THE ANSWER OF SOME OLD VARIETIES OF *SOLANUM TUBEROSUM* L. FOR *IN VITRO* CULTIVATION

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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 [12] 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.

These studies are good opportunities for further potato genetic resources conservation researches and for political and ethical decisions.

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.

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.

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*, *Lillium regale*, *Mamillaria* and *Triticale* [6].

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, *Zea mays*, *Saintpaulia* and tobacco [7 - 10].

The goal of the experiments was to test the reaction of different varieties of potato 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 (*Băcâia18* şi *Almaşul Mic de Munte*, 49).

Solanum vitro–plantlets (minicuttings) used as explants donors were cultivated on a sterile base medium (Murashige-Skoog, 1962) [11]. The propagation medium [3] that provided the best results for *in vitro* propagation of potato old varieties and varieties (*Solanum tuberosum* L.) 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 [2, 6].

Vitroculture conditions were: temperature 19°C and photoperiods' 8 light / 16 dark.

After one week from experiment set up, for a period of 35 – 42 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 plants height (cm), caulia formation (nodes/internodes) and foliar system index (cm^2). Mean leaf diameter was measured for plantlets grown on vegetation dishes in order to finally compare the development of the foliar system [2].

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 [1].

For multiple comparisons we have used specific methods for single factor analysis [1].

RESULTS

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 (Table 1 & Fig. 1) [2].

In case of *Bacaia* 18 variety, only the culture medium supplementation with concentrations of $\theta = 3.7 \times 10^{-3}$ g/cm^3, has induced the stimulation of foliar system formation, the difference comparing the control being of $\bar{d} \pm s_{\bar{d}} = + 0.13 \pm 0.00$ (Table 2; Fig. 2 & 3).

The supplementation of the culture media with a maximum concentration of bioactive magneto–fluidic nanocomposite $\theta = 55 \times 10^{-3}$ 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 $\bar{d} \pm s_{\bar{d}} = -\ 0.60 \pm 0.05$, and to the control variant of $\bar{d} \pm s_{\bar{d}} = -\ 3.20 \pm 0.63$ (Table 3 & Fig. 4) [2].

Table 1. Height growth of new *Solanum tuberosum* L. plantlets, *Băcâia 18*, old variety *in vitro* cultivated in the presence of magneto-fluidic nanocomposites

Statistics evaluation	Days of observation					
	7 days	**14 days**	**21 days**	**28 days**	**35 days**	**42 days**
Type V_1 – PM (propagation medium)						
$\bar{x} \pm s_{\bar{x}}$	2.35±0.26	3.37±0.33	4.78±0.56	5.29±0.59	5.38±0,78	5.42±0,46
$\bar{d} \pm s_{\bar{d}}$	N/A	1.02±0,40	1.41±0.64	0.51±0.80	0.09±0.95	0.04±0,88
Type V_2 – PM + NCM $\theta = 0.37 \times 10^{-3}$ g/cm^3						
$\bar{x} \pm s_{\bar{x}}$	3.04±0.32	3.65±0.33	4.96±0.55	5.74±0.60	5.86±0.82	6.10±0.82
$\bar{d} \pm s_{\bar{d}}$	N/A	0.61±0.41	1.31±0.67	0.78±0.83	0.12±1.01	0.24±1.20
$\bar{d}$ **V_2-C**	+ 0.69 ± 0.33 **(ns)**	+ 0.28 ± 0.47 **(ns)**	+ 0.18 ± 0.80 **(ns)**	+ 0.45 ± 0.83 **(ns)**	+ 0.48 ± 1.12 **(ns)**	+ 0.68 ± 0.98 **(ns)**
Type V_3 – PM + NCM $\theta = 3.7 \times 10^{-3}$ g/cm^3						
$\bar{x} \pm s_{\bar{x}}$	2.92±0.35	4.44±0.43	5.17±0.62	5.63±0.65	5.83±0.92	6.15±1.22
$\bar{d} \pm s_{\bar{d}}$	N/A	1.52±0.54	0.73±0.74	0.46±0.88	0.20±1.11	0.32±1.52
$\bar{d}$ **V_3-C**	+ 0.57 ± 0.41 **(ns)**	+ 1.07 ± 0.53 **(oo)**	+ 0.39 ± 0.82 **(ns)**	+ 0.34 ± 0.86 **(ns)**	0.45 ± 1.20 **(ns)**	+ 0.73 ± 1.28 **(n)s**
Type V_4 – PM + NCM $\theta = 37 \times 10^{-3}$ g/cm^3						
$\bar{x} \pm s_{\bar{x}}$	1.50±0.19	2.16±0.14	2.26±0.37	2.41±0.16	2.67±0.16	2.74±0.5
$\bar{d} \pm s_{\bar{d}}$	N/A	0.66±0.20	0.10±0.37	0.15±0.38	0.26±0.20	0.07±0.26
$\bar{d}$ **V_4-C**	- 0.85 ± 0.28 **(oo)**	- 1.21 ± 0.34 **(oo)**	- 2.52 ± 0.66 **(ooo)**	- 2.88 ± 0.60 **(ooo)**	- 2.71 ± 0.78 **(oo)**	- 2.68 ± 0.64 **(ooo)**
Type V_5 – PM + NCM $\theta = 55 \times 10^{-3}$ g/cm^3						
$\bar{x} \pm s_{\bar{x}}$	1.43±0.18	1.70±0.28	1.97±0.27	2.09±0.26	2.09±0.25	2.35±0.38
$\bar{d} \pm s_{\bar{d}}$	N/A	0.27±0.28	0.27±0.34	0.12±0.36	0.00±0.35	0.26±0.41
$\bar{d}$ **V_5-C**	- 0.92 ± 0.28 **(oo)**	- 1.67 ± 0.40 **(ooo)**	- 2.81 ± 0.61 **(ooo)**	- 3.20 ± 0.63 **(ooo)**	- 3.29 ± 0.81 **(oo)**	- 3.07 ± 0.53 **(ooo)**

