EFFECT OF MICROWAVE TREATMENT OF THE GRAPE MUST FERMENTATION PROCESS

Viktória Kapcsándi[1] – Miklós Neményi[2] – Erika Lakatos
[1]University of West Hungary, Faculty of Agricultural and Food Science
[2]University of West Hungary, Faculty of Agricultural and Food Science, H-9200 Mosonmagyaróvár, Vár 2.

ABSTRACT

Our work during the fermentation process grape must was investigated. In our study we performed a comparison of different treatments (conductive, microwave, yeast, conductive + yeast, microwave + yeast) samples obtained by the fermentation of grape must. During the experiment, control samples also were compared with the results. The fermentation period was studied in samples of sugar, alcohol and acidity changes. Compared to the control sample, the sample was warmed hotplate, a microwave treatment received from the yeast supplement, in addition to yeast inoculation heating also received a hotplate and microwave treatment and yeast fermentation properties of samples is also given supplements. The treatments of the samples decreased faster than sugar, the fermentation time is, at best, approximately 40% shorter.

INTRODUCTION

The main task of winemaking technology is to optimize of fermentation process in order to suitable production of wine (EPERJESI et al. 1998). Complex processes are take during the fermentation process, which could influence the process by positive or negative way. However, the controlled fermentation is well directed process with to application of appropriate parameters (CALADO et al. 2002; SABLAYROLLES 2009). During the fermentation the emphasis is mostly on to optimize the alcohol, sugar and acid content (PICKERING et al. 1998; BIACS et al. 2010).

MATHERIALS AND METHODS

A method was developed for studying the effects of various treatments in the course of must fermentation. The raw material (must) was treated different ways: 1.microwave treatment; 2.inoculation with yeast; 3.conventional heating; 4.their combination. The results of the treatments were compared in the aspect of alcohol concentration, sugar and acid content.

During the experiments the alcoholic content was determined by Malligand-device, the sugar content of must with spectrophotometer, and acidity by titration (with NaOH). The measurements were performed with three repetitions.

RESULTS AND DISCUSSION

The initial sugar content was 17 during the measurements. The difference is visible between no treatment and the treated samples in the 8th day of fermentation (Figure 1). The sugar content degree reduce of the control sample is much slower.

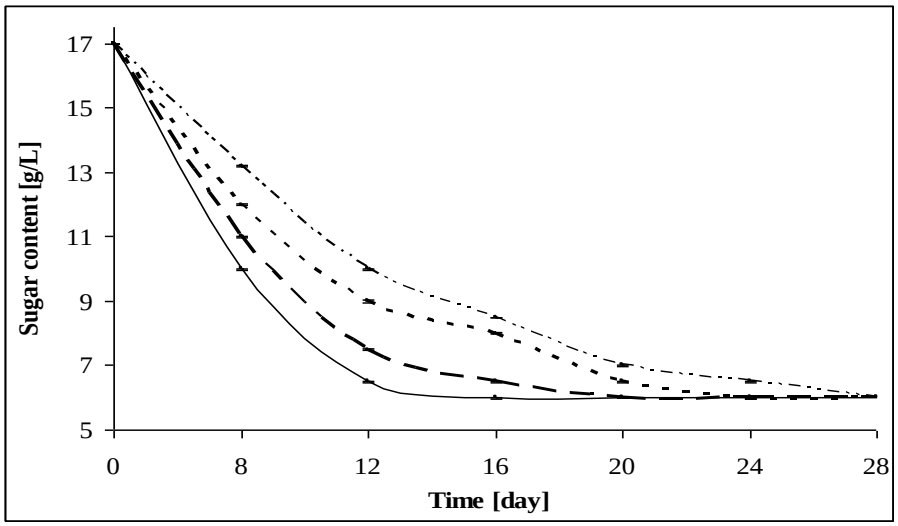

Figure 1. Changes the sugar content of the must during the fermentation of the control (-·-·-·), the microwaves (- - -), the yeast (—·—), and the yeast and microwave treated (——) samples.

