Testing of herbal preparations in white wine technology

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Abstract. The paper gives a comparative analysis of the flocculation ability of gluing preparations of animal, vegetable and synthetic origin. The objects of study were also wort and wine material from the Viognier and Chardonnay grape varieties of the first and press fractions. The optimal concentrations of a specific material were pre-selected. Mathematical processing of the research data showed the reliability of the results. The study showed the feasibility of using herbal preparations, as well as their positive effect on the quality of the product in comparison with preparations of synthetic origin.

1. Introduction
Wine is a natural agricultural product defined by international organizations and considered by the conventions and laws of the EU as “a product obtained exclusively as a result of complete or partial alcoholic fermentation of fresh grapes, both crushed and whole, as well as grape must. Despite the strict rules required for production compliance, winemaking is both an art and a science. Different climatic conditions and soil types strongly influence the same grape variety. Many varieties of wine have emerged as a result of the application of different methods of viticulture, and only a few winemakers will argue that there is only one "correct" way of winemaking.

Each wine is unique. Soil, weather, geology, varietal distinctions and production methods - all of these decisions, although variable factors, make each wine special. Due to the growing competition in the wine market, as well as the growing consumer requirements for the finished product, the issue of producing high-quality wines is not in the last place among producers.

Speaking about the quality of the finished wine, we first of all mean its appearance, which is associated with the transparency of the wine poured into bottles. This is especially important for white wines. Microparticles and colloidal substances that are present in wine can not only worsen the external impression, but also negatively affect its organoleptic properties. Therefore, the most important process of preparing wine for bottling is clarification and physico-chemical stabilization of wine from cloudiness.

In the production of white wines, oxidation of polyphenols such as catechins and proanthocyanidins causes the appearance of a brown color. Oxidation can also lead to undesirable smells and aromas for wine (i.e. acetic acid), which leads to a decrease in organoleptic and visual characteristics. By decreasing the concentration of polyphenols in white wine prior to bottling, the winemaker increases the storage potential and taste of the wine.

The dosage of clarifiers is critical in the direction of consumer acceptance of white wines in bottles, turbidity can ultimately lead to consumer rejection and economic losses. The type and concentration of the clarifying agent depends on the wine and the general purpose of the winemaker.
Numerous clarifying agents are available to achieve wine stability. Each drug has its own advantages and disadvantages in terms of wine taste, cost and loss of wine due to over-production. Protein substances, including gelatin, casein, egg albumin, or gelatin, react with negatively charged particles such as tannins. Alternatively, non-proteinaceous materials such as bentonite and tannins aid in protein precipitation.

Against the background of the consumer's close attention to the composition of food additives (allergic reactions, animal diseases, products of synthetic origin, etc.), the search and development of alternative methods and methods of processing must and wine are especially relevant.

Vegetable proteins are a relatively new class of adhesives. By their action, they are similar to protein substances of animal origin, but do not contain allergenic components. They can be used in the production of wines certified in accordance with vegetarian requirements. In addition, growing concerns about wine additives and labeling regulations are forcing winemakers to look for alternatives to animal products.

2. Research objects
As objects of research in this work were selected gluing preparations of various origins:
1. Animal origin:
   - ErbiGel.
   - KalKazin.
   - CrystallinSupra.

2. Of plant origin:
   - KiFin.
   - FINEO.
   - INOFIN V.
   - Qi No.
   - LittoFresh Sense.
   - LittoFresh Bridge.
   - LittoFresh Origin.
   - Klia GT W.

3. Synthetic origin:
   - ErbsleWFP.

For experimental studies, grape must from Viognier variety obtained by primary pressing of pulp and wort of press fractions of Chardonnay varieties obtained by secondary pressing were used. Also, for experimental research, we used wine material obtained from press fractions of Traminer, Viognier and Manzoni varieties.

3. Research methods
3.1 Wort research scheme.
The research was carried out by pasting the wort in laboratory conditions. The study of the wort was carried out according to the scheme: in the wort (1 liter) a preparation with different dosages is found. Bottles are filled with wort and kept for 3 days at a temperature of 10˚C. Upon expiration of the term, the bottles are opened and indicators are measured (content of polyphenols, content of catechins, color at a wavelength of $\lambda = 420$ nm).
3.2 Wine material research scheme.
The study was carried out by pasting the wine material with an experimental sample, followed by sampling after 3 days and 14 days. Selected samples were tested for polyphenol content, turbidity (NTU), color at $\lambda = 420$ nm, color at $\lambda = 280$ nm.

