IN VITRO PLANTLETS FROM SOMATIC EMBRYOS OF SELECTED ORNAMENTAL PLANTS- A NEW PROSPECT FOR INTERIOR DECORATIONS AND HORTICULTURE INDUSTRY

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ABSTRACT

Somatic embryogenesis is a multi-step process for the induction of somatic embryogenesis, embryo development, embryo maturation and embryo germination. All plantlets obtained through somatic embryogenesis did not differ phenotypically from the parental clones (Stefaniak, 1994). In this study, several plants such as *Gerbera jamesonii*, *Begonia x hiemalis* Fotsch., and *Saintpaulia ionantha* were successfully regenerated through somatic embryogenesis process. Explants such as leaf, petiole and stem were used to induce somatic embryos from all the plant species. Explant were cultured on Murashige and Skoog (MS) medium supplemented with various types of plant growth regulators such as 6-Benzylaminopurine (BAP), α-Naphthalene acetic acid (NAA), 2, 4-Dichlorophenoxyacetic acid (2,4-D) and Thidiazuron (TDZ). Due to the attractiveness and elegance of in *vitro* plantlets derived from somatic embryos, they have the potential to be promoted and marketed as interior decorations, scientific handicrafts and further publicized as a new prospect in horticulture industry.

INTRODUCTION

Plant tissue culture is a technique to propagate plant under aseptic condition and can be initiated from any part of vegetative plant. Today, tissue culture technique is being used widely worldwide knowing its potentials in horticulture industry. The main importance in plant tissue culture is the potential of cultured tissues to regenerate into complete plant. This technology is being used widely in the ornamental industry and in other plant production organizations worldwide. (Chu, 1992; Huetteman and Preece 1993; Mantell et al., 1985; Pierik, 1987). Somatic embryogenesis was introduced as an alternative to plant *in vitro* propagation. Somatic embryo production is steadily increased as essential factors become better understood (Williams and Maheswaran, 1986).
Through somatic embryogenesis studies, hundreds of new plantlets could be formed from only a small piece of explant. Somatic embryogenesis is induced from vegetative plant tissues and does not occur in natural plant breeding. *Gerbera jamesonii* (African daisy), *Begonia x hiemalis* Fotsch (*Begonia* Rose) and *Saintpaulia* ionantha (African violet) are three important ornamental plant species. Somatic embryogenesis in this three temperate

grown plant species was studied. Mass propagation of these three plant species were obtained through the induction of somatic embryos. *In vitro* plantlets obtained from somatic embryos of *Gerbera*, *Begonia* and *Saintpaulia* were then exploited and developed as interior design and decoration products. These three ornamental plant species are known as versatile temperate plant comprise of an enormous group of lovely and very spectacular flowering plants. They are popular as bedding and pot plant as well as indoor houseplants. These plants are known to have very high economical values. The main objectives of this study are to induce and produce somatic embryos from small pieces of vegetative parts of these three plant species and to utilize the *in vitro* plantlets as interior decorative products which are scientifically and exclusively designed. Other than that, these *in vitro* plantlets were also hoped to be promoted and commercialized as scientific decorative product and to be introduced to the horticulture industry worldwide.

MATERIALS AND METHODS

Standard tissue culture method was used in this study. Explants of *Gerbera jamesonii* were obtained from 8-weeks-old aseptic seedlings. Somatic embryos of *Gerbera jamesonii* were induced when embryogenic callus obtained from leaf explants were cultured on MS (Murashige and koog, 1962) medium fortified with 1.0 mg/L BAP and 0.1 mg/L NAA with the addition of 50mM L-Proline. Explants of *Begonia x hiemalis* Fotsch var *Schwabenland Red* were obtained from stock plant, surface sterilized and cultured onto MS medium with the addition of 1.0 mg/l BAP and 1.0 mg/l NAA to induce regeneration of *in vitro* plantlets. Leaves were selected from the *in vitro* plantlets to induce somatic embryogenesis. Leaf explants were then cultured on MS medium supplemented with 1.0 mg/l BAP, 0.5 mg/l 2,4-D and 0.5 g/l casein hydrolysate for the induction of somatic embryo. Morphological characteristics of the callus were identified using double differential dyeing method adapted from Gupta and Durzan (1987). Meanwhile, embryogenic callus was successfully obtained in *Saintapulia ionantha* when leaf explants were cultured on MS medium supplemented with 1.5 mg/l 2,4-D and 2.0mg/l BAP. Direct somatic embryo was highly achieved when leaf explants were cultured on MS medium fortified with 1.8 mg/l TDZ. *In vitro* plantlets obtained from regeneration of somatic embryos of all these three ornamental plants were then cultured onto MS basal medium in special autoclavable containers.

