THE EVOLUTION OF THE *SOLANUM TUBEROSUM* L. NEOPLANTLES CULTIVATED *IN VITRO* ON CUTURE MEDIA SUPPLIMENTED WITH BIOACTIVE MAGNETO-FLUIDIC NANOCOMPOSITES

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Summary: During the last decades the bioactive magnetofluid nanocomposites proved both their unique performances and their high potential. Everywhere nanotechnologies gain ground being economic systems having a controlled period of the induced effect, of the planed biodegradation and of the used quantities. Nanotechnologies are applied in biology. They are of beneficed effects in plant and animal protection. The bioactive magnetofluid nanocomposites used for plants are applied in the vegetation phase by means of spraying. The nanocomposites are also elements of the culture media for the inducing of the calus and the regeneration of plants belonging to the species *Chrysanthemum*, *Lilium regale*, *Mamillaria, Triticale* and *Solanum tuberosum* L. TiO_2 nanocrystals are used for the sterilization of the spaces where cereals are kept and for destroying the fungi from the seeds. The goal of the experiments was to test the reaction of different types of explants when cultivated *in vitro* on media supplemented with bioactive magnetofluid nanocomposites.

Keywords: nanocomposites, applications, biotechnologies

INTRODUCTION

The researches about the influence of the bioactive magneto-fluidic nanocomposites on the vegetal organisms began around 1988 at USAMVB Timisoara. The bioactive magneto-fluidic nanocomposites are studied because they represent the first step towards the application of nanotechnologies in biology, medicine, biomaterials and agriculture (Butnaru et. al. 1995).

The bioactive magneto-fluidic nanocomposites are magnetic oxide particles stabled with fat acids and dispersed in water. Their effect upon vivid organisms was studied a lot lately (Baciu et. al. 2005).

At the species *Triticum*, *Triticale*, *Hordeum* and *Zea* was studied the influence of different types of concentrations of the bioactive magneto-fluidic nanocomposites upon the seeds germination. A tiny reaction of these bioactive magneto-fluidic nanocomposites was observes at *Triticum* as against the other species (Butnaru & Butnaru, 1995).

In the ontogeny of the plants that come from the seeds treated with bioactive magneto-fluidic nanocomposites teratological modifications were observed, such as gigantism, deformations and growths at the cotyledonous tomato leaves or growths at the coleoptiles of the *Zea* and *Triticum* plants (Butnaru & Butnaru, 1995).

In general NMA used in low concentrations stimulated the germination of the tested plant species, whereas at high concentrations the germination was suppressed.

Profound modifications at the level of the cytoplasmatic organites were observed in 1991 by *Butnaru Gallia* and her team at Triticale – a hybrid with incomplete cytognetic stability – where as a result of the seed testing with NMA and NMU by imbibition albino forms appear after 3 hours in a percentage of 12% and 2.7% respectively. The albinism was signaled and at homozygote wheat and barley forms (Sala 1999).

In 1990 Butnaru observed that the different influence of the bioactive magneto-fluidic nanocomposites upon the maize plants coming from seeds treated with various concentrations of ferro-fluids (Sala et. al. 1997). By determinations the development dynamics was followed (number of active leaves from the anthesis to maturity) and the analysis of the production characters (length at both cob diameters, number of rows and the number of berries on the cob).

The bioactive magneto-fluidic nanocomposites were integrated as component elements of the culture media at the inducing of the callus and the regeneration of plants at the species *Chrysanthemum indicum* (Baciu et. al. 2004), *Lillium regale*, *Mamillaria* and *Triticale* (Butnaru 1994).

These experiments and the following researches demonstrated the bioactivity of the bioactive magneto-fluidic nanocomposites and the favourable action of small concentrations as well as the repressive effect of the high concentrations in the callus forming and regeneration processes at *Triticale*, tomatoes, *Saintpaulia* and tobacco (Butnaru et. al. 1995, Butnaru et. al. 1995).

