

NANOSECOND PULSED ELECTRIC FIELDS AFFECT THE GROWTH OF PLANTS AND FUNGI

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Plants¹ and fungi have been treated with pulsed electric fields to examine the effects of nanosecond pulses on their development. Therefore spores of the basidiomycete *Hypsizygus ulmaris* (elm oyster mushroom) as well as 7 day old seedlings of *Arabidopsis thaliana* were exposed to field strengths of 5 - 50 kV/cm. The rectangular voltage pulses were generated by a transmission line pulse generator and delivered to a standard electroporation cuvette (electrode distance: 4mm) containing the immersed spores or seedlings. The pulse duration (10 ns, 25 ns and 100 ns) and the number of pulses (10 -100) were adapted for a certain specific energy delivery to the load. Typical specific energies used for the treatments were in the range of 100 J/kg up to 10 kJ/kg. After electric field treatment, 100 µl of the treated spore suspension was used to inoculate an agar plate and incubated for 12 days at 25°C in the dark. For plant treatment, 10 seedlings have been transferred to an agar plate and cultivated for 11 days in a growth chamber. The development of the mycelium was documented daily. Images of the seedlings were acquired every second day. The mycelium area and the leaf area have been determined by the program ImageJ². The most distinct effects on seedling and mycelium growth were observed for a treatment energy of 100 J/kg (5 kV/cm, 100 ns, 100 pulses). For these parameters, the seedlings showed a leaf area increase of up to a factor of 2 compared to the control, whereas the mycelium covered area was 2.75 times larger. It is assumed, that growth stimulation is a stress response of the organism against nsPEF exposure. This response might be triggered by a calcium release from porated internal stores, caused by the nsPEF-treatment.

1. C. J. Eing, S. Bonnet, M. Pacher, H. Puchta and W. Frey, "Effects of nanosecond Pulsed Electric Field Exposure on *Arabidopsis thaliana*", IEEE Transactions on Dielectrics and Electrical Insulation Vol. 16, No.5
2. W. S. Rasband, "ImageJ", U. S. National Institutes of Health, Bethesda, Maryland, USA, <http://rsb.info.nih.gov/ij/>, 1997-2008