THE INFLUENCE OF MAGNETOFLUIDS NANOCOMPOSITES TO POTATOES OLD VARIETIES VITROPLANTLETS

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Abstract. The genus *Solanum* is of great importance for the molecular and cell biology researches in general, and for the vegetal genetic engineering in particular.

Solanum tuberosum ssp. *tuberosum* L. is one of the most important culture plants of the temperate zone, being the fifth in rank among the cultivated species around the world and the fourth in rank as world crop and as proteins production among the culture plants.

In the scientific activity of the Department of Genetics the magneto fluids nanocomposites have been used since from 1985. From the historical point of view the magneto fluids nanocomposites were use in technology, medicine and in the plant kingdom. The most spectacular results were obtained in medicine in the carcigenesis treatment. The magneto fluids nanocomposites were used in biotechnology, especially for improving the regenerative processes.

In our experiments we wanted to understand the magneto fluids nanocomposites effect upon in vitro regeneration processes in *Solanum tuberosum* L. old varieties.

Keywords: potato, varieties, in vitro, magneto fluids nanocomposites

INTRODUCTION

In the last two decades, bioactive magneto–fluidic nanocomposites proved their unique performances and increased applicative potential. They are widely used in biological sciences and firstly in medical sciences, this being related with wide diversity of the fundamental and applicative issues that could find solutions in the use of magneto–fluidic nanocomposites [1].

In order to be used in biology and medicine studies, the bioactive magneto–fluidic nanocomposites must meet the following criteria: lack of toxicity, biological compatibility, dispersion ability of directed immobility. Great care is given to the physical and chemical characteristics as well as to the toxicity of the substances used to stabilize the bioactive magneto–fluidic nanocomposites [9].

Researches regarding the influence of bioactive magneto–fluidic nanocomposites on vegetal organisms were developed in 1998 at U.S.A.M.V.B. Timisoara. The bioactive magneto–fluidic nanocomposites were used as solutions or compatible biological suspensions with a certain magnetic intensity and using various dilutions. They were applied on plants during the vegetation period by spraying with special manual devices or using portable or activated pumps.

Bioactive magneto–fluidic nanocomposites were integrated as components of the culture (nutritive) media for callus induction and plant regeneration of several species: *Chrysanthemum indicum* [2], *Lillium regale*, *Mamillaria* and *Triticale* [4].

These studies and former researches have demonstrated the magneto–fluidic nanocomposite bioactivity and their positive effect when used in small concentrations as well as the repressive effect of high concentrations on callus induction and plant regeneration in *Triticale*, tomatoes, *Saintpaulia* and tobacco [5, 6].

The goal of the experiments was to test the reaction of different varieties of potatoes when cultivated *in vitro* on media supplemented with bioactive magnetofluid nanocomposites.

MATERIAL AND METHODS

In the organized experiment, there has been studied the two old varieties collected from Apuseni County (*Bacaia18* şi *Almasul Mic de Munte*, 49).

Potatoes vitro–plantlets used as explants donors were cultivated on a sterile base medium (***Murashige-Skoog***, 1962) [7]. The propagation medium [3] that provided the best results for *in vitro* propagation of potatoes old varieties and genotypes was supplemented with different concentrations of bioactive magneto–fluidic nanocomposites with magnetizing force of 200Gs, based on Fe_3O_4 stabilized in lauric acid and conditioned with distilled water for *in vitro* preservation for a longer time period.

After one week from experiment set up, for a period of 49 – 56 days (when plants reached the upper part of the vegetation dishes) we have started making observations writing down that date of root formation, date of start for organogenesis and every seven day we made observations and determinations related to plant height, caulia formation (nodes/internodes) and foliar system. Mean leaf diameter was measured for plantlets grown on vegetation dishes in order to finally compare the development of the foliar system.

The statistical calculations were used for analysis of the individual variance, the values with central tendency and their deviation ($\bar{x} \pm s_{\bar{x}}$) as well as the differences and their deviation ($\bar{d} \pm s_{\bar{d}}$) being assessed.

For multiple comparisons we have used specific methods for single factor analysis.

RESULTS AND DISCUSSION

Considering *Bacaia* 18 old variety, the best results were observed for variants supplemented with small concentrations of bioactive magneto–fluidic nanocomposite $\theta = 0.37 \times 10^{-3}$ g/cm^3 and $\theta = 3.7 \times 10^{-3}$ g/cm^3 the difference regarding the control being of $\bar{d} \pm s_{\bar{d}} = + 0.45 \pm 0.83$ and $\bar{d} \pm s_{\bar{d}} = + 0.34 \pm 0.86$, respectively (**Fig. 1**, **Fig. 2**).

