BIOLOGICAL AND TECHNOLOGICAL STUDIES IN *POLYANTHES TUBEROSA* L.

STUDII DE BIOLOGIE SI TEHNOLOGIE LA *POLYANTHES TUBEROSA* L.

Fl. TOMA, Sorina PETRA
U.S.A.M.V. Bucharest

Abstract: *In Romania, the tuberose (Polyanthes tuberosa L.) is one of the most appreciated cut flowers mainly due to its white flowers, very pleasant perfumed.*

But the long period of flowers bulbs production and the small percentage of flowering of plants represent two big difficulties of the culture for this beautiful plant.

In this reason, the aim of our studies was to reduce the period of flowers bulbs production and to increase the flowering percentage through in vitro tissue cultures.

We used as explants buds taken from the small bulbs. As tissue culture media we used Murashige & Skoog '62 supplemented with different ratio of NAA, KIN and BAP. The best regeneration of plants was registered on media with 0,2 mg / l NAA + 1,5 mg / l KIN + 2,0 mg / l BAP.

We recorded the shortage of flowers bulbs production from three years through classical methods to one year by using in vitro tissue culture.

MATHERIALS AND METHODS

The biological material used for our experiences was represented by a local population of tuberose from Bucharest area zone.

From bulbs with 1,0 – 1,5 cm diameter we took the explants – buds with 1 – 2 mm length accompanied of un rhizome fragment with same length. After other researches we establish that the best moment for the explants inoculation is the month of April.

The bulbs were carefully washed with water after the protective tunic was removed. In the next step we disinfected the bulbs under laminar flow with HgCl 2 0,1 % for 20 minutes.

Two to three washes with sterile water were applied before the make explants and a 70 % ethanol solution was used for final disinfection.

The culture media was Murashige & Skoog ' 62, supplemented with hormones NAA, KIN and BAP in various concentrations (table 1).

Table 1

Experimental variants for in vitro production of bulbs tuberose

Variants	Growing hormones (mg/l)		
	NAA	KIN	BAP
V 1	0,2	0,5	2,0
V 2	0,2	1,0	2,0
V 3	0,2	1,5	2,0
V 4	0,2	2,0	2,0
V 5	2,0	0,5	2,0

Cultures were kept under 16 hrs light at 16 hours light at 2000 – 2200 lx alternate with 8 hours dark, 20 – 22 °C during the day / 16 – 19 °C during the night and 80 / 85 % UR.

Acclimatization was realized on sand substrate under 95 % UR conditions. After acclimatization the plants were planted in pots with organic substrate where they continued to grow till autumn.

In the next year bulbs obtained from in vitro regenerated plants were planted in field in a comparative scheme along with those obtained by classical methods (table 2).

Table 2

Experimental variants for in field comparative culture

Variants	The origin of bulbs	The age of bulbs (years)	The diameter of bulbs (cm)
V 1	vitro	0,3	1,0
V 2	field	1,0	1,0
V 3	field	2,0	1,1 – 2,0
V 4	field	3,0	2,1 – 3,0

We analyzed the growth of the plants and the quality of bulbs observing the size and the provenience to check the effect of in vitro micropropagation on flower bulbs.

RESULTS

All observations in both studies, in vitro and in field culture confirmed the benefic effect of in vitro micorpropagation upon the solving the difficulties regarding the technology for tuberose production.

Results regarding in vitro production of plants. Analyzing the percentage of the explants which regenerated explants we observed a variation between 58,33 % at variant V 4 and 91,66 % at variant V 5 (table 3).

Table 3

The evolution of explants on the initiated media

Variants	Regenerated explants (%)	Plantlets regenerated per explants	The length of plantlets (cm)	The number of leaves
V 1	88,33	1,37	4,38	0,75
V 2	86,66	1,99	3,77	0,59
V 3	86,66	4,11	3,87	0,61
V 4	58,33	1,37	2,59	0,32
V 5	91,66	1,44	4,46	0,78

The number of plantlets regenerated per explants – the most important parameter for knowing the final number of in vitro formed bulbs – varied between 1,37 at variants V 1 and V 4 and 4,11 at variant V 3 (fig. 1, 2).

he growth of regenerated plantlets on the culture media recorded similar values at all five variants (table 4).