Note: $\bar{x} \pm S_{\bar{x}}$ (average ± standard deviation of the average), $\bar{d} \pm s_{\bar{d}}$ (difference ± standard deviation of difference), $\bar{d}$ V_5-C (difference between variant and witness).

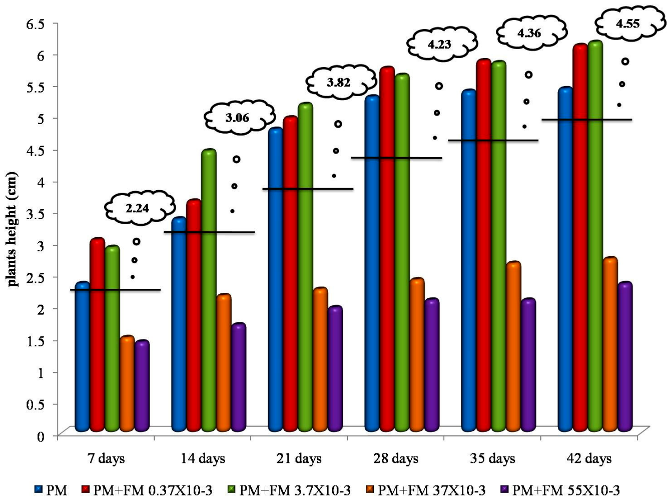

Figure 1. The growth rate of new *Solanum tuberosum* L. plantlets –*Bacaia*, 18 (722) old variety on culture media supplemented with different magneto – fluidic nanocomposite concentrations

Table 2. Evolution of foliar surface index of new *Solanum tuberosum* L. plantlets, *Băcâia 18,* old variety *in vitro* cultivated under the influence of magneto-fluidic nanocomposites

