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Issue Article

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STUDY OF FUNGICIDES IN WINE AND LEES

Abstract: *The effects of different concentrations of fungicides on the reproduction of yeasts and the quality of alcoholic fermentation were studied. Depending on the different concentrations of used fungicides, alcoholic fermentation of experimental samples is conducted with varying intensities. In the case of spontaneous yeast, the weight of emitted CO_2 (g) is always high. This indicates that alcoholic fermentation occurs with vigor in these samples. And with the samples where fungicide was added, alcoholic fermentation didn't develop. When spontaneous yeast was used, we got less sugar in all the samples and in comparison, with samples with fungicides. This means that toxic substances affected yeast development and fermentation processes.*

Key words: *Yeast, fungicide, lees, chromatography.*

Language: *English*

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Introduction

In the general system of development of agriculture in Georgia, the production of viticulture and winemaking occupies a prominent place, which determines the food security of the country. Winegrowers face issues of grape quality, requirements for the study and technological improvement of wines produced from it. The quality of the wine was gradually affected by the chemicals used in viticulture. This circumstance obviously affects the quality of grapes and, accordingly, wine, so the issue of obtaining environmentally friendly products is directly related to the strategy for the production of grapes and wine. It is known that after the harvest, the cultivation of the vineyard begins. In particular, after the autumn-spring activities carried out in the vineyards with mineral fertilizers, the fight against various grape diseases begins, with the use of herbicides and various pesticides. It should be noted that these events are held in winter and early spring. Thus, the effect of fungicides on grapes and the quality and safety of wines made from them is a very topical issue.

Currently, the following are mainly used in vineyards: Simazine, Dalapon, Agropon, Basfapon, Daupon, Balapon, Propinat, roundup, utal, fosulen, nitosorg, karagard and others. Their use, like mineral fertilizers, should be limited to strictly defined doses established by law [3-4]. The USAID office in Georgia and the Georgia Agricultural Efficiency

Recovery Project (REAP) requested an analysis of pesticides registered for import and agricultural production in Georgia. The Pesticide Evaluation Report (PER) analyzes the active substances of each registered pesticide, the main properties and characteristics of the resulting pesticide active substances (AI) are included in the appendix. As is known, the use of herbicides and other pesticides has not only positive but also negative sides [5-11]. It should be noted that they enrich the plant with other fungicide substances, from which their residual amount first passes into grapes, and from there into food products of its processing, causing toxic effects in the human body.

In recent years, the use of mineral fertilizers, herbicides and pesticides has been sharply reduced. In some countries, they are completely banned and are related to the production of bio vineyards, which means limiting the use of other toxic elements or even completely banning them [12-15]. Objects and methods of research were chosen for the study.

Methods and objects of research: two vineyards were selected for research in the viticulture macrozone of Kakheti: a bio vineyard and an industrial vineyard. During the growing season of the vineyard, the following fungicides were used to treat the vineyard against pests and diseases:

. Falcon is a 3rd generation fungicide whose active ingredients are tebuconazole 167 g/l, spiroxamine 250 g/l, triadimenol 43 g/l;

• Kuperval is a fungicide whose component is active Substances: Bordeaux mixture 200 g/kg (in terms of copper), copper sulfate + calcium hydroxide 20% m / m (in terms of copper);

• Cupertin Super - fungicide, the component of which is active Substances: Bordeaux mixture (TC) 22.5% wt./m. (225 g/kg); cymoxanil 3% m/m (30 g/kg);

• Sulfur 800 g/kg is a pesticide whose component is active. Substance sulfur 800 g/kg.