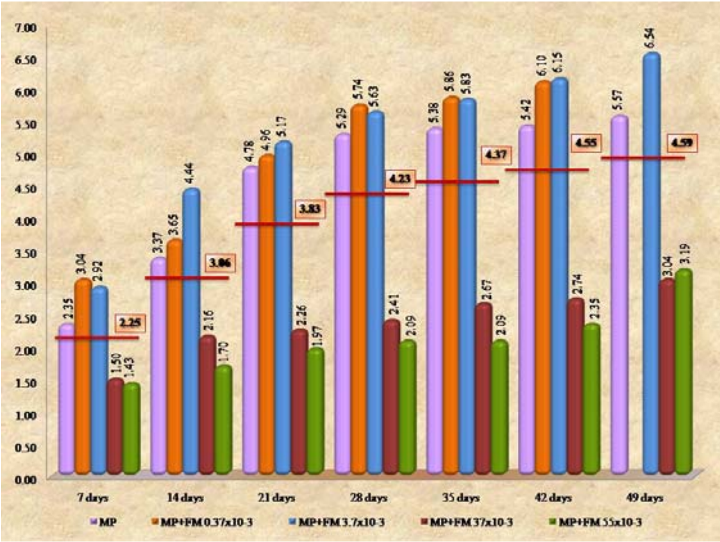

Figure. 1. The growth rate of new *Solanum tuberosum* L. plantlets –Bacaia, 18 old varieties on culture media supplemented with different magneto – fluidic nanocomposite concentrations

Figure. 2. Aspects regarding the behaviour of new *Solanum tuberosum* L., Almasul Mic de Munte and Bacaia, 18, old varieties in vitro cultivated on media supplemented with different concentration of bioactive magneto-fluidic nanocomposites

The supplementation of the culture media with a maximum concentration of bioactive magneto–fluidic nanocomposite θ = 55 x 10^{-3} g/cm^3 has determined repression for growth greater than the one registered for *Almasul Mic de Munte*, 49, the difference between varieties being of $\bar{d} \pm s_{\bar{d}}$ = - 0.60 ± 0.05, and to the control variant of $\bar{d} \pm s_{\bar{d}}$ = - 3.20 ± 0.63 (**Fig. 2**, **Fig. 3**).

Only the culture media supplementation with a magneto–fluidic nanocomposite concentration of θ = 3.7 x 10^{-3} g/cm^3 has determined a stimulation towards the control variant ($\bar{d} \pm s_{\bar{d}}$ = + 0.07 ± 0.64) in case of *Almasul Mic de Munte* 49 old variety, while for the rest of the variants, the values situated below those registered in the control variant, the smallest being found for the variants θ = 37 x 10^{-3} g/cm^3 and θ = 55 x 10^{-3} g/cm^3, the difference to the control being of $\bar{d} \pm s_{\bar{d}}$ = - 3.08 ± 0.67 for both considered concentrations.

In case of *Bacaia* 18 variety, only the culture medium supplementation with concentrations of θ = 3.7 x 10^{-3} g/cm^3, has induced the stimulation of foliar system formation, the difference comparing the control being of $\bar{d} \pm s_{\bar{d}}$ = + 0.13 ± 0.00 (**Fig. 4**).

In case of *Almasul Mic de Munte* 49 variety, only the culture media supplementation with maximum concentration of magneto–fluidic nanocomposites has induced the repression of foliar system formation, the difference comparing the control being of $\bar{d} \pm s_{\bar{d}}$ = - 0.02 ± 0.00 and the rest of the variants showing positive significant difference comparing the control. The greatest positive difference was registered for the supplemented variant with a magneto–fluidic nanocomposite concentration of θ = 3.7 x 10^{-3} g/cm^3, $\bar{d} \pm s_{\bar{d}}$ = + 0.04 ± 0.00 (**Fig. 5**).