Statistics evaluation	Days of observation					
	7 days	**14 days**	**21 days**	**28 days**	**35 days**	**42 days**
Type V_1 – PM (propagation medium)						
$\bar{x} \pm s_{\bar{x}}$	0.02±0.35	0.02±0.35	0.03±0.00	0.04±0.01	0.17±0.06	0.21±0.06
$\bar{d} \pm s_{\bar{d}}$	N/A	0.00±0.00	0.01±0.00	0.01±0.00	0.13±0.00	0.04±0.00
Type V_2 – PM + NCM θ = 0.37 x 10^{-3} g/cm^3						
$\bar{x} \pm s_{\bar{x}}$	0.01±0.00	0.03±0.01	0.03±0.00	0.04±0.01	0.17±0.07	0.21±0.15
$\bar{d} \pm s_{\bar{d}}$	N/A	0.02±0.00	0.00±0.00	0.01±0.00	0.13±0.00	0.06±0.14
$_{\bar{d}}$ **V_2-C**	- 0.01 ± 0.00 (***)	+ 0.01 ± 0.00 (-)	0.00 ± 0.00 (ns)	0.00 ± 0.00 (-)	0.00 ± 0.00 (-)	0.00± 0.14 (ns)
Type V_3 – PM + NCM θ = 3.7 x 10^{-3} g/cm^3						
$\bar{x} \pm s_{\bar{x}}$	0.02±0.00	0.15±0.12	0.20±0.15	0.27±0.03	0.30±0.03	0.31±0.05
$\bar{d} \pm s_{\bar{d}}$	N/A	0.13±0.10	0.05±0.14	0.07±0.10	0.03±0.00	0.01±0.00
$_{\bar{d}}$ **V_3-C**	0.00 ± 0.36 (***)	+ 0.13 ± 0.10 (-)	+ 0.17 ± 0.10 (ns)	+ 0.23 ± 0.00 (ns)	+ 0.13 ± 0.00 (-)	+ 0.10 ± 0.00 (-)
Type V_4 – PM + NCM θ = 37 x 10^{-3} g/cm^3						
$\bar{x} \pm s_{\bar{x}}$	0.02±0.00	0.13±0.00	N/A	N/A	N/A	N/A
$\bar{d} \pm s_{\bar{d}}$	N/A	0.11±0.00	N/A	N/A	N/A	N/A
$_{\bar{d}}$ **V_4-C**	0.00 ± 0.00 (***)	+ 0.11 ± 0.00 (-)	N/A	N/A	N/A	N/A
Type V_5 – PM + NCM θ = 55 x 10^{-3} g/cm^3						
$\bar{x} \pm s_{\bar{x}}$	0.04±0.01	0.04±0.01	N/A	N/A	N/A	N/A
$\bar{d} \pm s_{\bar{d}}$	N/A	0.00±0.26	N/A	N/A	N/A	N/A
$_{\bar{d}}$ **V_5-C**	+ 0.02 ± 0.26 (**)	+ 0.02 ± 0.00 (ns)	N/A	N/A	N/A	N/A

Note: $\bar{x} \pm S_{\bar{x}}$ (average ± standard deviation of the average), $\bar{d} \pm s_{\bar{d}}$ (difference ± standard deviation of difference), $_{\bar{d}}$ V_5-C (difference between variant and witness).

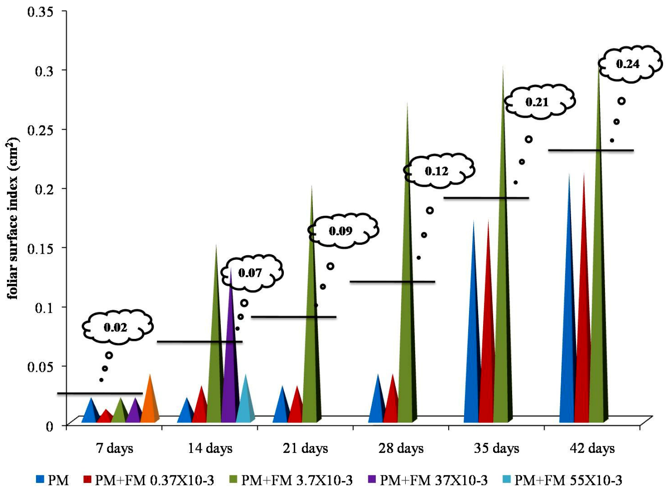

Figure 2. Evolution of foliar surface index of new *Solanum tuberosum* L. –*Bacaia* 18 variety on culture media supplemented with different concentrations of magneto – fluidic nanocomposites

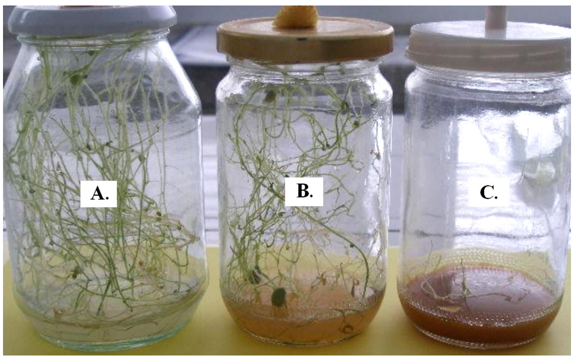

Figure 3. Aspects regarding the behavior of new *Solanum tuberosum* L., *Bacaia* old variety *in vitro* cultivated on media supplemented with different concentration of bioactive magneto-fluidic nanocomposites: **A** - propagation medium; **B** - propagation medium + bioactive magneto-fluidic nanocomposites θ = 3.7 x 10^{-3}; **C** - propagation medium + bioactive magneto-fluidic nanocomposites θ = 37 x 10^{-3}

