THE MAGNETICAL FIELD – NEW TECHNOLOGIE FOR WINE MICROBIOLOGICAL STABILIZATION

CÂMPUL MAGNETIC – O NOUĂ TEHNOLOGIE DE STABILIZARE MICROBIOLOGICĂ A VINULUI

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Abstract. *Because the classical methods for food sterilization (pasteurization, thermolization or sterile filtrations) decay the nutritive quality of food, the found of new non-thermal technologies is essential. The use of magnetic field for wine stabilization is valuable because is a friendly innovative technology based on non-heating procedures, without influencing on the savor, color and nutritional value of the products undergoing such treatment. The static magnetic field (the magnetic field intensity is constant with time) have been explored for their potential as microbial inactivation method. The SMF was applied for 5min, 10 min, 15 min and 20 min. It remarks that the static magnetic field inhibited microbial growth. The experiment was carried out on 2 wine batches (1 white wines and 1 red wines). The geometry for system was constant. The exposition times and the intensity for magnetically field are established by preliminary experiments. The results show that this method is very efficiently for food preservation.*

Rezumat. *Având in vedere deficiențele metodelor clasice de sterilizare utilizate in prezent (pasteurizare, termolizare sau imbuteliere la cald, filtrări sterilizante), cercetările pentru găsirea unei tehnologii alternative sunt total justificate. Printre soluțiile nontermale actuale (iradiere, câmp electric pulsatoriu, presiuni înalte, UV, ultrasunete), aplicarea câmpului magnetic static/oscilator poate conferi o siguranță microbiană a produselor alimentare lichide, fără a le altera calitatea nutritivă.*

Wine can be defined as the alcoholic product resulting from the fermentation of fresh grape juice obtained from grapes with the genotypes of *Vitis vinifera* that have been propagated over the ages (Țardea, 2007). Wines can be produced with compositional characteristics (changes in aroma and flavours) that differ from year to year, depending on the grape type, microbial species predominating at the time.

In traditional winemaking the grape juice, after the grape pressing, is put into vats where fermentation take place, spontaneously transforming the must into wine. The fermentation of the juice can involve many types of yeast, like Saccharomyces. There are advantages to not leaving the must to its destiny and no allowing the free growth of wild undesired yeasty, it is best to guide the fermentation and to favour the elliptical morphological yeast of the species S.cerevisiae.

Traditional winemaking presupposes several prefermentative treatments during which wild microbiota are controlled through the addition of SO_2 (Romano and Suzzi, 1993). The antiseptic function of SO_2 is an important

determinant for the yeast population, having been revealed selective especially towards lactic and acetic bacteria. The necessary sulphide amounts must be kept to the minimum, above all for health and organoleptic reasons.

For this reason, the use of alternative nonthermal methods (like magnetical field) in food processing has been under intense study (Frankel, 1995, Barbosa et al., 2000, Tudorache et al, 2007). Innovative non-thermal processing technologies can deliver a range of product and process benefits depending on the product application. Often these technologies may deliver fresher tasting, minimally processed food products at a level of safety equivalent to, or better than, traditional approaches.

MATERIAL AND METHODS

The experiment was carried out at the laboratory scale. The equipment for the SMF treatment consists in a pulse generator and an electromagnet. The intensity was read on a multimeter and the samples were placed inside the electromagnet, in centrum, where the intensity of magnetic field is constant and maximum (10^{-2} T in our experiment).