The bioactive magneto-fluidic nanocomposites tested were produced by the Romanian Academy, Timisoara, (C.C.T.F.A.), a team led by *PhD. Doina Bica* and characterized by the Politehnica University, Institute of Complex Fluids (C.N.I.S.F.C) led by *PhD. Ladislau Vekaş*.

MATERIAL AND METHODS

The *Solanum tuberosum* L., *Desirée* variety, vitroplantules, explant donors come rom steril Murashige – Skoog base medium (Murashige & Skoog, 1962).

The propagation medium (Badea et. al. 2004) on which best results were obtained at the in vitro cultivation of the potato vitro plantlets was supplemented with

different concentrations of bioactive magneto-fluidic nanocomposites with the magnetization 200Gs, on Fe_3O_4 basis stabilised by lauric acid and conditioned in distilled water because it must be kept as long as possible (Table 1).

The bioactive magneto-fluidic nanocomposites concentration is given by the value θ that represents the ferrite concentration (g) at a given moment.

The observation were made at intervals of 7 days.

The results were processed according to the variation analysis method (Butnaru & Moisuc, 1979) and for the multiple comparisons special monofactorial analysis methods were used (Ardelean 2005).

Table 1. The composition of the in vitro keeping medium

No.	Components	mg/l
1	Macro and micro elements Murashige & Skoog	
Vitamins		
2	Thiamine	0,40
3	Myo-inositol	100,00
4	NaH_2PO_4	170,00
Bioactive magneto-fluidic nanocomposites		
5	$\theta = 0{,}37 \times 10^{-3}$ g/cm^3	15 µl / l
6	$\theta = 3{,}7 \times 10^{-3}$ g/cm^3	150 µl / l
7	$\theta = 37 \times 10^{-3}$ g/cm^3	1,5 ml / l
8	$\theta = 55 \times 10^{-3}$ g/cm^3	15 ml / l

RESULTS AND DISCUSSIONS

The evaluations were carried out every 7 days up to 42 days. Thereafter no quantitative determinations could be done as the neo plantlets reached the upper end of the culture pot.

A stimulation of growth versus control variant during all days was registered at the variant $\theta = 3.7 \times 10^{-3}$ g/cm^3 the best results were obtained at 21 and 28 days, the difference against control being significant $\bar{d} \pm s_{\bar{d}} = + 2.38 \pm 1.01$, and insignificant $\bar{d} \pm s_{\bar{d}} = + 2.22 \pm 1.13$ respectively.

The stimulation of the growth versus control variant was registered and at the variant $\theta = 37 \times 10^{-3}$ g/cm^3, the best results being registered at the 21st day of observation, the difference being $\bar{d} \pm s_{\bar{d}} = + 0.84 \pm 0.80$, at 42 days of observation. The differences against the control variant being positive but les than $\bar{d} \pm s_{\bar{d}} = + 0.12 \pm 1.04$.

At the variant $\theta = 55 \times 10^{-3}$ g/cm^3 a growth stimulation was registered against the control variant up to the 21st day of observation. When the difference against the control variant was of $\bar{d} \pm s_{\bar{d}} = + 0.73 \pm 0.75$. From this day onward in all observation days a slight repression in growth was observed. The highest value was registered at 42 days of observation; the highest value was registered at 42 days of observation. The difference against the control variant is $\bar{d} \pm s_{\bar{d}} = -0.40 \pm 1.08$.

CONCLUSIONS

The growth in height of the neo plantlets was stimulated at the variants supplemented with bioactive magneto-fluidic nanocomposites in small concentrations.

The bioactive magneto-fluidic nanocomposites in high concentration $\theta = 55 \times 10^{-3}$ g/cm^3 have repressed the height of the neo plantlets.

As the growth and the organogenesis of the plants were much slowed at the concentrations $\theta = 37 \times 10^{-3}$ g/cm^3 and $\theta = 55 \times 10^{-3}$ g/cm^3 bioactive magneto-fluidic nanocomposites, suspended in distilled water, the culture media that contain them are recommended to be used for the *in vitro* conservation of the *Solanum tuberosum* L. species.