Research has been ongoing for 3 years. During the 2020 harvest season, 200-200 kg of grapes were harvested from both the organic and industrial vineyards mentioned above. The grapes were processed according to the classical technology for making white wine. The resulting must was clarified with sulfuric anhydride. 100 mg/l added to the must for the preparation of bio wine; 300 mg/l was used for must obtained from an industrial vineyard according to the existing instructions). After clarification and removal from the sediment, the wort was divided into 3 parts. It was transferred to separate fermentation containers, the first part was added to the pure yeast culture "flavor 2000", in the amount of 3% of the sweet volume, the second part was added to the pure yeast culture Zimaflor f15, and alcoholic fermentation was carried out on spontaneous yeast in the third part. Then all three samples were again divided into 3 parts, to which fungicides were added (1-Sulfolac, 2-Cuperval, 3-Falcon and 4-Kupernik Super).

Samples were dispensed into 10 fermentation tanks. All ten samples were placed in a thermostat at a temperature of 20-22 degrees and alcoholic fermentation was carried out. After alcoholic fermentation was completed, young fermented wines (bio and industrial) were removed from the sediment and chemical analysis was carried out. Residual sugars, total acidity, alcohol content, volatile acids, the amount of free and total sulfuric anhydride, etc. were determined in wine samples. fungicides and pesticides in industrial samples of wines. Considering the data obtained, the amount of fungicide in wine was of interest for the test, for which the following numbering was added to the listed analytical samples:

1. Bio wine less;

2. Industrial wine less;

3. Industrial wine less+ flavor 2000+ Sulfur ;

4. Industrial wine less+ Zimaflor15+ Sulfur ;

5. Industrial wine less+ flavor 2000+ Kuperval;

6. Industrial wine less+ Zimaflor15+ Kuperval;

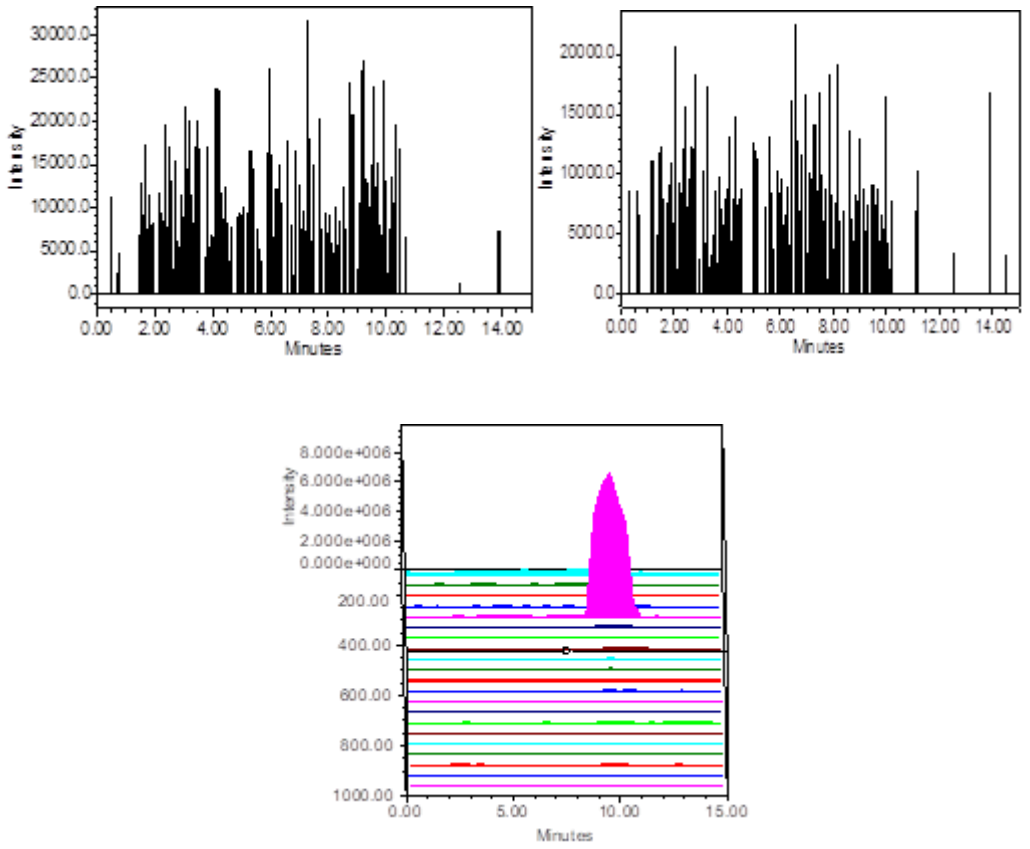
7. Industrial wine less+ flavor 2000+ Cupertin Super;