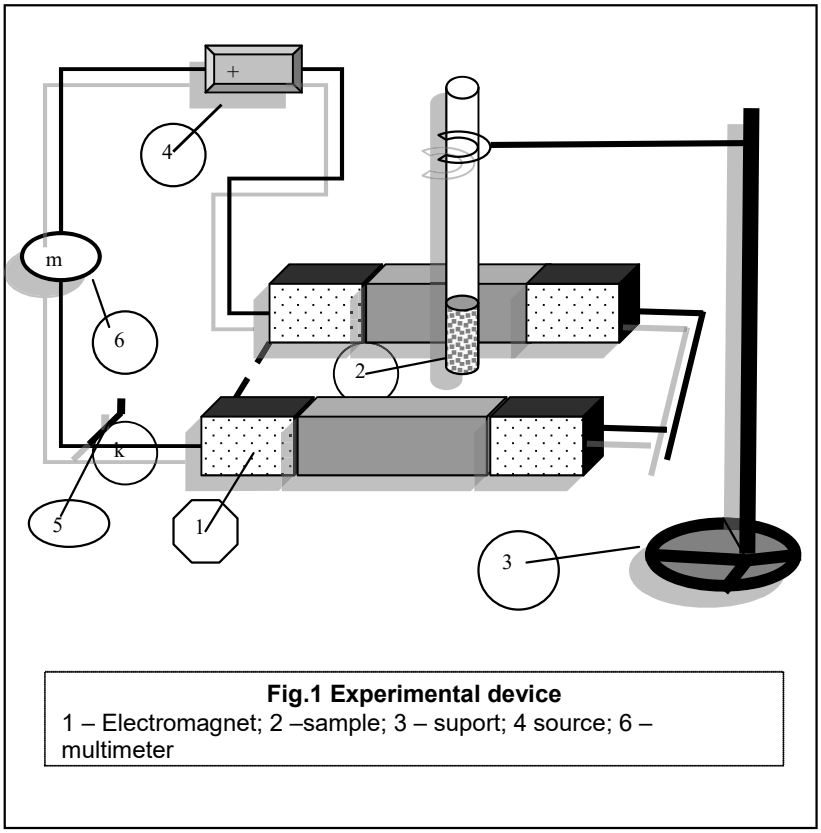

Fig.1 Experimental device
1 – Electromagnet; 2 –sample; 3 – suport; 4 source; 6 – multimeter

We used cell suspension with yeast isolated from white wine (Sauvignon Odobesti) and from red wine (Merlot Cotesti) in YPG liquid medium.

The experimental variants were different by the treatment period. A 24 hours suspension was treated in static magnetic field for 5, 10, 15 and 20 minutes. It was a control sample (witness lot – the must that did not undergo SMF treatment).

For the detection of viable yeast cells number, after 24 hours from exposure we diluted cell suspensions in sterile physiological water and we inoculated the 10^{-4}, 10^{-5} and 10^{-6} dilution in YPG solid medium (three repetitions for each dilution from exposed samples). The Petri dishes were incubated 72 hours at 30ºC and the colonies were estimated with Funke Gerber device. We calculated the number of viable cells per ml for each exposed sample and for witness sample.

RESULTS AND DISCUSSIONS

The results represent an indirect estimation of viable yeast cells number, by average number of colonies, at the same dilution (10^{-6}), for yeast cells suspension treated in static magnetic field 5, 10, 15 and 20 minutes and for witness sample. In figure 2 and 3 was presented the growing on the solid medium, for different experimental variants.

Fig.2 Yeast colonies derived from white wine, 5 min SMF, 10^{-7} dilution

Fig.3. Yeast colonies derived from red wine, 5 min SMF, 10^{-5} dilution

From figure 4 it remarks that the number of viable yeast cells derived from white wine decreases after 5, 10 or 15 minutes of exposure in magnetic field, comparative with the control.

After 20 minutes of exposure in static magnetic field, the numbers of viable cells are higher than sample treated for 5, 10 or 15 minutes, but smaller than the control sample.