Samples treated with microwave and yeast and inoculated only with yeast samples reached the highest alcoholic content (12.6%, 12.2%) on 20th day of fermentation, which implies that the treatment significantly influence the speed of fermentation.

In simple microwave treated sample achieved the highest alcohol content on 24-28th day of fermentation (12.1-12.2%).

Based on these results, can be stated that the fermentation is significantly influenced by the treatments.

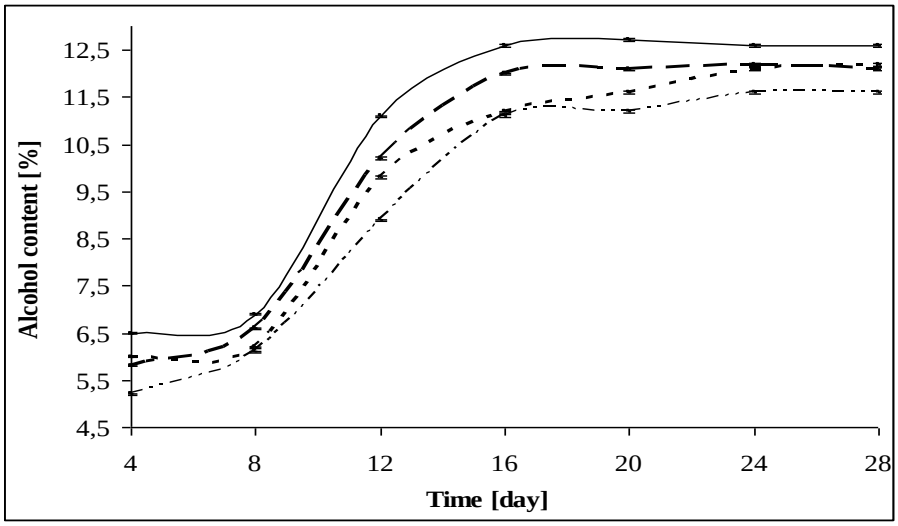

Figure 2. Changes of alcohol content of the must during the fermentation of the control(-·-·-·), the microwaves(- - -), the yeast (—·—) and the yeast and microwave treated (——) samples

At the beginning of the fermentation acidity was increased for a while and then decreased, as it is written in other studies (KÁLLAY 2010). This can be clearly seen in our measurements (*Figure 3*).

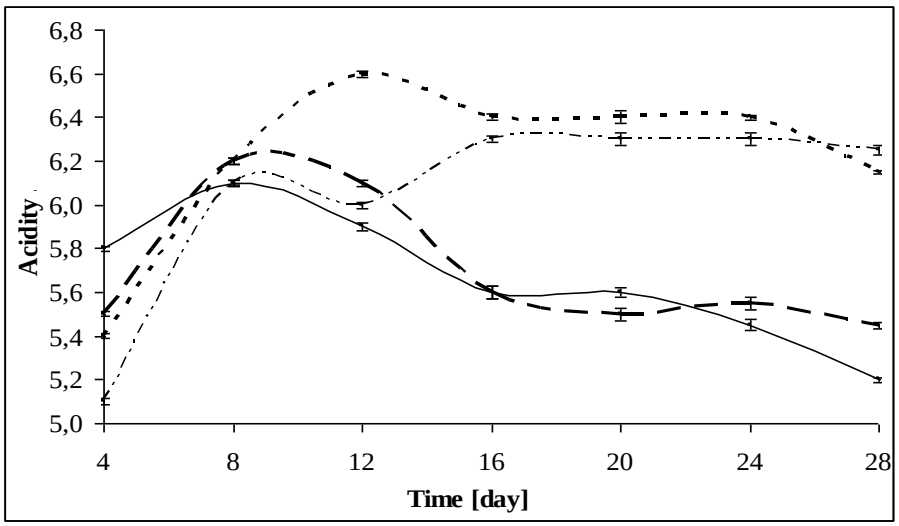

Figure 3. Changes of acidity of the must during the fermentation of the control (- · - · -), the microwaves(- - -), the yeast (— · —) and the yeast and microwave treated (——) samples

Further experiments, conventional (conductive) is treated by placements. Compared to the control sample, the sample was warmed hotplate, a microwave treatment received from the yeast supplement, in addition to yeast inoculation heating also received a hotplate and microwave treatment and yeast fermentation properties of samples is also given supplements.