4. Experimental part
The essence of the study is to test the use of protein preparations of plant origin and compare them with preparations of animal and synthetic origin. The optimal concentrations of materials were selected experimentally.

The obtained research results allow to carry out a comparative analysis of the flocculation ability of gluing materials of protein nature and to evaluate their effectiveness. This analysis is of practical importance and prevents winemakers from purchasing low-efficiency material.

It should be noted that it is of interest to conduct an additional similar analysis on wine materials from specific grape varieties separately, taking into account the terroir characteristics of the places of its growth.

Table 1 presents comparative data on the dynamics of the decrease in polyphenols.

| Drug name     | % reduction in polyphenols at the minimum dosage of the drug | % decrease in polyphenols at max drug dosage |
|---------------|-------------------------------------------------------------|-------------------------------------------|
| ErbiGel       | 2                                                          | 9                                         |
| Kal Kazin     | 4                                                          | 17                                        |
| Cristalline supra | 1                                                  | 4                                         |
| LittoFresh Most | 1                                                  | 9                                         |
| Klia GT W     | 5                                                          | 12                                        |
| Erble PVPP    | 5                                                          | 13                                        |
| Qi Fine       | 1                                                          | 10                                        |
| Fyneo         | 2                                                          | 16                                        |
| Inofine v     | 1                                                          | 7                                         |
| Qi No [OX]    | 2                                                          | 16                                        |
| LittoFresh Sense | 1                                                | 5                                         |
| LittoFresh Origin | 2                                               | 10                                        |

Figure 1 shows a graph of the percentage reduction in polyphenols at the minimum dosage of the drug.

![Figure 1. Dynamics of the percentage of polyphenols at the minimum dosage of drugs.](image)
Figure 2 shows a graph of the percentage reduction in polyphenols at the maximum dosage of the drug.

![Graph of percentage reduction in polyphenols](image)

The analysis showed an ambiguous range of changes, which makes it possible to judge the need to select specific dosages for individual wine materials. So for champagne wine materials, preparations with a lower percentage of reduction are suitable. For wine materials of pressed fractions, preparations with a higher percentage of polyphenol content reduction are required.

Wine tasting is an integral part of product quality. A comparative closed-ended evaluation of the final samples was carried out, the results of which are presented in table 2.

**Table 2. Protocol for tasting samples of wine material.**

| Drug name       | Dosage | Votes for 1st place | Votes for 2nd place | Votes for 3rd place | Number of points |
|-----------------|--------|---------------------|---------------------|---------------------|-----------------|
| Cristslline supra | 4 g/hl | +                   | -                   | -                   | 3               |
| ErbiGel         | 4 g/hl | -                   | +                   | -                   | 2               |
| Kalkazin        | 15 g/hl| +++                 | -                   | +                   | 10              |
| FYNEO           | 3 g/hl | -                   | -                   | +                   | 1               |
| Qi No [Ox]      | 20 g/hl| -                   | +                   | -                   | 2               |
| Qi Fine         | 20 g/hl| -                   | +                   | -                   | 2               |
| Inofine v       | 10 g/hl| +                   | +                   | -                   | 5               |
| LittoFresh Sense| 15 g/hl| ++                  | +                   | +                   | 9               |
| LittoFresh Most | 40 g/hl| -                   | -                   | +                   | 1               |
| LittoFresh Origin| 5 g/hl| +++                 | +                   | -                   | 11              |
| Klia GT W       | 120 g/hl| -                   | +                   | -                   | 2               |
| Erble PVPP      | 30 g/hl| -                   | -                   | +                   | 1               |
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The results of the tasting evaluation showed that the most harmonious, harmonious and transparent were the wine samples obtained using the Calcazin, LittoFresh Origin and LittoFresh Sense preparations.

5. Conclusion
The analysis showed an ambiguous range of changes, which makes it possible to judge the need to select specific dosages for individual wine materials, depending on the grape variety. So for champagne wine materials, preparations with a lower percentage of reduction are suitable. For wine materials of pressed fractions, preparations with a higher percentage of polyphenol content reduction are required.

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