From the table 4 we observed that the acclimatization of plants was done with very less loses, almost negligible and growth of plants until rest period had similar values for all variants.

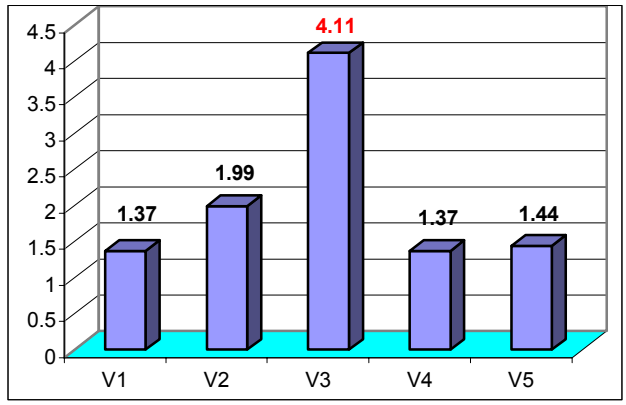

Figure 1. The variation of the plantlets number regenerated per explants

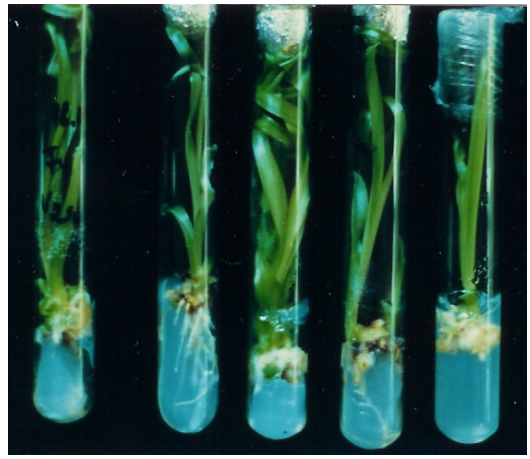

Figure 2. The tuberose plants obtained by culture media

Table 4

The growth of regenerated plantlets an the rooting media

Variants	The length of plantlets (cm)	Number of leaves	Number of roots	The lengths of roots (cm)	Acclimatized plants (%)
V 1	9,00	2,20	4,23	2,55	97,26
V 2	8,43	2,20	4,43	2,39	96,57
V 3	6,90	1,93	3,76	2,47	98,10
V 4	5,93	1,50	2,90	2,59	92,06
V 5	9,06	1,90	2,26	2,26	100,00

For each variants the in vitro regenerated plants had formed till rest period between 2,94 and 4,20 bulbs of about 1,0 cm diameter, those significance a multiplication coefficient of bulbs between 7,46 at variant V 4 and 57,20 at variant V 3 (table 5, fig.3.).

Table 5

The variation of parameters of bulbs obtained in vitro

Variants	No. of bulbs regenerated per plants	The multiplication coefficient of bulbs	Diameter of bulbs (cm)	Weight of bulbs (g)
V 1	3,53	16,00	1,15	3,35
V 2	3,26	20,93	1,11	3,34
V 3	4,20	57,20	1,17	3,37
V 4	2,94	7,46	1,13	3,11
V 5	4,24	21,60	1,11	3,33

Figure 3. The tuberose plants obtained by best culture media

Researches concerning the in field culture of tuberose plants. Our researches have shown that when using for planting bulbs obtained from plants regenerated in vitro the started in vegetation and the growth of plants was more rapid compared with the bulbs obtained in field (table 6).

We recorded very significant results concerning the number and quality of bulbs obtained per plants regenerated in vitro (fig. 3).

From the table 7 and figure 4 we observed that over 75 % of plants regenerated in vitro formed in only one year of in field culture flowers bulbs of first size (over 3,1 cm diameter) and the other 25 % of plants formed flowers bulbs of second size (2,6 – 3,0 cm diameter).