Figure 4. shows that the "microwave + yeast" and "yeast + conductive" reached a maximum alcohol content earlier (fermentation 14 days) than the other samples.

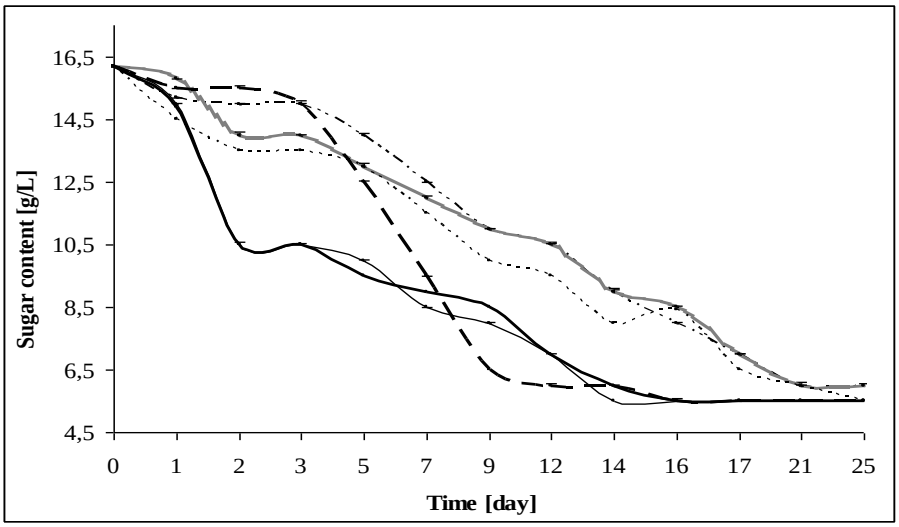

Figure 4. Changes of sugar content of the must during the fermentation of the control (- - - -), conductive (——), the microwaves (· - - - -), the yeast (— · —), the yeast and conductive (——), and the microwave and yeast treated (——) samples.

The alcohol content of the combined treated samples reached the highest level (10.4% - hot plate + yeast; and 10.2% - microwave + yeast) on 14th day of fermentation. The alcohol content of the must samples that were treated only with yeast inoculation or hot plate reached the highest level on the 18th day of fermentation (10% and 9.8%).

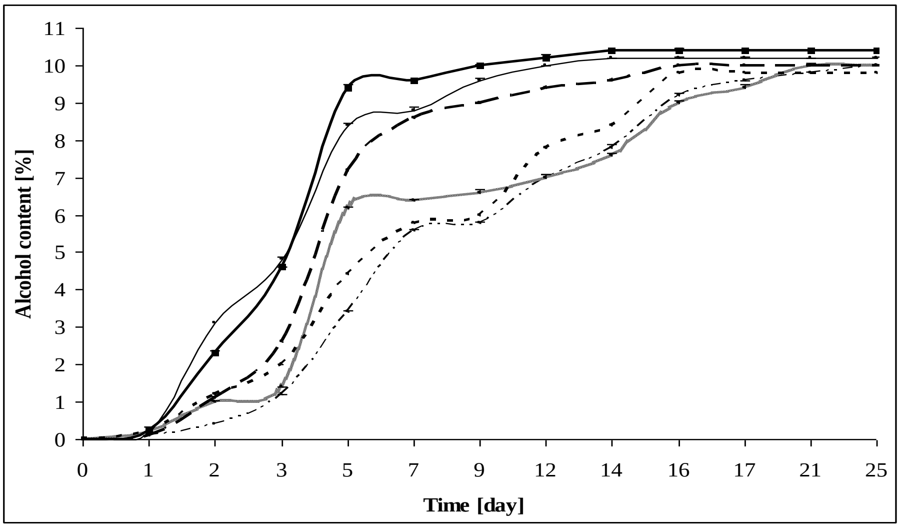

Figure 5. Changes of alcohol content of the must during the fermentation of the control (), conductive (), the microwaves (), the yeast (), the yeast and conductive (), and the microwave and yeast treated () samples.

