TEST APPLIED TO SEVERAL ROMANIAN MICROFILTERING COMPOSITES IN THE TECHNOLOGICAL FLOW OF WINE STERILE FILTRATION

TESTAREA UNOR COMPOZITE MICROFILTRANTE ROMANESTI PE FLUXUL TEHNOLOGIC DE FILTRARE STERILA A VINULUI

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Abstract. *The wine sterile filtration represents a very important process of the winemaking technology. The microbiologic stability and its availability during the whole period of wine storage depend on the filtration quality. There are lots of sterile filtration techniques, and the filtration through sterile plates represents one of them. At the national level, the filtering plates are produced by CEPROHART Braila, which, within 2006-2008 accomplished valuable variants of microfiltering composites for wine sterile filtration. Such materials were tested at IC-DVV Valea Calugareasca. The Romanian microfiltering composites were tested by applying an original technology elaborated on that purpose. Its background was a laboratory technology for wine sterile filtration and analysis methods for the technical parameters of the filtration and for the wine quality parameters, associated with filterability and quality. Tests were made for assessing the filtration efficacy, by considering the capacity of retaining the main microorganisms in wine, the filtering characteristics and the filtration effects on wine composition and organoleptical features. The results obtained with the Romanian microfiltering composites were compared to those of the similar products on the market. Considering their efficacy, it was concluded that several variants of Romanian microfiltering composites are quite comparable to the products made in EU.*

Rezumat. *Filtrarea sterila a vinurilor reprezinta o veriga importanta a tehnologiei de producere a vinurilor. Stabilitatea microbiologica a vinului si conservarea ei pe toata perioada de pastrare depind de capabilitarea operatiei de filtrare . Tehnicile de filtrare sterila sunt multiple iar filtrarea prin placi sterile este una dintre ele. La nivel national, placile filtrante se produc la CEPROHART Braila. Aceasta societate a realizat in perioada anilor 2006-2008 variante de compozite microfiltrante performante destinate filtrarii sterile a vinurilor. Aceste materiale au fost testate la IC-DVV Valea Calugareasca. Compozitele microfiltrante romanesti au fost testate dupa o metodologie proprie, elaborata pentru acest scop. Ea are la baza o tehnologie de laborator pentru filtrarea sterila a vinurilor si metode de analiza a parametrilor tehnici ai filtrarii si a parametrilor calitativi ai vinurilor, asociati filtrabilitatii si calitatii. S-au realizat teste pentru evaluarea eficacitatii operatiei de filtrare pe baza capacitatii de retinere a principalelor microorganisme din vin, a caracteristicilor filtrante si a efectelor filtrarii asupra compozitiei si insusirilor senzoriale a vinurilor. Performantele compozitelor microfiltrante romanesti au fost comparate cu performantele produselor similare de pe piata. Rezultatele obtinute au aratat ca unele variante de compozite microfiltrante romanesti prezinta performante apropiate de cele ale produselor similare fabricate in UE.*

The sterile filtration of the wines is an important link of the wine production technology. The microbiological stability of the wine and its conservation during the whole preservation period depends on the capability of the filtration operation and on the wine composition. The proteins, the polysaccharides, the mucilage, the gums and the colloidal coloring substances are the particles in the wine that have clogging power (Gaitier B., 1984).

Numerous studies regarding the sterile wine filtration were performed abroad (Bruetschy A. Si col., 1997; Gautier B., 1984; Neff J., 1999; Vacariuc L. Si col., 2001) and in our country (I.C-D.V.V. Valea Calugareasca). The studies referred to formulas for filter layers, sterile filtration techniques, sterile filtration optimization, and evaluation of the sterile filtration efficiency and to the effects of this operation on the genuineness of the wine.

There are multiple techniques of sterile filtration, and the filtration through sterile plates is one of them. The main manufacturers of sterile plates are: Begerow, Saitz, Schenck, Filtrox. At national level, the filter plates are manufactured by CEPROHART Braila.

The purpose of this study is to evaluate the technical performances of the sterile plate manufactured by CEPROHART Braila in order to identify the non-compliant features and to test newly created microfiltering composites within the wine sterile filtration process. The results were obtained in the frame of the Project no. M1-C2-303/CEEX Program, performed between 2006 and 2008.

MATERIAL AND METHOD

The evaluation of the M110 filter sheet technical performances within the wine sterile filtration process

The M110 filter sheet technical performances were established within the white and red wines sterile filtration process applied at the level of the pilot station from I.C-D.V.V. Valea Calugareasca. Two batches of wines were used, a white and a red one from the 2006 harvest. The wine has undergone proteic and tartaric stabilization. The filtration was performed through the plate filter Minus 10P/Manufatured by Fratelli Marchisio, Italy. The characteristics of the filter were the following: filtering surface of the plate 0.04 m^2, number of plates 11. The filter features a manometer.