8. Industrial wine less+ Zimaflor15+ Cupertin Super;

9. Industrial wine less+ Zimaflor15+ Falcon;

10. Industrial wine less+ flavor 2000+ Falcon;

The determination of fungicides in wine was carried out by the chromatographic method. Samples for chromatographic analysis of fungicides in wine sediment were prepared as follows: 1 g of wine sediment was taken and dissolved in a 0.5% alcohol-aqueous solution of hydrochloric acid (1:1). According to chromatographic analysis (see chromatogram sample 17,18.) according to chromatograms in sample 7, i.e. in wine sediments fermented with Flavor 2000, the amount of falcon was 0.016 mg/l, and in wine sediments fermented with it was 0.57 mg/l. These data allow us to conclude that the cultural yeasts used in alcoholic fermentation adsorbed the Falcon fungicide on the cell surface and transferred it to the liquid. A high capacity for adsorption in this direction was found in the cultivated yeast Zimaflor15.



Picture 1.

As can be seen from the pictures, in the organic wine of sample N1, none of the pesticide compounds included in our test was recorded, the same results are obtained by chromatographic analysis of the organic wine sediment. In the technical wine of sample N2, compounds with M/Z masses of 149.98 are approximately equal to 150, the retention time of which is 4.989 minutes. M/Z 182.82 (149.79) also noted in this sample; 192, 95; 214.99 - with the corresponding retention time. In samples 3 and 4, M/Z302 is written; 215 and 280; 122.84 - with the corresponding retention time. The sediments of this wine have a similar feature. When compared with the standards, it was found that these substances are the fungicide sulfur, the chromatograms of which are presented as a single compound. As for samples 5 and 6, in the samples treated with the falcon pesticide/Z 298.15. This peak is not fixed on the verse of these samples. Based on the results of the studies, it can be concluded that the fungicides that participated in the studies pass from grape juice to wine, having the ability to adsorb on yeast cells and pass wine lees.

Conclusion: For the first time in Georgia, we have studied the content of toxic substances-fungicides in grapes, must, wine lees and their influence on the quality of wine. By researching the model solutions of grapes, must and wine lees it was determined: In bio and industrial wine samples and their verses The high-performance liquid was identified by chromatography and mass spectrometry Mass and retention time of standards and search substances. The high-performance liquid was identified by chromatography and mass spectrometry Mass and retention time of standards and search substances. Carbohydrates, organic acids and Quantitative composition of fungicides. It was established that:

• It is not found in organic wine (control # 1) and in its verse residual amount of one fungicide;

• Chromatographically, according to the standards, in industrial wines and their liquors, the corresponding fungicide was found (#2 - Uddasva, ## 3-4 (13-14) Sulfur; ## 5-6 , Kuperval; ## 7-8 , Cupertin Super and ## 9-10 Falcon. The amount of fungicides depends on the type of cultured yeast involved in alcoholic fermentation;

• Cultivated yeasts used in alcoholic fermentation produced e.g. Adsorbing the fungicide Falcon to its cell surface and transferring it into the liquid. The cultural yeast "Zymaflore f15" was found to have a greater adsorption capacity in this direction.

• In the research industrial samples ## 3-20, apart from the included fungicide, the substance cymoxaline is found everywhere. This substance may be used as a background component of the pesticides we sample. Its amount in wine samples ranges from 0.01 to 2.96 mg/l. The mentioned high-molecular

compound was found in the form of traces in wine sediments.

