. Histological investigation showed that in the ELS both shoot and root meristems were distinctly evident. It was concluded that the ELS obtained were in fact somatic embryos.

Key words Lily · Flower bulbs · Somatic embryos · Dicamba · Picloram

Abbreviations *NAA* 1-Naphthaleneacetic acid · *2,4-D* 2,4-Dichlorophenoxyacetic acid · *BA* 6-Benzylaminopurine · *MS* Murashige and Skoog basal salts and vitamins · *ELS* Embryo-like structures

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Introduction

Lily, a monocot belonging to the *Liliaceae*, is one of the most important bulbous crops, used all over the world in the flower industry as a cut flower and potted plant. The success of many breeding programmes of lily species depends on having suitable plant material for genotype cloning using in vitro techniques. For in vitro selection, protoplast fusion or genetic transformation, recovery of regenerative callus and cell suspension cultures can be very helpful.

Cell suspension cultures are generally initiated from compact or friable callus, defined by Green (1982) as type I and II, respectively, of which the latter type is generally considered to be the most suitable. A particular type of differentiation which may occur in tissues or cells cultured in vitro is the development of somatic embryos, in a process referred to as somatic embryogenesis. This regeneration process has several advantages over regeneration by organogenesis, such as the probable single-cell origin, thus avoiding chimerism in the regenerated plants (Skirvin et al. 1993), and an increased regeneration rate, even from long-term culture (Vasil 1983).

During the last decade, a number of protocols have been developed for the establishment of embryogenic cell suspensions and callus cultures of rhizomatous and bulbous ornamental crops like *Alstroemeria* (van Schaik et al. 1996), *Freesia* (Wang et al. 1990), *Gladiolus* (Kamo et al. 1990), *Hemerocallis* (Smith and Krikorian 1991), *Iris* (Laublin et al. 1991) and *Tulipa* (van den Bulk et al. 1995).

Recently, somatic embryogenesis was shown to occur from bulb scales in some lily hybrids (Haensch 1996), while there are no reports describing this regeneration process from undifferentiated tissues of lily species and hybrids. The present work describes the establishment of embryogenic cell suspensions of *Lilium longiflorum* Thunb. and plant regeneration. Histological investigations of differentiation processes were done to confirm the bipolarity of somatic embryos.