The characteristics of the filtration were determined (average flow, duration of one cycle, extension of one cycle and weeping volume) and the efficiency of the sterile filtration through the M110 plate was evaluated. The study established, also, the influence of the sterile filtration through the M110 plate over the general and colloidal composition of the wines. The characteristics of the filtration were established by a procedure specially elaborated by I.C-D.V.V. Valea Calugareasca for this objective. The general wine composition characteristics were determined by standardized methods. The tannins, the colloidal polysaccharides and the proteins were evaluated by the following personalized methods: MP-VT-PF-02.01-TAN (tannin), MP-VCT-F-O1-COLGL (colloidal polysaccharides) and MP-VCT-F-02-PROT (proteins).

The primary data analysis was performed by comparison and graphically. The comparison was performed with the Steril 40 plate manufactured by the Begerow Company.

Testing of newly created types of microfiltering composites within the wine sterile filtration process

7 types of newly created microfiltering composites were tested, types that have the following codes: P1, P2, P3, P4, A, F and L. The sterilizing effect of these microfiltering composites was evaluated in the laboratory, using a Sartorius filter, with a 3 l capacity. The test was performed for the main contamination germs of the wine, yeasts, lactic bacteria and acetic bacteria. For yeasts the *Saccharomyces rozei* species for lactic bacteria, *Leuconostoc oenos* and for acetic bacteria, *Acetobacter vini* were used. Suspensions of the above mentioned germs were performed in conditions of maximum microbial load (10^3 UFC/ml). The sterilizing effect was evaluated based on the microbial load of the filtered liquid and on the retention rate of the microorganisms, determined through personalized methods by I.C-D.V.V. Valea Calugareasca.

The primary data analysis was performed graphically and by comparison. The comparison was performed with the Steril 40 plate.

RESULTS AND DISCUSSIONS

Evaluation of the technical performances of the M110 filter plate within the wine sterile filtration process

The latest type of sterile filter sheet manufactured by CEPROHART Braila is M110. This sheet does not fully comply with the quality criteria. In order to identify the weaknesses of this plate, the technical performances of the sheet were evaluated during a red wine and a white wine sterile filtration process. The results achieved are presented in Table 1.

Table 1

Characteristics of the wine sterile filtration through two types of sheets

Filtration characteristics	Plate M110	Plate Steril 40
White wine, 2006 crop		
Average flow (l/m^{2}min)	50,44	55,29
Duration of one cycle (min)	235	440
Filtred volum per cycle (l)	2519	5170
Weeping volume (l/l filtered wine)	0,023	0,002
Red wine		
Average flow (l/m^{2}min)	27,15	28,86
Duration of one cycle (min)	215	270
Filtred volum per cycle (l)	2041	2435
Weeping volume (l/l filtered wine)	0,019	0,008

The analysis of the sterile filtration characteristics showed that the M110 sheet is inferior to the Steril 40 sheet. The filtration through the M110 sheet is performed at a flow with 6-9% lower, and the weeping losses are very large. The losses are triple for the red wine and 10 times larger for the white wine. The duration and extension of a filtration cycle are, also, much lower.

The sterilizing effects of the two types of sterilizing plates are different (Table 2).

Table 2

Microbial load (UFC/ml) of the wines filtered through various sheets

No.	Parameter	Wine before filtration	Wine after filtration through	
			Plate M110	Plate Steril 40
White wine, 2006				
1.	Yeasts	0.07	0.002	0
2.	Lactic bacteria	0.11	0.006	0
3.	Acetic bacteria	0	0	0
Red wine, 2006				
1.	Yeasts	6.3	0.02	0
2.	Lactic bacteria	9.66	0.04	0
3.	Acetic bacteria	0	0	0

The M110 sheet did not entirely retain the yeasts and the lactic bacteria. The wine did not contain acetic bacteria. The yeasts retention rate in the white and red wine was 1.54, respectively 2.50. The lactic bacteria retention rate was approximately the same. The influence of the wine sterile filtration on the wine composition should be minimal. The values of the physical-chemical parameters specific to the general and colloidal composition of the wines are presented in Table 3.

Table 3

General and colloidal composition of the wines sterile filtrated through various filter sheets

Physical-chemical characteristics of the wine	White		Red	
	M110 sheet	Steril 40 sheet	M110 sheet	Steril 40 sheet
Achieved level of alcohol %	11,9	11,9	12,5	12,5
pH	3,46	3,46	3,88	3,90
Total acidity (g/l tartaric acid)	6,42	6,42	4,97	4,97
T 625	25,50	25,88	2,45	2,45
Total extract (g/l)	20,66	20,64	27,45	27,41
Cinder (g/l)	1,88	1,91	2,37	2,38
Cinder alkalinity (g/l K_2CO_3)	2,11	2,07	2,49	2,28
Tannins (g/l)	6,64	6,65	3,07	3,05
Glucidic colloids (mg/l glucose)	75	92	102	116
Proteins (mg/l)	63	65	100	128

Fig. 1. The deviation from the control (wine sterile filtered through Steril 40) of the physical-chemical parameters of the wine sterile filtered through M110

The sterile plate type significantly influenced the alkalinity of the red wine cinder and the glucidic colloids and proteins of the white and red wine (Figure 1)

This deviation is a result of the different por size and porosity of the two tested sheets.