Table 3. Height growth of new *Solanum tuberosum* L. plantlets, *Almaşul Mic de Munte 49* old varieties, *in vitro* cultivated in the presence of magneto-fluidic nanocomposites

Statistics evaluation	Days of observation				
	7 days	14 days	21 days	28 days	35 days
Type V_1 – PM (propagation medium)					
$\bar{x} \pm s_{\bar{x}}$	1.46±0.21	2.53±0.28	4.91±0.76	5.40±0.70	5.77±0.62
$\bar{d} \pm s_{\bar{d}}$	N/A	1.07±0.33	2.38±0.80	0.49±1.03	0.37±0.93
Type V_2 – PM + NCM θ = 0.37 x 10^{-3} g/cm^3					
$\bar{x} \pm s_{\bar{x}}$	1.49±0.32	3.24±0.56	3.57±0.68	3.72±0.65	4.23±0.88
$\bar{d} \pm s_{\bar{d}}$	N/A	1.75±0.64	0.33±0.87	0.15±0.95	0.51±1.10
$\bar{d}$ **V_2-C**	+ 0.03 ± 0.37 **(ns)**	+ 0.71 ± 0.61 **(ns)**	- 1.34 ± 1.01 **(ns)**	- 1.68 ± 0.97 **(ns)**	- 1.54 ± 1.06 **(ns)**
Type V_3 – PM + NCM θ = 3.7 x 10^{-3} g/cm^3					
$\bar{x} \pm s_{\bar{x}}$	2.07±0.27	3.41±0.33	4.42±0.45	5.58±1.01	5.84±0.17
$\bar{d} \pm s_{\bar{d}}$	N/A	1.34±0.41	1.01±0.54	1.16±1.09	0.26±1.01
$\bar{d}$ **V_3-C**	+ 0.61 ± 0.33 **(ns)**	+ 0.88 ± 0.41 **(ns)**	- 0.49 ± 0.87 **(***)**	+ 0.18 ± 1.22 **(oo)**	+ 0.07 ± 0.64 **(o)**
Type V_4 – PM + NCM θ = 37 x 10^{-3} g/cm^3					
$\bar{x} \pm s_{\bar{x}}$	1.69±0.17	2.00±0.27	2.32±0.28	2.63±0.39	2.69±0.25
$\bar{d} \pm s_{\bar{d}}$	N/A	0.31±0.30	0.32±0.38	0.31±0.48	0.03±0.47
$\bar{d}$ **V_4-C**	+ 0.23 ± 0.24 **(ns)**	- 0.53 ± 0.37 **(ns)**	- 2.59 ± 0.80 **(ns)**	- 2.77 ± 0.80 **(ns)**	- 3.08 ± 0.67 **(ooo)**
Type V_5 – PM + NCM θ = 55 x 10^{-3} g/cm^3					
$\bar{x} \pm s_{\bar{x}}$	1.52±0.38	2.40±0.34	2.60±0.16	2.66±0.31	2.69±0.30
$\bar{d} \pm s_{\bar{d}}$	N/A	0.88±0.52	1.08±0.38	0.06±0.31	0.03±0.40
$\bar{d}$ **V_5-C**	+ 0.06 ± 0.42 **(ns)**	- 0.13 ± 0.44 **(ns)**	- 2.31 ± 0.78 **(ns)**	- 2.74 ± 0.75 **(oo)**	- 3.08 ± 0.67 **(ooo)**

Note: $\bar{x} \pm S_{\bar{x}}$ (average ± standard deviation of the average), $\bar{d} \pm s_{\bar{d}}$ (difference ± standard deviation of difference), $\bar{d}$ V_5-C (difference between variant and witness).

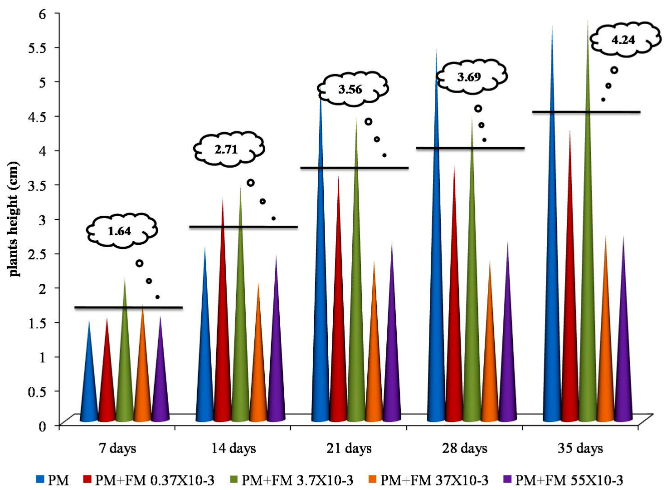

Figure 4. The growth rate of new *Solanum tuberosum* L. plantlets – *Almasul Mic de Munte* (743) old variety on culture media supplemented with different magneto – fluidic nanocomposite concentrations

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 [1].