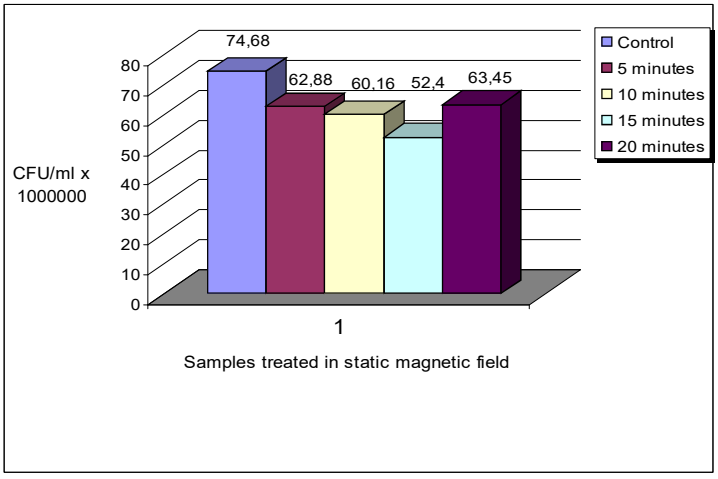

Fig. 4. Number of viable cells from red wine

For yeast cells, suspension derived from red wine the number of viable cells is show in figure 5. It remarks that the number of viable yeast cells decreases after 5, 10, 15 or 20 minutes of exposure in magnetic field comparative with the control, but more than the samples derived from white wine.

The number of viable cells for sample treated 15 or 20 minutes are higher than the number for sample treated 5 or 10 minutes.

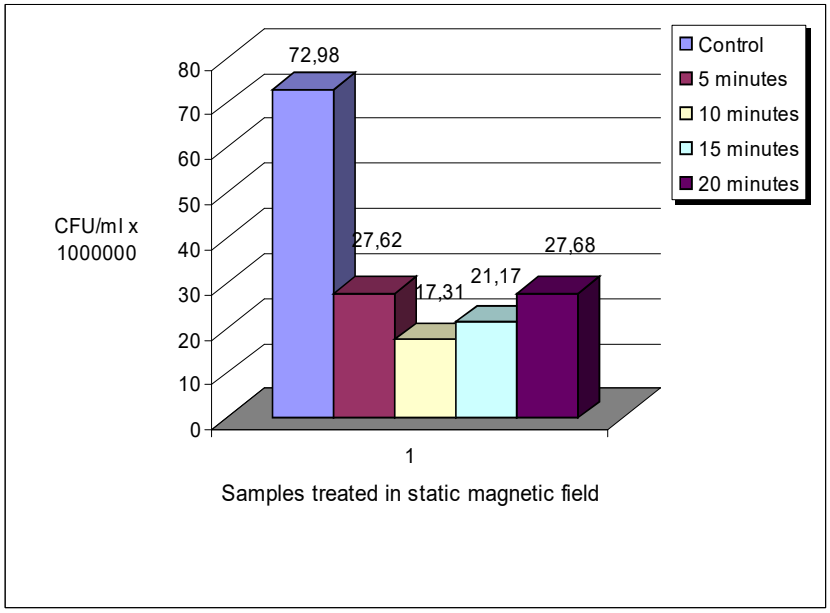

Fig. 5. Number of viable cells from white wine

CONCLUSIONS

It remarks that the SMF effect is different for the yeast colonies derived from white wine and red wine; on the red wine, the SMF action is powerful. The number of viable cells for samples from red wine was smaller than the number of viable cells for samples from white wine at the same exposure time (the initially number of cells are approximately the same, for control lot).

From our experiments, it cannot remarks a direct correlation between the exposure time and the decrease of viable cells number. Other authors observed a similar behavior of yeast cells, in static magnetic field.

Exposure to a magnetic field may stimulate or inhibit the growth and the reproduction of yeast. Inhibition or stimulation of the growth of microorganisms exposed to magnetic fields may be a result of the magnetic fields themselves or the induced electric fields.

The effect of magnetic fields on the microbial population of liquid foods (like wine) may depend on the magnetic field intensity, the microbial growth stage or the property of food (resistivity, electrical conductivity).

The mechanisms of microbial inactivation by static magnetic field are not very well known, so we will continue the experiment with more variants (different intensity magnetic field, time of exposure, microbial growth stage etc.).

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