Table 6

The variation of plants growth in the field culture

Var.	Number of leaves				Length of leaves (cm)			
	June	July	August	Sept.	June	July	August	Sept.
V 1	5,81	32,43	57,85	63,12	10,60	36,75	43,62	46,80
V 2	3,30	18,93	31,34	39,40	10,56	28,20	30,54	32,10
V 3	5,33	21,54	38,00	48,73	10,83	29,12	32,30	32,82
V 4	9,64	30,55	53,43	58,51	11,36	30,10	32,35	33,22

Figure 3a. The tuberose plant obtained from in vitro produced bulbs

Table 7.

The variation of number and weight of bulbs formed per plants

Var.	Number of bulbs from size:				Weight of bulbs from size (g):			
	I	II	III	IV	I	II	III	IV
V 1	0,75	0,25	3.55	13,84	50,00	29,75	9,48	3,38
V 2	0,00	0,25	3,82	12,12	-	25,00	6,00	2,38
V 3	0,50	0,35	3,34	10,57	35,50	27,55	6,14	2,45
V 4	0,65	0,35	3,40	11,84	39,50	28,45	6,10	2,73

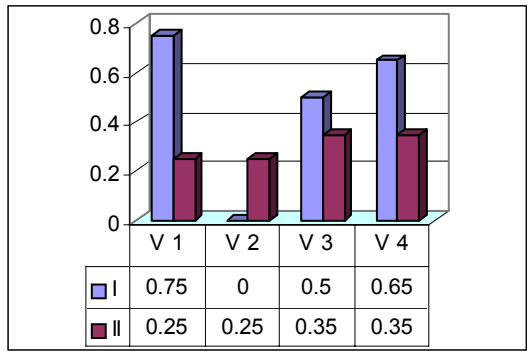

Figure 4. The variation of flowers bulbs number formed per plants

CONCLUSIONS

- Tuberose plants respond very well to in vitro multiplication, the number of regenerated plantlets and their evolution being in direct correlation with the media culture.
- The best results of the in vitro micropropagation of tuberose were obtained on the media with 0,2 mg / l NAA + 1,5 mg / l KIN + 2,0 mg / l BAP.
- The in vitro multiplication of the tuberose planting having practical effect expressed by a great shortage of period of obtained the flowers bulbs (over 3,1 cm diameter).
- The starting of bulbs vegetation and the growth of plants on the in field culture were more rapidly at the variants with plants obtained from planting regenerate in vitro.

BIBLIOGRAFY

1. **Bankar, G.J. and Mukhopadhyay, A.,** 1980. *Varietal trial on tuberose (Polyanthes uberose, L..)*. South Indian Horticulture, 28.
2. **Benschop, M.,** 1993. *Polyanthes, cap.32 / The physiology of flower bulbs* (A.A. de Hertogh et M. Le Nard, editor). Elsevier Science Publishers, Amsterdam.
3. **Toma, Fl., 1998**. *Contribution upon the study of biology and technology of Polyanthes tuberosa L. specie*. PhD thesis, USAMV Bucharest, Romania.
4. **Toma, Fl. Şi col.,** 1998. Studies on the biochemical transformations detected in Polyanthes uberose L. plants. XXVIII th Annual ESNA Meeting, Brno, Czech Republic.
5. **Toma, Fl., 2000.** *The influence of the inoculation moment and culture media upon the percentage of the "in vitro" regeneration of Polyanthes tuberosa L. plants*. Lucrările ştiinţifice ale Primului Congres Internaţional de Biotehnologie al Universităţii Valahia din Târgovişte.
6. **Toma, Fl. and col., 2002**. *Studies concerning the effect of in vitro tissue cultures upon the bulbs and flower production of Polyanthes tuberosa L.* Biotechnologia Habana 2002 – Agro-Biotech in the new millennium, 24 – 29 November 2002, Havana, Cuba.