In case of *Almasul Mic de Munte* 49 variety, only the culture media supplementation with maximum concentration of magneto–fluidic nanocomposites (θ = 55 x 10^{-3} g/cm^3) 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 (Table 4, Fig. 5 & Fig. 6) [1].

Table 4. Evolution of foliar surface index of new *Solanum tuberosum* L. plantlets, *Almaşul Mic de Munte 49,* old variety *in vitro* cultivated under the influence of magneto-fluidic nanocomposites

Statistics evaluation	**Days of observation**				
	7 days	**14 days**	**21 days**	**28 days**	**35 days**
Type V_1 – PM (propagation medium)					
$\bar{x} \pm s_{\bar{x}}$	0.02±0.00	0.02±0.00	0.02±0.00	0.03±0.01	0.04±0.00
$\bar{d} \pm s_{\bar{d}}$	N/A	0.00±0.00	0.00±0.00	0.01±0.00	0.01±0.00
Type V_2 – PM + NCM θ = 0,37 x 10^{-3} g/cm^3					
$\bar{x} \pm s_{\bar{x}}$	0.02±0.00	0.02±0.00	0.02±0.00	0.04±0.02	0.06±0.02
$\bar{d} \pm s_{\bar{d}}$	N/A	0.00±0.00	0.00±0.00	0.02±0.00	0.02±0.00
$\bar{d}$ **V_2-C**	0.00 ± 0.00 **(***)**	0.00 ± 0.00 **(***)**	+ 0.01 ± 0.01 **(o)**	+ 0.02 ± 0.02 **(ns)**	+ 0.17 ± 0.01 **(ns)**
Type V_3 – PM + NCM θ = 3.7 x 10^{-3} g/cm^3					
$\bar{x} \pm s_{\bar{x}}$	0.02±0.01	0.04±0.02	0.06±0.03	0.07±0.08	0.08±0.00
$\bar{d} \pm s_{\bar{d}}$	N/A	0.02±0.00	0.02±0.00	0.01±0.00	0.01±0.00
$\bar{d}$ **V_3-C**	+ 0.02 ± 0.00 **(ns)**	+ 0.02 ± 0.00 **(ns)**	+ 0.04 ± 0.00 **(ns)**	+ 0.04 ± 0.00 **(ns)**	+ 0.04 ± 0.00 **(***)**
Type V_4 – PM + NCM θ = 37 x 10^{-3} g/cm^3					
$\bar{x} \pm s_{\bar{x}}$	0.01±0.00	0.01±0.00	0.01±0.00	0.01±0.00	0.01±0.00
$\bar{d} \pm s_{\bar{d}}$	N/A	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00
$\bar{d}$ **V_3-C**	- 0.01 ± 0.00 **(ooo)**	- 0.01 ± 0.00 **(ooo)**	- 0.01 ± 0.00 **(ooo)**	- 0.02 ± 0.00 **(ns)**	- 0.03 ± 0.00 **(ns)**
Type V_5 – PM + NCM θ = 55 x 10^{-3} g/cm^3					
$\bar{x} \pm s_{\bar{x}}$	0.01±0.00	0.01±0.00	0.01±0.00	0.01±0.00	0.02±0.00
$\bar{d} \pm s_{\bar{d}}$	N/A	0.00±0.00	0.00±0.00	0.00±0.00	0.01±0.00
$\bar{d}$ **V_5-C**	- 0.01 ± 0.00 **(ooo)**	- 0.01 ± 0.00 **(ooo)**	- 0.01 ± 0.00 **(ooo)**	- 0.02 ± 0.00 **(ooo)**	- 0.02 ± 0.00 **(ns)**

Note: $\bar{x} \pm S_{\bar{x}}$ (average ± standard deviation of the average), $\bar{d} \pm s_{\bar{d}}$ (difference ± standard deviation of difference), $\bar{d}$ V_5-C (difference between variant and witness).

