The use of vegetable proteins in the clarification of white wine "Catalanesca".

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Abstract.

The paper shows analytical data concerning use of vegetable proteins in the clarification of white wine "Catalanesca". The proteins used were: Soy, wheat and bean. Regarding the parameters of the clarification the proteins were compared to an animal gelatin at two different temperature (4.5°C and 20°C).The clarification took place using water solutions of proteins at different concentration :10/20/40 g/hl. Use of vegetable proteins was introduced in order to prevent the risk of some animal diseases, linked with the use of animal gelatin, as BSE and others. The considerations reported in the text show how vegetable proteins have more efficiency than animal gelatin to reduce the turbidity of wine (Panero et al., 2001). Moreover vegetable clarifiers produce a low volume lees, which enable to recover much wine during the decanting operation. The content of total phenols and catechins in clarified wine was the same at both temperatures and for both clarifying agents used. Vegetable proteins also show more efficiency than gelatin to maintain wine's color stability and in some cases, the employment of high quantities of vegetable proteins produced a significant decrease of metal content as potassium, copper and iron.

Keywords: Fining, clarifying, white wine, gelatin, vegetable proteins, must, wine

Proceedings of the 3rd CIGR Section VI International Symposium on FOOD AND AGRICULTURAL PRODUCTS: PROCESSING AND INNOVATIONS Naples, Italy, 24-26 September 2007

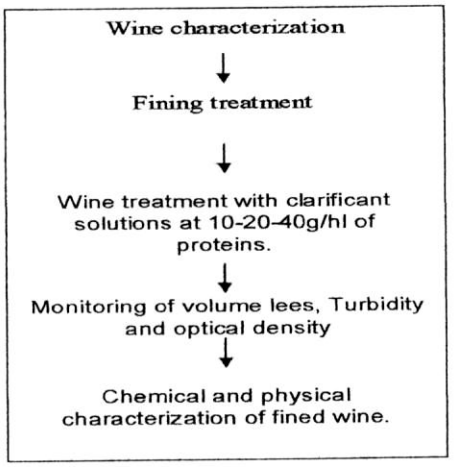
Introduction

The "Catalanesca" grape is a typical southern Italy vine(Pasquarella C., 2004)., according to Moio (2004) opinion, the wine made from its grapes is dry with equilibrate taste and fruity flavour characterized by apricot and honey notes. The commercial diffusion of this wine is very recent so the aim of this work has been the study of different clarification practises during winemaking, trough the use of common animal gelatines and vegetable proteins using as clarifying factors. Once fermentation is completed, the clarification process begins. Winemakers have the option of racking or siphoning their wines from one tank or barrel to the next in the hope of leaving the precipitates and solids called pomace in the bottom of the fermenting tank. Filtering and fining may also be done at this stage. Fining occurs when substances are added to a wine to clarify them. Often, winemakers will add egg whites, clay, or other compounds to wine that will help precipitate dead yeast cells and other solids out of a wine. These substances adhere to the unwanted solids and force them to the bottom of the tank. The clarified wine is then racked into another vessel, where it is ready for bottling or further aging(Di Domenica B, 1985;Marenghi M,2002). The more used clarifying compounds in wine making process were animal gelatines but the bovine spongiform encephalopathy crisis has led some winemakers to question gelatin as a fining agent and to reject the use of animal proteins (Lefebvre S, 2003). Vegetable proteins was evaluated as a substitute for gelatin by comparing vegetable treatments to other fining agents currently used (gelatin-tannin). In this experimentation have been utilized soybean, bean and whey proteins . The clarification of Catalanesca wine has been conduct at ambient temperature 20°C and in refrigerated conditions 4.5°C.

Materials and methods

The flow chart below shows the experimental draw followed.(Fig.1)

Fig.1. Experimental Draw.



Fining agents

Four proteic fining agents were utilized: three of vegetal origins and one of animal origin.
Supro 500 was a soybean clarificant, its production was protected by an OGM free program.
It has been utilized also beans lyophilized powder, and gluten.
The animal proteins were: Goldenclear: food gelatine applied in red and white wine fining.
Its use is allowed by Italian DM 26/04/69 (on wine additives); DM 20/10/78 (on food additives).

