

Comparison of some Commercial Pectic Enzyme Preparations Applicable in Wine Technology

DANA ČAPOUNOVÁ and MILAN DRDÁK

Department of Food Chemistry and Biotechnology – Faculty of Chemistry,
Technical University of Brno, Brno, Czech Republic

Abstract

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The preparations of pectic enzymes are used for a more efficient extraction of desirable red grape pigments and other phenol compounds which are bound in plant cells and can be faster released by the action of pectic enzymes. Moreover, they shorten the time of maceration, settling, and filtration. The results of our experiments gives a comparison of the efficiency of preparations applicable in wine technology. The best preparation was Trenolin Rot followed by Vinoxym G that could shorten the time of pre-fermentation to about 3 days thanks to a more intensive extraction of red grape pigments. By using the enzyme preparations Gammapect AWP and Ovopres, the time of filtration was ten times shorter. Compared to the control sample, the speed of desliming was threefold and twofold faster, respectively, for Gammapect AWP and Gammapect W2L.

Keywords: red wine; wine technology; pectic enzymes; anthocyanins

The enzyme preparations in current commercial cans contain diverse amounts of cellulytic, β -glykosidic, proteolytic and other species of enzymes apart from the main pectic enzymes that split pectic compounds. For the production of these enzymes mainly a fungus line of *Aspergillum* is used. The enzymes are released into the production medium and are further purified and concentrated (REXOVÁ-BENKOVÁ 1976). The preparations can be bought in the solid or liquid form.

Pectins are present in tissues of all higher plants and differ in composition. The plant tissues are formed by cells which are separated by wall cells, contrary to the animal cells. Pectin is present as intercellular putty and together with hemicellulose forms a part of the wall. Pectin belongs to the group of polysaccharides. To the main polysaccharide chains other shorter or longer, straight or branched, saccharide chains are attached.

The pectic enzymes are able to split those chains and saccharidic bonds between the chains (WHITAKER 1984; ANONYM 1989). The release of red grape pigments and aroma compounds can thus be quicker. The pectin, due to its structure, acts further as a stabiliser of cloudy stuffs

and retards the speed of settling and filtration. The quantity of pectin in fruits depends on many factors, especially on the species of fruit and the stage of maturity. 0.2 to 3% pectin can be found in ripe wine grape.

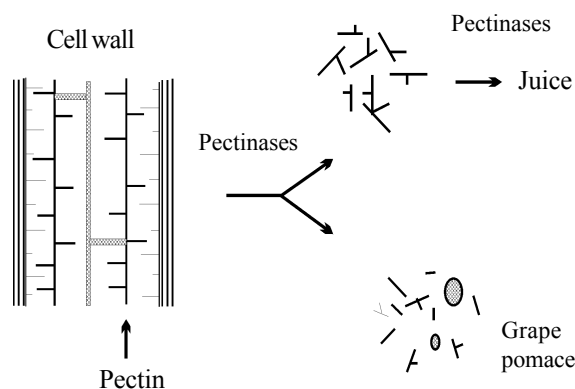


Fig. 1. Mode of action of pectic enzymes (Gammazym, Product Information. GammaChemie GmbH, Munchen)

MATERIAL AND METHOD

Commercial pectic enzyme preparations were used in the experiments. The preparations were obtained from Novo Nordisk, GammaChemie GmbH, and Erbslöh. The preparations were added to unclarified juice that was obtained from harvested Blaufränkisch red grapes. The red grapes were crushed; the mash was placed in pre-fermentation reservoirs (5 l). Corresponding quantities of enzyme preparations were added. All samples were clarified by filtration and centrifugation before the measurements. Anthocyanins were separated by LC 10AD Shimadzu Liquid Chromatogram with SPD-M10 AVP diode array detector under the following analysis conditions: column: Biosphere SIC 18, 150 mm × 4.6 mm, wavelength 520 nm (DRDÁK 1992). Helios α and δ spectrophotometers were used for measuring of A_{520} . Turbidity was expressed as optical density of the sample with 10 mm path length in a cell at 660 nm (CAPDEBOSCQ 1989). The filtration speed was measured as the time needed for filtration of a defined amount of the mash sample that passed through the goffer filtration paper. The speed of sedimentation was expressed as the thickness of sediment that formed within 10 min after the mixing up of experimental bottles with the samples.

RESULTS

The release of red grape pigments

The determination of anthocyanins is based on the evaluation of absorbency A_{520} . The value of this absorbency corresponds to the released amount of red grape pigments (Fig. 2). Trenolin Rot and Vinozym G were found to be the best of all preparations followed.

