



## Original Article

*Planta*

March 2008, Volume 227, *Issue 4*, pp 883-891

First online: 20 November 2007

# High frequency (900 MHz) low amplitude (5 V m<sup>-1</sup>) electromagnetic field: a genuine environmental stimulus that affects transcription, translation, calcium and energy charge in tomato

- David Roux
- , Alain Vian
- , Sébastien Girard
- , Pierre Bonnet
- , Françoise Paladian
- , Eric Davies
- , Gérard Ledoigt

## Abstract

Using an especially-designed facility, the Mode Stirred Reverberation Chamber, we exposed tomato plants (*Lycopersicon esculentum* Mill. VFN8) to low level (900 MHz, 5 V m<sup>-1</sup>) electromagnetic fields for a short period (10 min) and measured changes in abundance of three specific mRNA soon after exposure. Within minutes of electromagnetic stimulation, stress-related mRNA (calmodulin, calcium-dependent protein kinase and proteinase inhibitor) accumulated in a rapid, large and 3-phase manner typical of an environmental stress response. Accumulation of these transcripts into the polysomal RNA also took place (indicating that the encoded proteins were translated) but was delayed (indicating that newly-synthesized mRNA was not immediately recruited into polysomes). Transcript accumulation was maximal at normal Ca<sup>2+</sup> levels and was depressed at higher Ca<sup>2+</sup>, especially for those encoding calcium-binding proteins. Removal of Ca<sup>2+</sup> (by addition of chelating agents or Ca<sup>2+</sup> channel blocker) led to total suppression of mRNA accumulation. Finally, 30 min after the electromagnetic treatment, ATP concentration and adenylate energy charge were transiently decreased, while transcript accumulation was totally prevented by

application of the uncoupling reagent, CCCP. These responses occur very soon after exposure, strongly suggesting that they are the direct consequence of application of radio-frequency fields and their similarities to wound responses strongly suggests that this radiation is perceived by plants as an injurious stimulus.

### **Keywords**

Mode stirred reverberation chamber Radiofrequency electromagnetic field Stress  
Tomato Wound-like responses