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Research Application Summary

Evaluation of micro and macro propagation techniques of Gerbera (*Gerbera Jamesonii*) under different conditions

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Abstract

Gerbera has gained popularity in the last year in many countries of the world and it is in great demand in the floral industry as cut flower as well as potted due to its beauty, colour, long vase life, and ability to dehydrate after long transportation. Conventional propagate is too slow. Accordingly, the current investigation was undertaken with the objectives of establishing the most suitable micropropagation techniques of Gerbera in Sudan and to select the best medium/media for macropropagation of Gerbera. Shoot tips and petioles of five Gerbera cultivars were tested for shoot and root induction. Three kinds of cytokinins, BAP, Kintin and 2ip, were used for induction, and two auxins, IBA and NAA were used for root induction at four concentrations of each. Different growth media, including different ratios of peatmoss, sand and silt, were used in macropropagation experiment. For shoot induction, BAP was found the best since it resulted in the highest number of shoots/ plantlet. Moreover, 1mg/l concentration was the best of BAP. For root induction, the two auxins, IBA and NAA, gave comparable results, with NAA being slightly better up to 1 mg/ l. Among the growth media used in in-vivo propagation peat moss was the best medium for propagation.

Key words: Auxins, cytokinins, Gerbera, micro propagation

Résumé

Le Gerbera a gagné la popularité durant la dernière année dans de nombreux pays du monde et il est en grande demande dans l'industrie florale comme fleur coupée aussi bien que fleur en pot grâce à sa beauté, sa couleur, sa longue vie en vase et sa capacité de déshydratation après un long transport. Une propagation conventionnelle est aussi lente. En conséquence, la présente recherche a été entreprise avec comme objectifs d'établir les techniques les plus appropriées de micropropagation du Gerbera au Soudan et de sélectionner le meilleur milieu /

milieux pour la macropropagation de Gerbera. Les bouts de pousse et les petioles de cinq cultivars de Gerbera ont été testés pour l'induction de pousse et de racine. Trois types de cytokines, BAP, Kintin et 2iP ont été utilisés pour l'induction, et deux auxines, IBA et NAA ont été utilisées pour l'induction de la racine à quatre concentrations chacune. Les différents milieux de croissance, y compris les différentes proportions de mousse de tourbe, de sable et de limon, ont été utilisés dans l'expérience de macropropagation. Pour l'induction de pousse, BAP a été trouvé le meilleur car il a entraîné le plus grand nombre de pousses / plantule. En outre, la concentration d'1 mg / l était la meilleure de la BAP. Pour l'induction des racines, les deux auxines, IBA et NAA, ont donné des résultats comparables, avec l'ANA étant un peu mieux jusqu'à 1 mg / l. Parmi les milieux de croissance utilisés in-vivo la mousse de propagation de tourbe est le meilleur milieu de propagation.

Mots clés: Auxines, cytokinines, Gerbera, micropropagation

Background

The Barberton, Transvaal, African daisy or Gerbera, is a flower with increasing commercial significance. Gerbera is one of the leading cut flowers and ranks among the top ten cut flowers of the world (Parthasaraihy and Nagaraju, 1999). The production of Gerbera was approximately US 220 million in 2001 representing 70 million stems sold in US alone (Broek *et al.*, 2004). It has wide applicability in the floral industry as cut flower and potted plant. The flowers are hardy and stand the rigors of transportation and a long keeping quality fetches a good market price.

Gerberas are propagated by seeds or dividing clumps. If we are successful in developing effective and low cost in vitro system, tissue culture can establish plants with predictable selected traits for mass propagation. It can also provide desirable somaclones and bonus along with economy of time. Tissue culture of Gerbera has been studied by various scientists (Aswath and Wanzeen, 2004; Thakur *et al*., 2004; Sharma and Srivastava, 2005; Kanwar, 2008).

The history of gerbera introduction in Sudan is not a very old one. However, recently it gained an increasing importance as a new ornamental plant in Sudan. Research on ornamental in general and Gerbera in particular is meager. Accordingly, one of the most important priorities is to provide the necessary information for growing the different ornamental plants in Sudan.

Gerbera is well appreciated as a decorative garden plant, cut flower, potted plant as well as for economic value. However, there is a lack of information on the scientific methods of propagation, optimum planting media of production and nutritional requirements of Gerbera in Sudan. The objectives of the current study were to test the response of Gerbera to micro and macro propagation techniques and to evaluate their performance under different condition.