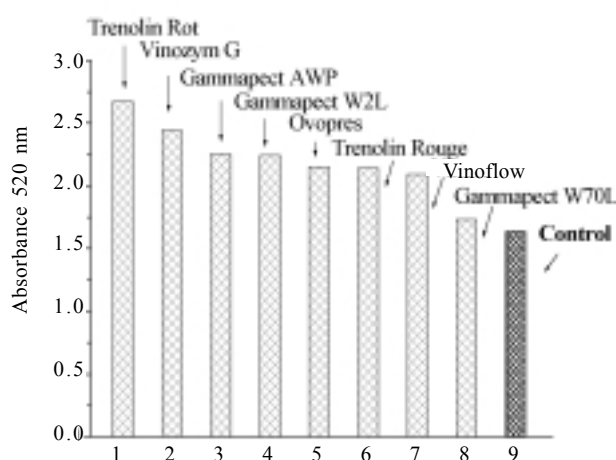


Fig. 2. Released red grape pigments after five-day pre-fermentation of mash

A_{520} can be influenced by the absorbency of cloudy stuffs. The amount of those stuffs can be evaluated by the measurement of absorbency A_{660} (Fig. 3). The densest cloud was found in the control sample and, on the other hand, in the case of the application of Gammapect AWP and Ovopres preparations, the concentration of the cloudy stuffs was very low.

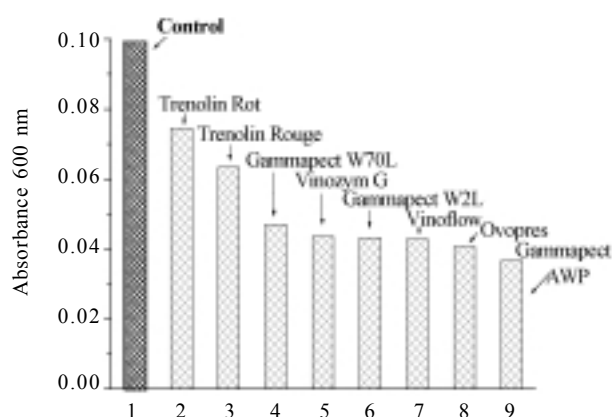


Fig. 3. Cloudy stuffs after a five-day pre-fermentation of mash

The filtration speed

The shortest times of filtration (as short as 1/10 of that of the control) were found in the cases of the following preparations: Gammapect AWP and Gammapect W2L. The experiments were carried out at the end of pre-fermentation.

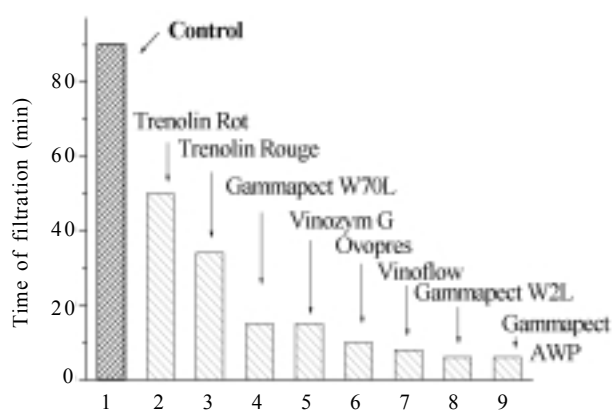


Fig. 4. The time of filtration of the wine samples at the fifth day of pre-fermentation

Settling

The process of coagulation and settling of cloudy stuffs was accelerated. The speed of desliming was in the case of Gammapect AWP and Gammapect W2L three times and two times faster, respectively, compared to the control sample.

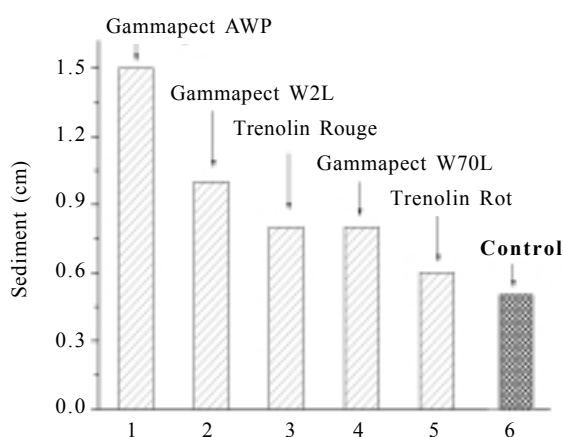


Fig. 5. The thickness of the sediment, 10 min after the mixing up of the experimental bottles with the wine samples

DISCUSSION

Phenol compounds were released during pre-fermentation of the red mash from grape berries. The major red grape colorants – anthocyanins – belong to the group of the phenol compounds. These are released from the tissues of berries by the action of enhanced amount of ethanol. By the action of pectic enzymes on the grape skin, this process was accelerated.