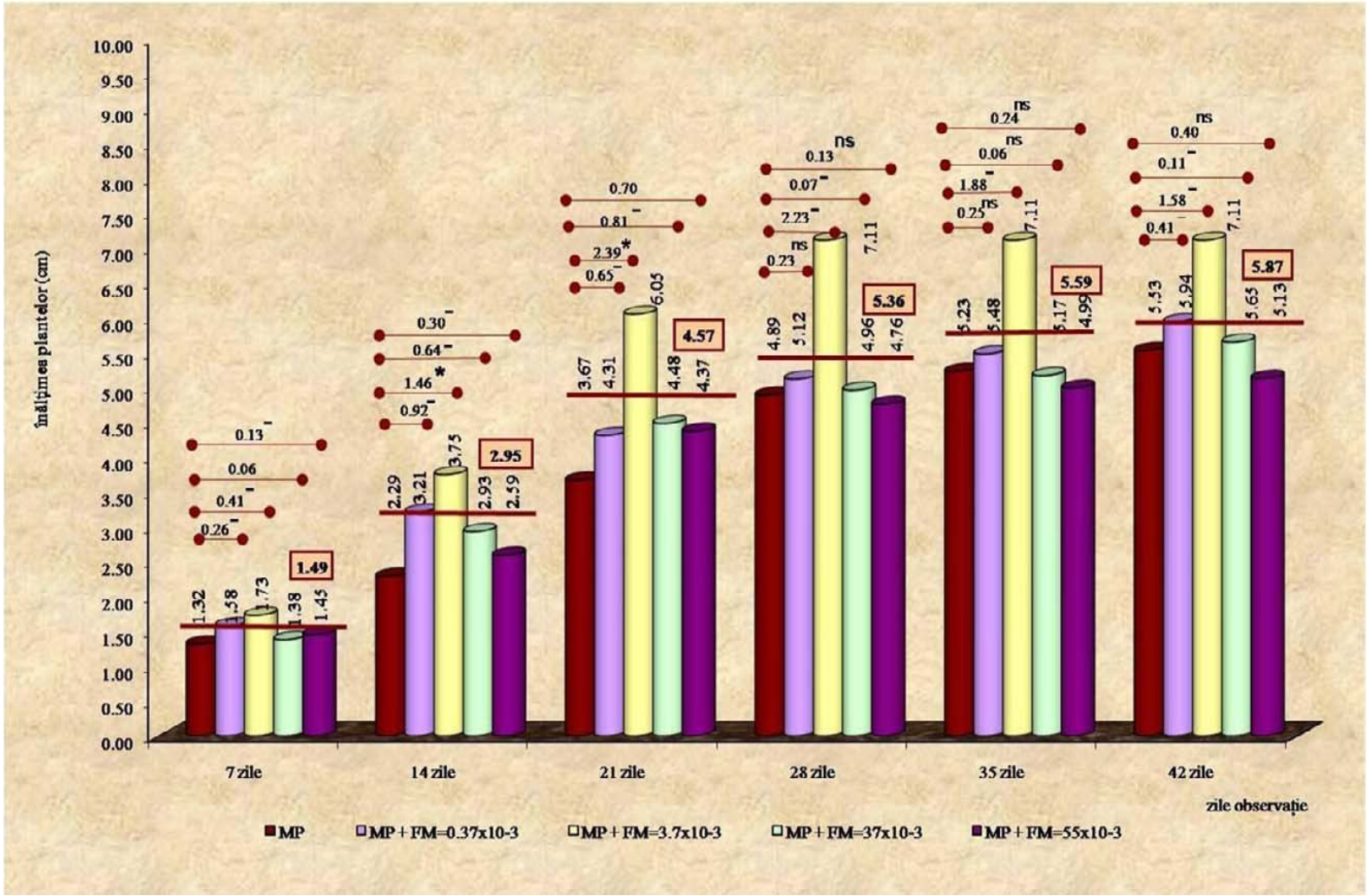

Figure 1. The growth rate of new *Solanum tuberosum* L. plantlets, *Desiree* variety on culture media supplemented with different magneto-fluidic nanocompozite concentrations

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