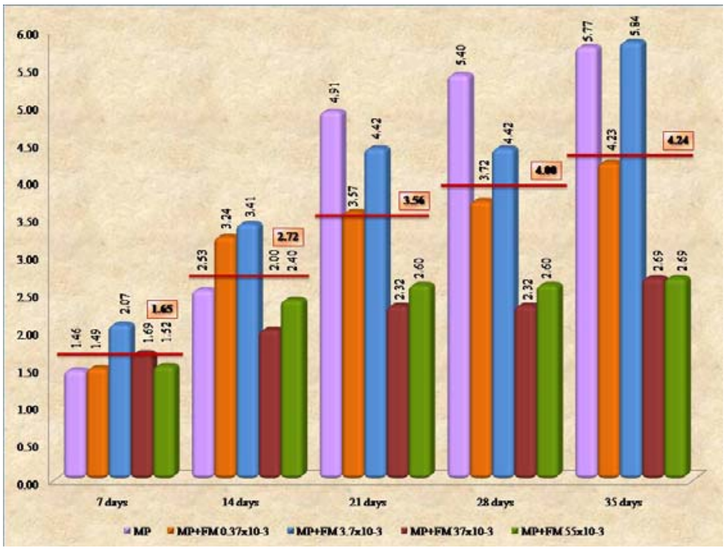

Figure 3. The growth rate of new *Solanum tuberosum* L. plantlets – Almasul Mic de Munte old variety on culture media supplemented with different magneto – fluidic nanocomposite concentrations

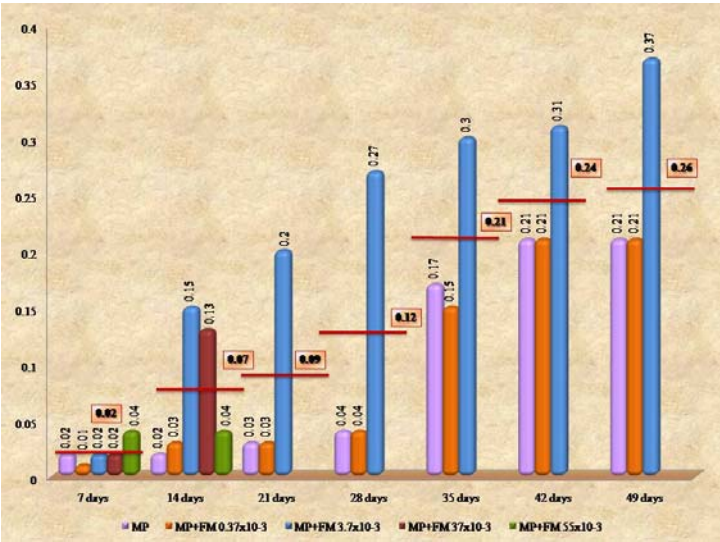

Figure 4. Evolution of foliar surface index of new *Solanum tuberosum* L. –Bacaia 18 variety on culture media supplemented with different concentrations of magneto – fluidic nanocomposites

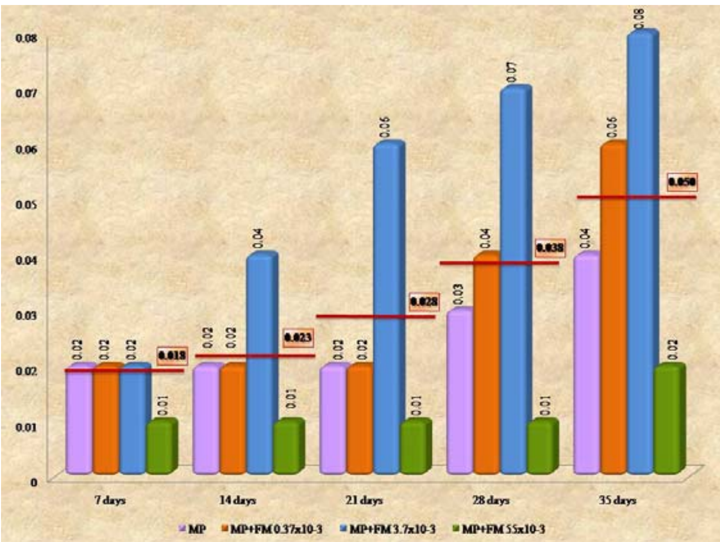

Figure 5. Evolution of foliar surface index of new *Solanum tuberosum* L. –Almasul Mic de Munte 49 variety on culture media supplemented with different concentrations of magneto – fluidic nanocomposites

CONCLUSIONS

Biometrical determinations performed for explants and new plantlets made possible to conclude the followings:

- The height growth of the new plantlets registered higher values for the variants supplemented with small concentrations of magneto-fluidic nanocomposites. The use of higher concentrations $\theta = 55 \times 10^{-3} g/cm^3$ induced an obvious repression of new plantlet height.
- The foliar surface growth was repressed on culture media supplemented with high concentrations of magneto-fluidic nanocomposites in comparison with control variant H_2Od.
- Considering that plant growth and organogenesis were considerably hindered when high bioactive magneto-fluidic nanocomposite concentrations suspended in distilled water were used $\theta = 37 \times 10^{-3} g/cm^3$ and $\theta = 55 \times 10^{-3} g/cm^3$, these culture media are strongly recommended to be used for *in vitro* preservation of potatoes.

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