Fining Process

Clarification took place in 700 ml flasks . Agents have been dissolved in water in order to obtain a 20g/l solution. Experimental process has been lead at ambient temperature :20°C and at refrigerated one :4.5°C. Samples have been monitored over a period of 7 days and during this time has been determinates turbidity, density at 420nm and lees volume. Turbidity has been evaluated trough a Turbidimether LP 2000 HANNA-INSTRUMENTS, density was measured by a UV-VIS Spectrophotometer Shimadzu 1601.Total Polyphenols content has been determinate trough Folin-Ciocalteau method. Determination of Iron, Copper and Potassium was made by means of Atomic adsorption Spectrophotometry (AAS), a Perkin-Elmer 1100B with acetylene flame used.

Results and discussions

Ambient temperature Experimentation

The vegetables fining agents promoted a decrease of turbidity higher than gelatin. The best results were obtained with soybean and whey proteins. In fact, turbidities has shown a value, after flotation, of 5.2 FTU in sample treated with whey and soybean proteins at 40g/hl. Gelatin gave little satisfactory results (Fig .2). Wine treated with soybean proteins achieved turbidity values lower than wine treated with gelatin. Since 8 h after the treatment with 40g/hl of soybean proteins, there was a costant turbidity level. Instead on wine treated with gelatine the turbidity decrease only after 24 hour treatment (Fig. 3).

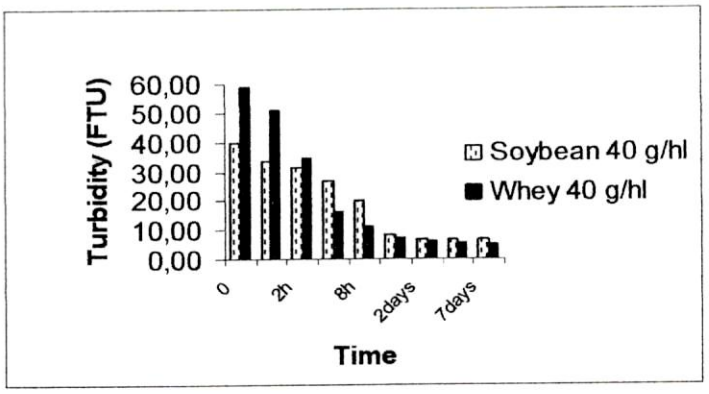


Fig. 2 Turbidity values of white wine Catalanesca treated with Soybean and Whey at 40g/hl.

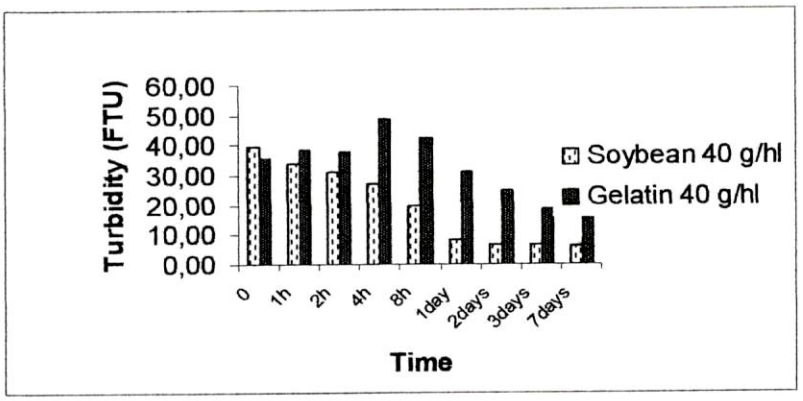


Fig.3 Turbidity values of white wine catalanesca treated with soybean and gelatin at 40g/hl.