The acidity is similar as in the first measurment. At the beginning of the fermentation acidity was increased for a while and then decreased.

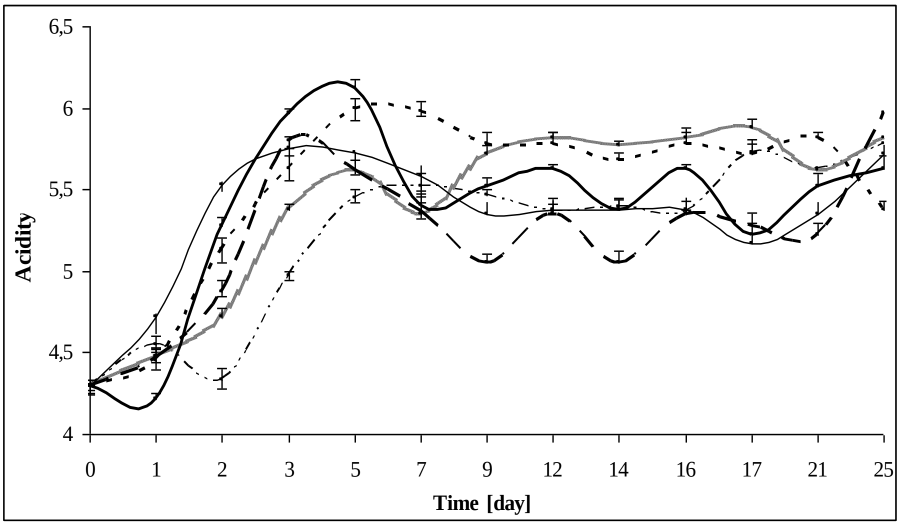

Figure 6. Changes of acidity of the must during the fermentation of the control (), conductive (), the microwaves (), the yeast (), the yeast and conductive (), and the microwave and yeast treated () samples.

CONCLUSIONS

The fermentation time was by 40% shorter in the best case. These results are probably caused by the yeast inoculation and the microwave treatment.

There is no significant difference between the conventional heating and microwave treatments in case of using yeast.

In this case the non-thermal effect of microwave is not prevail or has no effect to measure. It is stated that a short-term heat treatment prior to fermentation at max. 32^{o}C influences the parameters of the fermentation in a positive way by using yeast. The fermentation time is shortened, while the alcohol yield increased.

REFERENCES

1. BIACS P. - SZABÓ G. - SZENDRŐ P. - VÉHA A. (2010): Élelmiszer-technológia mérnököknek, [Food-technology for engineers] Szegedi Tudományegyetem Mérnöki Kar, Szeged
2. CALADO C.R.C. - TAIPA M.A. - CABRAL J. M.S. - FONSECA L.P. (2002): Optimisation of cultur conditions and characterization of cutinose produced by recombinant Saccharomyces cerevisiae. Enzyme and Microbial Technology. Vol. 31. pp. 161-170.
3. EPERJESI I. - KÁLLAY M. - MAGYAR I. (1998): Borászat, [Winery] Mezőgazda Kiadó, Budapest
4. KÁLLAY M. (2010): Borászati kémia. [Oenological chemistry] Mezőgazda Kiadó, Budapest. p. 94.
5. PICKERING G.J. - HEATHERBELL D.A. - BARNES M.F. (1998): Optimising glucose conversion in the production of reduced alcohol wine using glucose oxidase. Food Research International, Vol. 31, Issue 10, pp. 685-692
6. SABLAYROLLES J.M. (2009): Control of alcoholic fermentation is winemaking: Current situation and prospect. Food Research International 42 pp. 418-424.