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Original scientific paper

THE PARTICULARITIES OF THE CLARIFICATION PROCESS WITH BENTONITE OF WHITE WINE VINEGAR

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ABSTRACT
In this study, the physicochemical properties of Italian and German bentonites were evaluated, including the physicochemical characteristics of white wine vinegar. Once established, the optimal clarification regime and its physical parameters were determined. After establishing the optimized sedimentation parameters, the influence of different doses of bentonite on the physicochemical and organoleptic characteristics of the analyzed vinegar was investigated. With this was determined the influence of the different contact periods of vinegar with bentonite, on the physicochemical parameters of clarified wine vinegar. Thus, for the Italian bentonite, the optimal conditions for the clarification process were: dose of bentonite — 2.03 g·25L^{-1}, time — 45 min, temperature — 20±1 °C, stirring time — 60 s, centrifugation time — 3 min and spin speed of 300 min^{-1}. Moreover, when using the German bentonite, the optimal parameters were: bentonite dose — 1.96 g·L^{-1}, contact time — 45 min, temperature — 20±1 °C, stirring time — 300 s, centrifugation time — 3 min and spin speed of 300 min^{-1}. Finally, the sensory analysis of wine vinegar was performed and it was established, from the data, which of the analyzed bentonites has properties that are more efficient on the clarification process.

1. Introduction

Wine vinegar is obtained from wine by acetous fermentation and in which the maximum level of volatile acids in the raw materials may be exceeded [1]. It is well known that the wine and vinegars, prepared from grape musts, wine, or cider, even if are correctly made, settled and filtered, may develop in time a cloudy appearance. These changes may significantly reduce the market value to consumers which are requiring intense clarity for bottled liquids, as a proof of quality [2].

For these purpose the vinegar is treated with bentonite, and its removal is accomplished by adsorption or precipitation based on electric charge counterbalancing of the molecules [3]. Adsorption was shown to be independent of temperature, but varied slightly with protein content, pH and ethanol content [4].

One of the perceived disadvantages of bentonite fining is that it is thought to reduce flavor and aroma of wines. This perception is not supported by strong evidence in the normal operational range of bentonite additions by winemakers. Sensory evaluation of wines treated with bentonite showed no significant differences between the control and the fined samples [5].

2. Materials and methods

2.1. Materials

In this work, white wine vinegar was used, the raw material was taken from the wine factory in the city of Ialoveni. White wine vinegar was obtained as part of a scientific research that took place in the faculty of Food Technology, Technical University of Moldova. The obtained wine vinegar corresponds to the quality indicators stipulated in the Government Decision of the Republic of Moldova no. 1403, Art. III, to be accepted and allowed for consumption in food [6]. To clarify the white wine vinegar two types of bentonite were used: the first producer — Italy (Enartis, Francesco Bergaglio, Italia), natural mineral, Ca — bentonite (calcium bentonite); Germany (Erbslöh, Geisenheim, Germany) is the second largest producer of natural mineral, Na-Ca bentonite.

2.2. Methods

2.2.1. Analysis of physicochemical indices of bentonites

The beginning of the study was carried out to determine the physicochemical parameters of bentonites. The following parameters were defined: the density, the porosity [7], the dry matter [8], pH [9], the swelling index [10], the ash content [11].

2.2.2. Analysis of the physicochemical indices of vinegar

The optic density was determined using the Spectrophotometer LLG-uniSPEC2 [12]. The dry matter of the wine vinegar samples was determined according to the standardized methods [13]. The total acidity content, expressed in grams of acetic acid per liter of the sample, was determined by titration. In order to quantify the contribution of acidity when the solid is in contact with the solution was determined and the vinegar pH value using the device Hanna. The ash content can serve to identify certain types of fraud, such as the addition of water or an aqueous solution of acetic acid. The ashes of vinegar were determined through incineration of the vinegar extract conducted between 500 °C and 550 °C until the complete combustion of carbon [14]. Considering that the vinegar is a wine byproduct, the residual alcohol content, expressed as a percentage (v/v) was appreciated. Sensorial appreciation was conducted against a control sample [15].

3. Results and discussion

The study started with the determination of the raw material parameters, which was subsequently used for clarification. The obtained results, for the bentonites are presented in Table 1.

The results on the physicochemical composition of wine vinegar are shown in Table 2.

3.1. Determining the optimal dose of bentonite

The influence of the Italy and German bentonite dose, which ranged from 0.45 g·L^{-1} to 2.93 g·L^{-1}, was investigated on the white wine vinegar clearing process. The optimal dose of German bentonite was established based on Figure 1, and its value is equal to 1.96 g·L^{-1}, and the optimal dose of Italian bentonite its value is 2.03 g·L^{-1}.

The experimental data allow us to state that the clearing effect of white wine vinegar for both types of bentonite is observed at a higher dose 0.5 g·L^{-1}. An essential increase in the clearing effect is determined at a dose of 2 g·L^{-1}. Subsequent increase in the dose of bentonite has a significant influence on the vinegar clearing process.

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