

MODELING THE ACTION OF MICROWAVES ON *ESCHERICHIA COLI*

Ion Dan Mironescu^{1*}, Monica Mironescu¹

¹Faculty of Agricultural Sciences Food Industry and Environmental Protection,
University Lucian Blaga of Sibiu, Ion ratiu st. 7-9, 550012, Sibiu, Romania

*e-mail: ion.mironescu@ulbsibiu.ro

Abstract

Treatment with microwaves of *Escherichia coli*, a pathogen usually used as test food contaminating strain, gives generally a reduction of the microbial population. In this paper, the action of microwaves on *E. coli* on solidified and liquid media was investigated, as function of microwaves power x 1 (varying from 180 to 540 W), treatment time with microwaves x 2 (from 10 to 30 seconds) and inoculum concentration x 3 (from 102 cell/mL to 104 cells/mL) on both solidified and liquid substrate, after treatment and one week after treatment.

The strain *E. coli* ATCC 11775 was used. The inactivation rate (IR) was established as function of the three parameters, by using a 2³ full factorial design. The data obtained were used to build polynomial models for IR: $IR_{\text{solidified substrate}} = 28.93 + 18.14 \cdot x_1 + 16.18 \cdot x_2 + 11.28 \cdot x_1 \cdot x_2 + 2.45 \cdot x_2 \cdot x_3$; $IR_{\text{liquid substrate}} = 13.19 + 4.86 \cdot x_1 + 3.01 \cdot x_2 + 3.47 \cdot x_1 \cdot x_2$.

Results showed that only two from the three analysed parameters influence IR of *E. coli*, namely the microwaves power x1 and the treatment time with microwaves x2, on solidified or liquid substrate; both of them had a positive influence on IR, as individual or in combination. The inoculum concentration x3 seemed to not influence IR.

The free coefficient in the models was high, indicating that other factors as those investigated could have a positive influence on IR. It was difficult to establish whether action on solidified or on liquid media is more effective. An increase of inactivation was observed in all samples after one week of treatment with microwaves, indicating a possible residual action of microwaves. In the tested conditions, the better treatment with microwaves of liquid or solidified substrates contaminated with *E. coli* was at using microwaves power 540 W for 30 seconds.

Key words: Microwaves, *Escherichia coli*, Full factorial design, Model.