• With the results of the research, it can be concluded that the fungicides participating in the research are transferred from the grape must to the wine and with the ability of the yeast cells to adsorb in the wine lees.

Depending on the results of our research, we would be able to show preferences in bio wine production and, furthermore, it will help us to somehow predict some of the results after using some fungicides in Rkatsiteli wine.

References:

1. Jose, O.O., Paula, P.P., & Alberto, N.B. (2022). *Influence of Fungicides Residues in Wine Quality*, Dept. of Agricultural Chemistry, eologu and Pedology. University of Murcia, 2022, (pp.12-14). Spain.
2. Anastassiades, M., Tasdelen, B., Scherbaum, E., & Stajnbaher, D. (2007). *Recent developments in Quechers Methodology for pecticide multiresidue analysis.* In: Pesticide chemistry, Corp protection public health, envinromental safety2007 (pp.439-458).
3. Willey-VCH, W. G., Angioni, A., Carau, V.L., Aguilera, A., Melis, M., Minelli, E.V., Tuberoso, C., & Cabras, P. (2003). GC-ITMS determination and degradation of caption during winemaking. *J. Agric Food Chem.*, 51, (pp.6161-6766).
4. Aubert, C., Baumes, R., Guneta, Z., Lepoutre, J.P., Cooper, J.F., & Bayonove, C. (1997). Effects of flusilazole, a sterol biosynthesis inhibitor fungicide, on the free and bound aroma fraction of Muscat of Alexandria wines. *J. Int. Sci. Vigne Vin.*, (p.31, 57-64).
5. Aubert, C., Baumes, R., Gunata, Z., Lepoutre, J.P., Cooprt, J.F., & Bayonove, C. (1998). Effects of sterol biosynthesis inhibiting fungicides on the aroma of grape. *Ssci. Aliments.* 1998 (p.18, 41-58).
6. Barba, A., Mulero, J., Paya, P., Cayuela, J.M., Camara, M.A., & Oliva, J. (2009a). *Compuestos fenolicos de bajo peso molecular y antocianos en vinos Monastrell. Influencia de los fungicidas en su contenido.* In: Neuvos Horizontes en la Viticultura y Enologia, Servizo de Publications. Universidade de Vigo (Ed.). Universidade de Vigo, Ourense, Spain 2009b, (pp.257-530).
7. (n.d.). *Desapericion de residuos de fenhexamida duarante el proceso de vinification.* In: Nuevos Horizontes en la Viticultura y Enologia, Servizo de Publicacions. Universidade de Vigo (Ed.). Universidade de Vigo, Ourense, Spain, (pp.343-346).
8. Bollinger, D. W., Tsunoda, A., Ledoux, D., Ellersieck, M.R., & Veum, T.L. (2005). A comparison of the test tube and the dialysis tubing in vitro methods for123 estimating the bioabailabilitu of phosphorous in feed ingredients for swine. *J. Agric, Food Chem.*, 2005, (p.53, 3287-3294).
9. Ates, H., Mangelings, & Heyden, Y.V. (2008). Chiral Separations in polar Organic solvent chromatography; Updating a screening Srategy with hew chlorinecontaining polusaccharide-based Selectore. *Journal of Chromatography B,* 875, pp.75-64.
10. Feibusch, B., Gil-Av, E., & Charles-Singer, R. (n.d.). *Tetrahedr.* Lett., Separation of enantiomers by gas liquid chromatograrphy with an optically active stationary phase, 719960 (pp.1009-1015).
11. Lien, A.N., Hua, H., & Chuong, P.-H. (2006). Chiral Drugs: An Overview. *International Journal of Biomedical Science, Int J Biomed Sci.* 2006 Jun, pp.85-100.
12. Karrer, P. (1960). *Kurs organicheskoj himii.* (p.131,132). L.: Himicheskaja literatura.