Maximum release of the red grape pigments took place within 4 or 5 days after the application of pectic enzyme preparations during pre-fermentation of mash from red grape Blaufränkisch. Except control sample, we did not observe any further increase in red colour, but we found the dissolution of red pigments and a decrease of wine colour. In the control sample without the application of the preparations, 7 days were necessary to achieve the

same effect, i.e. 2–3 days more than in the samples with enzymes.

Trenolin Rot, Vinozym G and Gammapect W2L increased most the intensity of wine colour during 4 or 5 day of pre-fermentation.

The enzyme preparations used are able to split pectin chains to produce short chains of saccharides. The split pectin loses the protective activity to juice colloids which makes problems during filtration.

The shortest time of filtration was found after the application of the preparations Gammapect AWP (as short as 1/10) and Ovopres. Clouds may be formed by snaps of grape skins, and parts of pulp which are transferred to the must after pressing. Under the conditions of static desliming, clouds settle on the bottom of the container. In this way the wine is clarified. Chemically, clouds are formed by pectin, cellulose and other stuffs which can infuse during fermentation and this may result in an unpleasant taste of the red wine. The speed of desliming was three times higher after the use of pectic enzymes. After the application of pectic enzyme preparations during pre-fermentation of mash of red grape Blaufränkisch, we obtained the results that are reviewed in Table 1.

Conclusions

The results presented in this paper are important for the big winery plants. It is shown that the use of enzyme preparations allows a reduction of the time needed for some technological steps. Thus, large amounts of harvested grapes can be processed and wine with a higher sensory quality can be produced in a shorter time and a more economic way.

Problems of the use of pectic enzymes was partially clarified. Our results can contribute to a better orientation in the choice of suitable preparations required in technological processes.

Table 1. Comparison of the effects of pectic enzymes preparations on mash and wine samples

Pectic enzyme preparations	Characteristics followed			
	colour	decrease of turbidity	speed of filtration	speed of settling
Gammapect AWP	++	++	++	++
Vinozym G	++	+	+	n.d.
Trenolin Rot	++	–	+	–
Ovopres	+	++	++	n.d.
Gammapect W2L	+	+	+	+
Vinoflow	+	+	+	n.d.
Trenolin Rouge	++	+	+	+
Gammapect W70L	–	+	+	+

++ = distinct increase; + = slight increase; – = no differences to control samples; n.d. = not determined

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Souhrn

ČAPOUNOVÁ D., DRDÁK M. (2002): **Porovnání enzymových preparátů používaných ve vinařské technologii.** *Czech J. Food Sci.*, **20**: 131–134.

Enzymové preparáty jsou ve vinařské technologii užívány pro zvýšení extrakce žádoucích réвовých pigmentů a dalších fenolických látek. Tyto látky jsou vázány ve stěnách rostlinných buněk a jejich působením může být zvýšena rychlost uvolňování pigmentů. Použitím enzymů může být zkrácena doba macerace, doba usazování kalů a filtrace vína. Porovnávali jsme účinnost preparátů určených k aplikaci ve vinařství. Nejlepšími preparáty byly shledány Trenolin Rot, dále Vinozym G, při jejichž použití může být doba nakvácení rmutu vlivem intenzivní extrakce barviv zkrácena až o 3 dny. Užitím enzymových preparátů Gammapect AWP a Ovopres byla významně snížena doba filtrace. Rychlost sedimentace byla v případě použití preparátů Gammapect AWP třikrát a v případě Gammapect W2L dvakrát rychlejší v porovnání s kontrolním vzorkem.

Klíčová slova: červené víno; vinařská technologie; pektolytické enzymy; antokyaniny

Corresponding author:

Ing. DANA ČAPOUNOVÁ, Česká zemědělská a potravinářská inspekce, Ústřední inspektorát Brno, Květná 15, 603 00 Brno, Česká republika
tel.: + 420 5 43 54 02 09, fax: + 420 5 43 54 02 01, e-mail: capounova@czpi.cz