Volume lees has been influenced by the content of fining agent utilized, as regard the gelatine, it brought the formation of an higher volume lees than others clarification agents. Although soybean gave a constant volume lees during the entire period of clarification. Optical density values undergo reduction in final wine. After 4 hour of treatment density value was lower in wine treated with soybean and reached a normal value after 8 hour of treatment.
In figure 5 it is illustrated density trend related to different vegetable proteins and to their concentration levels in wine. Whey and bean proteins have shown a negative result on optical density value. Concerning oenological parameters as total polyphenols and catechins, all samples clarified with vegetal proteins showed a light decline of total polyphenols content regarding to the natural clarified wine (Fig. 6). Samples treated with soybean and gelatine proteins had a light decline of polyphenols amount.

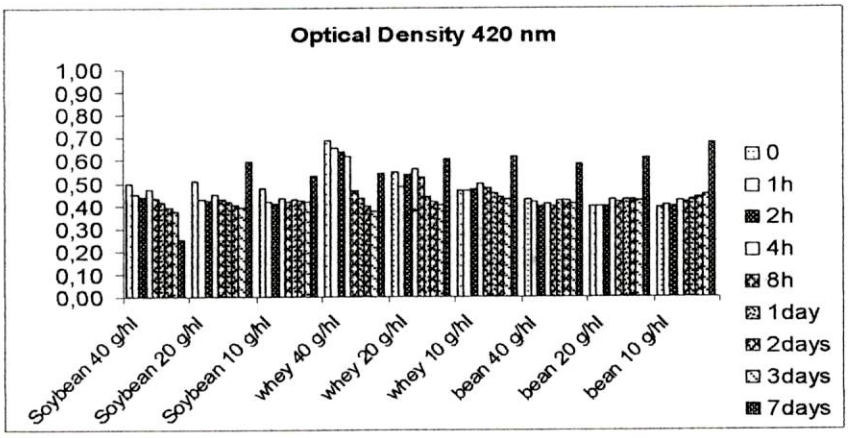


Fig.4 Density trend during clarification with vegetable proteins

Samples clarified in natural way had a polyphenols value of 890 mg/l, while samples clarified with soybean (40-20 g/hl) had a final amount of 782 mg/l and 784 mg/l respectively.

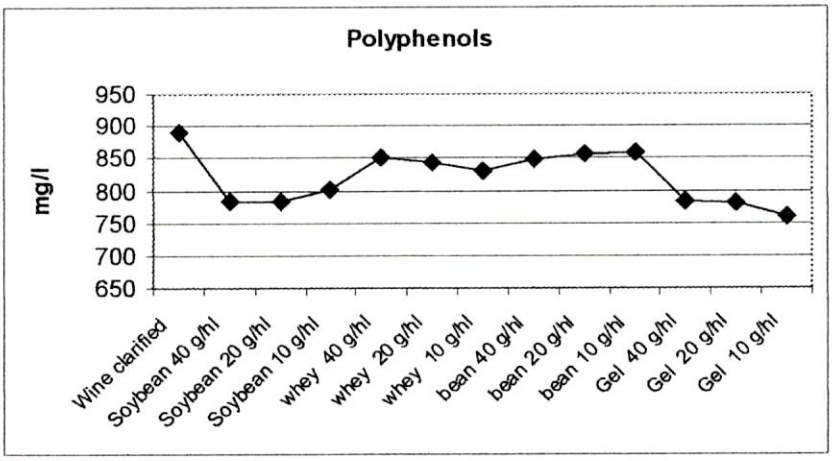


Fig.6 Polyphenols amount in clarified wine .

As regard catechins concentration, it has been observed a good reduction of this parameter during clarification. The highest reduction has been observed in samples clarified with soybean and gelatine which reached an amount of catechins of 120-130 mg/l at the end of clarification process. We, also, evaluated metals concentration of wine during the process. Iron(Fe2+), copper (Cu2+) and potassium (K2+) amount were evaluated. Their initial values were of 3.5, 5, 100 mg/l respectively. After clarification the best results have been reached with gelatine and soybean 40g/hl, where metals concentration has been reduced of 50% regarding to initial wine (fig.7). Clarification with vegetable proteins

influenced metals presence, reducing their concentrations by 50% respect to the natural clarified sample.