Testing of several newly created types of microfiltering composites within the wine sterile filtration process

The wine specific micro-flora consists of yeasts, lactic bacteria and acetic bacteria. The microbial load of the sterile filtered liquids depends on the filter composite used (table 4).

Table 4

Microbial load of the liquids after sterile filtration with various filter sheets

Sheet type	Group of microorganisms	Microbial load (UFC/ml)
Steril 40	Yeasts	0
	Lactic bacteria	0
	Acetic bacteria	0.007×10^3
P1 Composite	Yeasts	0
	Lactic bacteria	0.03×10^3
	Acetic bacteria	0.09×10^3
P2 Composite	Yeasts	0
	Lactic bacteria	0.02×10^3
	Acetic bacteria	0.09×10^2
P3 Composite	Yeasts	0
	Lactic bacteria	0.02×10^3
	Acetic bacteria	0.85×10^3
P4 Composite	Yeasts	0
	Lactic bacteria	0.04×10^2
	Acetic bacteria	0.02×10^3
A Composite	Yeasts	0
	Lactic bacteria	1.7×10^3
	Acetic bacteria	1.3×10^3
F Composite	Yeasts	0
	Lactic bacteria	1.2×10^3
	Acetic bacteria	1.2×10^3
L Composite	Yeasts	0
	Lactic bacteria	1.1×10^3
	Acetic bacteria	1.0×10^3

The study showed that the “Steril 40” plate can retain entirely the yeasts and the lactic bacteria and partially the acetic bacteria. The sheets manufactured by CEPROHART Braila have a wine specific microorganism retention capacity inferior to “Steril 40”. The respective sheets retained entirely the yeasts and partially the lactic and acetic bacteria.

The microorganism retention rate is specific for each filtering sheet type (Figure no. 2).

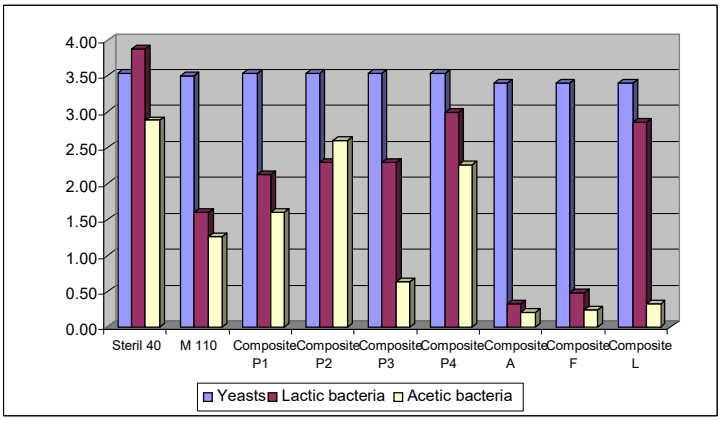

Fig.2 The microorganisme retention rate

The best sterilizing effect among the newly created plates was recorded by Composites P4 and P2, the first one retaining better the lactic bacteria and the second one, the acetic bacteria. It is necessary to continue the study in order to create plates that have the same sterilized effect as the similar imported plates.

CONCLUSIONS

The M110 filter plate manufactured by CEPROHART Braila does not have the capacity to entirely retain the bacteria, the glucidic colloids and proteins in the wine. It is necessary to manufacture other microfiltering composites to entirely retain the contamination germs and the wine particles with colmation power.

7 new types of microfiltering composites were created, composites that have the following codes: P1, P2, P3, P4, A, F and L. The best sterilizing effect was recorded by Composites P4 and P2, the first one retaining better the lactic bacteria and the second one, the acetic bacteria. It is necessary to continue the study in order to create sheets that have the same sterilizing effect as the similar imported sheets.

REFERENCES

1. **Bruetschy A., Durier C., Guillou S., Cuinier C., Leveau J. Y., 1997**- *Effects on microbiological and sensorial properties of Chinon red wines.* Revue Française d'Oenologie, Paris France, N° 163, pag. 28-32.
2. **Gautier B., 1984** - *Aspects pratiques de la filtration des vins*. Ed. Bourgognr-publications sarl/France.
3. **Vacarciuc L., Madan I., 2001** - *Filtrarea bauturilor.Ghid practice. Chisinau.*
4. **Neff J.,1999** - *The finer points of filtration.* Food Processing 60(3): 96-100.