Somatic Embryogenesis in *Schlumbergera truncata*©

Ezz Al-Dein Al-Ramamneh, Sridevy Sriskandarajah, and Margrethe Serek
The Royal Veterinary and Agricultural University, Department of Agricultural Sciences, Plant and Soil Science Laboratory, Floriculture, 40 Thorvaldsensvej, 1871, Frederiksberg C, Copenhagen, Denmark

INTRODUCTION

Cacti are dicotyledonous perennial plants with specialised features adapted for survival in arid and other climatic conditions. *Schlumbergera*, popularly known as "Christmas cactus" or "Thanksgiving cactus," is an epiphyte native to forests in Brazil. These cacti are grown as flowering potted plants (Boyle, 1997).

The conventional methods of propagation are often inadequate to meet the commercial demands for those cacti that exhibit low rates of seed production, germination, growth, or lateral branching. In vitro propagation is a potential alternative for production of these plants (Hubstenberger et al., 1992). While axillary and adventitious shoots in *Schlumbergera* and *Rhipsalidopsis* have been produced in vitro from phylloclade explants and callus cultures and from shoot tips, the frequency at which these shoots are produced is still low and unsatisfactory.

The greatest importance of somatic embryos is its practical application in large-scale vegetative propagation. Furthermore, in vitro somatic embryogenesis is an important prerequisite for the use of many biotechnological tools for genetic improvement (Santacruz-Ruvalcaba et al., 1998). Up to now no somatic embryogenesis has been reported in *Schlumbergera*. The objective of this study was to develop a protocol for somatic embryogenesis in *Schlumbergera*.

MATERIALS AND METHODS

Mother plants of *S. truncata* 'Russian Dancer' were grown in a greenhouse with 16 h light at 25–28 °C. Phylloclade explants were surface sterilised and grown in a medium consisting of MS salts (Murashige and Skoog, 1962), Staba vitamins (Staba, 1969), 22.7 µM TDZ and 1.3 µM NAA, 3% w/v sucrose, and gelled with 3 $g \cdot L^{-1}$ gelrite (regeneration medium) and incubated in light in a growth room (17-h photoperiod) at 25–28 °C.

Callus developed on explants was subcultured on fresh regeneration medium approximately every 2 months over a period of 9 to 12 months. Small callus pieces (approximately 100 mg) were transferred to liquid medium in Erlenmeyer flasks (100 ml). The medium was based on MS salts and vitamins supplemented with myo-inositol (0.1 $g \cdot L^{-1}$), 3% w/v sucrose, and kinetin at 0, 4.6 and 7.0 µM. The cultures were shaken at 120 rpm using a rotary shaker and incubated at 27–29 °C under a light intensity of 4 $\mu mol \cdot m^{-2} \cdot s^{-1}$ with 12 h-photoperiod.

After 37 days, callus was filtered through sieves (200 µm) and placed on gauze (TZMO SA, Polen) on the surface of MS-based medium supplemented with either 2,4-D (0.45 µM), or IAA (0.57 µM), or without hormones. For germination of somatic embryos, they were transferred to 1/2 or 3/4 strength MS media.

RESULTS

Indirect somatic embryogenesis was induced from phylloclade explants of *Schlumbergera truncata* 'Russian Dancer' plants. Subculture of callus grown in liquid medium supplemented with 7.0 μM kinetin to solid medium with either 0.45 μM 2,4-D, or 0.57 μM IAA, or without hormones resulted in the differentiation of somatic embryos. Somatic embryos began forming after 3 months on the medium containing 2,4-D and after 5 months on the medium without hormones or the one with IAA.

DISCUSSION

The high potential of auxins, particularly 2,4-D alone or in combination with other plant growth regulators, in the induction of embryogenic potential is evident. According to this study, it is necessary to transfer embryogenic tissue to a medium lacking auxin or one containing low auxin concentration for somatic embryos to form. It is also possible due to the long exposure of cultures to TDZ-containing media that TDZ partially has a role in the induction of somatic embryogenesis in *Schlumbergera*.

REFERENCES

Boyle, T.H. 1997. Holiday and Easter cactus, p. 82–88. In: M.L. Gaston, S.A. Carver, C.A. Irwin, and R.A. Larson (eds.), Tips on growing specialty potted crops, Ohio Florists' Assn., Columbus.

Hubstenberger, J.F., P.W. Clayton, and **G.C. Phillips.** 1992. Micropropagation of Cacti (*Cactaceae*), p. 49–68. In: Y.P.S. Bajaj (ed), Biotechnology in agriculture and forestry. High-tech and micropropagation IV, Vol. 20. Springer-Verlag, Berlin Heidelberg, Germany.

Murashige, T., and **F. Skoog.** 1962. A revised medium for rapid growth and bioassays with tobacco tissue cultures. Physiol. Plant 15:473–497.

Santacruz-Ruvalcaba, F., A. Gutiérrez-Mora, and **B. Rodríguez –Garay.** 1998. Somatic embryogenesis in some cactus and agave species. JPACP 3:15–26.

Staba, J.E. 1969. Plant tissue culture as a technique for the phytochemist. Recent Adv. Phytochem. 2:80.