Literature Summary

The species of Gerbera, perennial herb, is native to South Africa and Asia. The genus consists of about 40 species. Out of the recorded species, only one species, *Gerbera jamesonii*, is under cultivation. Callus establishment and regeneration of shoots were reported by Rufonii and Massabo (1991) in shoot tip, Miyoshi and Asakura (1996) in petioles and Huang *et al.* (2001) from the shoot tip and petiole in vitro. They found frequent browning on few cultivars. However, so far there has been no report on callus regeneration and subsequent recovery of the plants from ex vitro leaves and petioles.

Study Description

In this study different experiments were conduct to achieve the above mentioned objectives. The micro propagation techniques experiments were carried out at the tissue culture laboratory and green house of the Agricultural Research Corporation, Sudan. In these experiments shoot tips, leaves, petioles were used as testing materials on which the effect of different growth regulators (BAP, 2IP and kinetin) on morphogenesis, effect of different combination of cytokinins and ouxins on shoot and root morphogenesis, effect of different auxins (2,4-D, NAA, IBA and IAA) on rooting induction of plant lets were studied. Gerbera variety Jaguar (potted plants) was used to determine the optimum concentrations of sterilization solution, Clorox for gerbera micro propagation. Different concentrations of Clorox and different times of sterilization were used. The best concentration was 20% Clorox and 30 minutes. Effect of different types of growth regulators on callus and shoot induction of leaves and petioles were tested on five Gerbera varieties, viz., Jaguar, Red Explosion, Zembla and Sazou. The concentrations used were 0, 0.5, 1 and 1.5mg/l. Conventional propagation (in vivo) for Gerbera were tested on two cut flower Gerbera varieties, Red explosion and Sazou with the objective of selecting the best media for Gerbera growth, flowering and number of suckers per plant. Growth media used were according to the following ratios (peat moss, silt, silt: peat moss (2:1, 3:1) and silt: sand (2:1, 3:1).

Research Application

About twenty experiments were conducted for in vivo propagation of one cultivar of Gerbera. Six experiments were conducted for in vivo cloning of one cultivar of Gerbera. The different growth regulators gave variable degree of micro propagation. For instance BAP was the best in shoot induction (Table 1 and Fig. 1). Moreover, 1mg/l was the best concentration for shoot induction for three kinds of cytokinins. However, the highest concentration (1.5mg/l) seemed to induce a negative effect on shoot inductions (Table 1). Two experiments were conducted for rooting of plantlets using IBA and NAA (Table 2). Both IBA and NAA induced rooting with NAA being slightly better than IBA. Unlike IBA, the highest concentration (1.5mg/l) of NAA seemed to induce a negative effect of rooting (Table 2). Among the media for in vivo propagation peat moss was found to be the best medium for propagation (Fig. 1).

Table 1. Effect of different concentrations of BAP, Kin and 2ip cytokinins on shoot induction of Gerbera.

	Number of shoots/plantlets			
	0	0.5mg/l	1mg/l	1.5mg/l
BAP	7.25	31.25	37.4	25
Kin	5.05	14.75	16.4	12.95
2ip	4.45	6.65	7.35	7.35

Table 2. Effect of different concentrations of IBA and NAA on rooting of Gerbera.

	Number of roots/plantlet			
	0	0.5mg//l	1mg//l	1.5mg/l
IBA	3.6	14.9	19.8	20.1
NAA	3	17.3	20.95	16.85

Figure 1. Effects of different concentrations on BAP and 2ip cytokinins on shooting of Gerbera. Middle picture is for conventional propagation using peatmoss.

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References

Aswath, C. and Wazeen, S. 2004. An improved method for in vitro propagation of Gerbera. *J. of Ornamental Hor.* 7:141-146.

Broek Vandenl, Hayduj, J., Hodges, A.W. and Neves, E.M. 2004. Production, marketing and distribution of cut flowers in the United States and Brazil. Annual Report of Florida Agricultural Experiments Station, University of Florida. pp. 1-19.

Kanwar, J.K. and Kumar, S. 2008. In vitro propagation of gerbera –A review. *Hor. Sci. (Prague)* 35(1):35-44.

Miyoshi, K. and Asakura, N. 1996. Callus induction, regeneration of haploid plants and chromosome doubling in ovule culture. *Physiol. Plant* 15:473-497.

Parthasarathy,V.A. and Nagaraju.1999. In vitro propagation of *Gerbera jamesonii* Bolus.*Indian Journal of Horticulture* 56:82- 85.

Ruffoni, B. and Massabo, F. 1991. Tissue culture in *Gerbera jamesonni* hybrid. *Acta Hortic.* 289:147-148.

Sharma, G. and Srivastava, R. 2005. Combinations and concentrations of growth regulators for somatic embryogenesis in Gerbera. *Annals of Agricultural Research* 26:214-217.

Thakur, P. S., Ghorade, R.B. and Rathod, T.H. 2004. Micro propagation studies in Gerbera. *Annals of Plant Physiology* 18:133-135.