RESULTS AND DISCUSSION

Somatic embryogenesis is a powerful tool for plant propagation and improvement of ornamental plant. It is controlled by *in vitro* and *in vivo* environmental variables (Ammirato, 1983). Embryogenic callus that promoted the production of somatic embryos were successfully induced in *Gerbera jamesonii* Bolus ex. Hook f., *Begonia x hiemalis* Fotsch and *Saintpaulia* ionantha h. Wendl. Table 1 showed the number of somatic embryos induced from explants of *Gerbera*, *Begonia* and *Saintpaulia*. *Gerbera* produced 29.8 ± 1.2 somatic embryos when petiole explants were cultured on MS medium supplemented with 1.0 mg/l BAP and 0.1 mg/l NAA with the addition of 50 mM

L-Proline. Meanwhile, 23.75±3.20 of somatic embryos were formed in *Begonia* when leaf explants were cultured on MS medium fortified with 1.0 mg/l BAP and 0.1 mg/l 2,4-D with the addition of 500 mg/l casein hydrolysate. Leaf explants of *Saintpaulia* produced 32.70±1.7 somatic embryos when culture on MS medium supplemented with 1.8 mg/l TDZ. Embryogenic callus and somatic embryos of African marigold (*Tagetes erecta* L.) were induced when cotyledonary explants were cultured on MS medium supplemented with 2.0 mg/l 2, 4-D and 0.2 mg/l Kinetin (Bespalhok et. al. 1998). *In vitro* plantlets obtained from the conversion of somatic embryos of all three plant species were then transferred onto MS basal medium in special autoclavable glass containers. These beautiful plantlets were promoted as interior decoration products, scientific gifts and handicrafts. This new creative scientific product has the potential to be marketed in the horticulture industry worldwide.

CONCLUSION

In vitro plantlets of *Gerbera jamesonii*, *Begonia x hiemalis* Fotsch and *Saintpaulia* ionantha were successfully created from somatic embryos derived from vegetative parts of these ornamental plant species. This original and creative product is developed scientifically and exclusively for interior decorations, corporate gifts or presents and has large potential to be marketed as modern horticultural commodity.

REFERENCES

Ammirato, P.V. 1983. Embryogenesis; In The Handbook of Plant Cell Culture Techniqes for Propagation and Breeding, Vol. 1; pp 82-123 eds D. A. Evans., W. R. Sharp., P. V. Ammirato and Y. Yamada (New York, U.S.A.: Macmillan Publishing Company.

Bespalhok, J. C. F. and Hattori, K. 1998. Friable embryogenic callus and somatic embryo formation from cotyledon explants of African marigold (*Tagetes erecta* L.). Plant Cell Reports 17: 870-875.

Chu, I.Y.E (1992). Perspectives of micropropagation industry. In: Kurata K, Kozai T. (eds) Transplant production systems. Kluwer Academic, Amsterdam. pp 137-150.

Gupta, P.K. and Durzan, D.J., 1987. "Biotechnology of somatic poly-embryogenesis and plantlet regeneration in loblolly pine", *Bio/Technology*, 5: 147-151.

Huetteman C.A. and Preece J.E. (1993). Thidiazuron: a potent cytokinin for woody plant tissue culture. Plant Cell Tissue Organ Culture. 33:105-150.

Mantell S.H., Matthews J.A., McKee R.A (1985). Principles of plant biotechnology. Blackwell scientific, Boston. pp 130-157.

Murashige, T. and Skoog, F. 1962. A revised medium for rapid growth and bioassays with tabacco tissue cultures. Physiol. Plant. **51**: 473 – 497.

Pierik R.L.M. (1987). *In vitro* culture of higher plants. Martinus Nijhoff, Dodrecht. pp 183-230.

Stefaniak, B. (1994). Somatic embryogenesis and plant regeneration of Gladiolus (*Gladiolus hort.*) *Plant Cell Reports*, 13: 386-389.

Williams, E.G. and Maheswaran, G. (1986). Somatic embryogenesis: Factors influencing coordinated behaviour of cells as an embryogenic group. *Ann* Bot. 57: 443- 462.

TABLE 1: The optimum media and explants used for somatic embryo induction for selected plant species

Plant Species	Optimum media (Ms medium supplemented with growth hormones)	Explant	Number of Somatic Embryos (%)
Gerbera jamesonii	1.0 mg/l BAP + 0.1 mg/l NAA + 50 mM L-Proline	Petiole	$29.8 \pm 1.2_a$
Begonia x hiemalis Fotsch	1.0 mg/l BAP + 0.5 mg/l 2,4-D + 500 mg/l casein hydrolysate	Leaf	$23.75 \pm 3.20_b$
Saintpaulia ionantha	1.8 mg/l TDZ	Leaf	$32.70 \pm 1.7_c$

Mean ± SE, n=30. Mean with different letters differ significantly at p=0.05

FIGURES

Figures a-f : *In vitro* plantlets were exploited as interior decorations and readily to be promoted and marketed in the horticulture industry