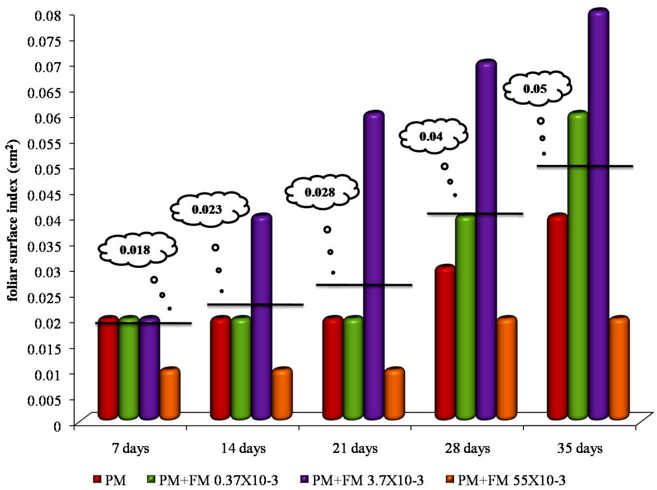

Figure 5. Evolution of foliar surface index of new *Solanum tuberosum* L. *–Almasul Mic de Munte 49* variety on culture media supplemented with different concentrations of magneto – fluidic nanocomposites

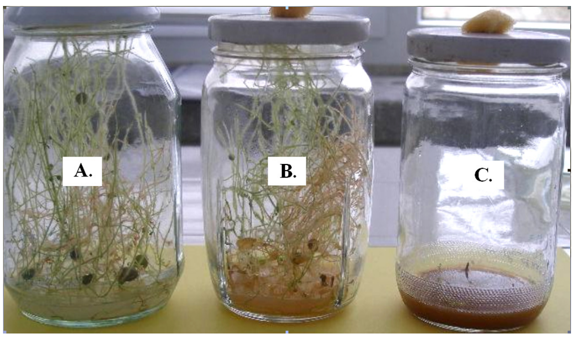

Figure 6. Aspects regarding the behavior of new *Solanum tuberosum* L., *Almasul Mic de Munte* old variety *in vitro* cultivated on media supplemented with different concentration of bioactive magneto-fluidic nanocomposites: **A** - propagation medium; **B** - propagation medium + bioactive magneto-fluidic nanocomposites θ = 3.7 x 10^{-3}; **C** - propagation medium + bioactive magneto-fluidic nanocomposites θ = 37 x 10^{-3}

DISCUSSION

The use of bioactive magneto-fluidic nanocomposites in the field of biological sciences depends firstly on dispersion medium, which is not always biocompatible, and secondly on the critical concentration necessary to associate compounds with magnetic properties. Mostly, this concentration is significantly higher than the level admitted for its circulation within the organism or by its presence at the exterior of the considered organ or organism [5].

The research groups from The Veterinary Medicine of U.S.A.M.V.B. Timisoara have investigated the possibilities to use bioactive magneto-fluidic nanocomposites in the veterinary practices considering the specific properties of these liquids and particularly based on the results obtained in biology and human medicine.

The bioactive magneto-fluidic nanocomposites could be successfully used in order to stimulate the immunological response on animals in case of using vaccines with low immunological properties [14].

On the ground of the negative reactions generated by the bioactive magneto-fluidic nanocomposites, we have performed a series of studies in order to assess the lethal dose for animals: DL_0 (as tolerant maximum dose - DMT), DL_{50}, DL_{75} and DL_{100}. In this regard, we have used 100 and 130 Gs bioactive magneto-fluidic nanocomposites considering rat and rabbit subjects. From the performed researches, we have concluded that the lethal dose is closely related with species and gender. Considering the obtained results, it could be concluded that the bioactive magneto-fluidic nanocomposites might be included in the group of moderate toxic compounds [7, 10].

Water-based (NMA) or oil-based (NMU) bioactive magneto-fluidic nanocomposites were tested on different plant species in order to determine the occurrence of various changes. In this regard, we have performed observations on control of seed germination; evolution of plants obtained from treated seeds, changes induced in the cell organelles and chromosomes, plant growth and appearance of some abnormalities as effect of the applied treatments [13].

In case of *Triticum*, *Triticale*, *Hordeum* and *Zea* species, we have studied the influence of different types and concentrations of bioactive magneto – fluidic nanocomposites on seed germination. It has been noticed a slight reaction to the action of these nanocomposites in *Triticum* comparing with the rest of the studied species.

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 *Solanum tuberosum* L. species.

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