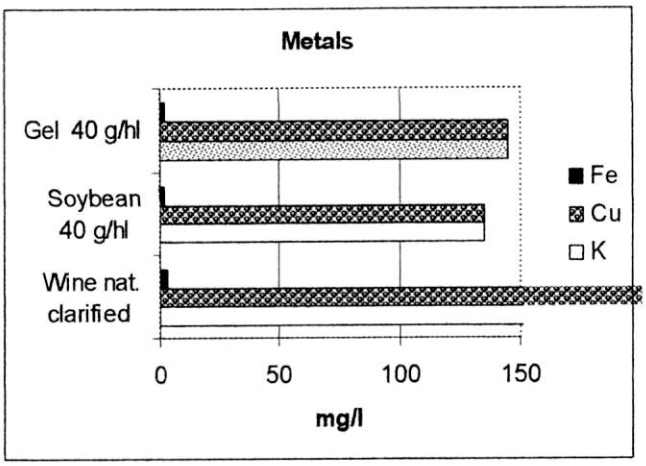


Fig.7 Metals concentration in wine clarified with vegetable proteins.

Refrigerated Temperature Sperimentation

Vegetable proteins has shown their optimal activity at 4.5°C temperature, Turbidity value decreased at 2.01 FTU in wine treated with whey proteins. In figure 7 we can see that whey proteins reached the best results in refrigerated condition. Soybean at 40g/hl has reduced turbidity in a percentage of 90%. In this conditions of clarification volume lees depends on fining agent amount (fig 8) Density also decreased of 50% in samples treated with soybean proteins after 72 h of treatment. Enological parameters did not be affected by relevant variations in this type of clarification treatment. It's interesting to underline that Iron concentrations had an high decrease in the sample treated with soybean at 20-10 g/hl.(Tab.1)

Tab.1 Metals amount in wine clarifiedt 4.5°C.

	K^{2+}	Cu^{2+}	Fe^{2+}
	mg/l		
Wine nat.clarified	**290**	**3,5**	**4,3**
Soybean 40 g/hl	155	1,6	3,8
Soybean 20 g/hl	160	1,8	2,0
Soybean 10 g/hl	168	2,0	1,0
Whey 40 g/hl	157	2,0	2,7
Whey 20 g/hl	160	1,9	2,9
Whey 10 g/hl	178	2,2	3,0
bean 40 g/hl	180	1,5	3,2
bean 20 g/hl	150	1,9	3,5
bean 10 g/hl	190	2,3	3,0
Gel 40 g/hl	150	1,8	2,6
Gel 20 g/hl	165	1,9	2,4
Gel 10 g/hl	170	2,1	2,0

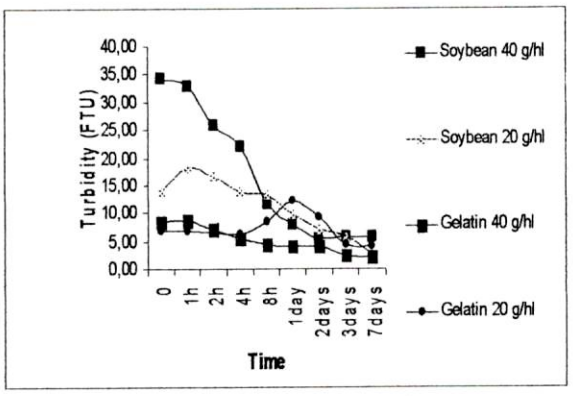


Fig.8 Turbidity trend in clarification at 4.5°C

Conclusions

This study has evaluated the possibility to replace gelatine with vegetable proteins in wine clarification process. It has been observed that temperature has no influence on fining agent activity so it may be concluded that refrigerated conditions don't accelerate clarification process. Turbidity values and volume lees change in a relevant way only with soybean proteins use, instead vegetable proteins have an incisive action on Iron and Copper concentration. From this point of view, the use of vegetable proteins could be considered a valid alternative to animal gelatine, not only for their cheaper price but for their reducing activity on metals content in wine. In fact cations like Iron, potassium and copper play a fundamental role in wine stability since they take a part in precipitations, breaks or oxidation-reduction processes that alter wine conservation.

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