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EVALUATION OF CHANGES IN COLOUR PROPERTIES OF CLARIFIED RED AND ROSÉ WINES

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Abstract

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Effects of some selected clarifying agents on the colour of red and rosé wines were investigated. Selected clarifying agents were added in various doses to young red and rosé wines. Total monomeric anthocyanins and total polyphenols were estimated in all treated wine samples, as well as the colour intensity, hues and parameters CIE L*a*b*. In accordance with our expectations, contents of anthocyanins were decreased in all samples treated with clarifying agents. The most marked loss of total monomeric anthocyanins was observed after the application of bentonite. As compared with red wine samples, the percentage losses in luminance values (i.e. in colour intensity) of rosé wines were higher and the resulting values were significantly dependent on the variety. In red wines, the content of polyphenols was very markedly decreased after the application of the highest dose of casein while in rosé wine samples the most marked decrease in the content of polyphenols was observed after the application of the preparation polyvinylpolypyrrolidon.

clarification, wine, anthocyanins, colour parameters

The choice of a suitable method of wine treatment and fining, as well as its proper application, are important prerequisites of making of top quality wine (Farkaš, 1983). In treated wines, however, each method of fining reduces their contents of extractive and volatile compounds. As far as the losses of anthocyanin pigments are concerned, the application of bentonite is often mentioned. This clay is used above all within the framework of making white wines because it assures their stability and removes protein compounds occurring in wine (Castellari *et al.*, 1998). To treat red wines with a high concentration of thermolabile proteins, Na-Ca bentonite clays are often use because they are more considerate to colour components of wine and usually can be used in lower doses (Leske *et al.*, 1995). When fining red wine, it is possible to use not only bentonite but also some other clarifying agents.

A liquid form of silicic acid (30% silica gel) is also often used as a clarifying agent. This compound is always applied in combination with positively charged preparations (above all with gelatine) because it assures a perfect flocculation and sedimentation of colloids. Gelatine is usually mixed with silicic acid in the ratios of 1:5 to 1:10. Gelatine itself is a chemically pure glue (a protein preparation), which is made above all of bones and cartilages of calves. In the acid milieu of wine, gelatine has a positive electric charge and is used to reduce the content of tannins and/or to accelerate the sedimentation of solid particles. Its effect if temperature-dependent; to reach a quick precipitation and sedimentation of colloids, the temperature should be at least 15 °C. In case of lower temperatures it is possible to replace gelatine with isinglass (Kraus, 2004). Usual doses of gelatine range from 5 to 20 g.100L^{-1}. In red wines, the over-fining is less likely due to their high content of tannins. Most frequently, however, it is used for fining of wine together with another, negatively charged preparation. Clarification with a mixture of silica gel and gelatine belongs to classical methods of wine fining (Kováč, 2004).

The effect of isinglass is very similar to that of gelatine. Isinglass is a protein preparation made of dried swim bladders of sturgeon, catfish, cod and other fish species. The application of isinglass is very considerate to wine and influences the quality of wine only a little. Usually it is applied in doses of 1 to 2 g.100L^{-1}. Isinglass is very efficient also in situation when the other clarifying agents do not work. It can be used to clarify red wines, especially those that were made by heating. However, its main advantage consists in the fact that it is efficient also at temperatures below 10 °C (Steidl, 2002).

Casein is another protein preparation that not only reacts with tannins but also (rather intensively) with wine pigments. Its capacity to bound polyphenolic wine components is high and for that reason it can be used also for modification and/or removal of defective taste, smell or colour; it also can reduce brownish tones of red wines. It is usually applied in doses of 10 to 30 g.100L^{-1} (Steidl, 2002).

Fresh or dried egg white is also very suitable for fining of red wine. Its efficient agent is albumin, which precipitates tannins (and partly also colour substances) present in wine so that it removes the bitterness of wine and partly also decolorizes it. Nowadays, dried egg white is used most frequently; it is mixed with a small volume of water and poured into the continuously stirred wine in the dose of 4 to 12 g.100L^{-1}. Pátek (2001) recommended to use dried egg white when making top-quality red wines, mainly due to the fact that it doses not disturb their aroma. Its effect is very reliable and it is not necessary to perform any preliminary tests. Kováč (2004) mentioned that egg white was used above all for a gentle fining of red wines because it preserves their original structure and balance, and slightly reduces their colour (however, it preferentially removes their brownish components).

Polyvinylpolypyrrolidon (PVPP) is another preparation that can be used for clarification of red and rosé wines, above all for the removal of phenolic compounds. Each dose of PVPP causes a loss of certain amounts of polyphenols, phenolic acids, protein complexes and procyanidins (Gómez-Plaza *et al*., 2001). PVPP shows a high adsorption capacity both to tannins and colour substances. It reduces the sensitivity of wine to oxidation and thus stabilizes its colour. If applied in low doses, it can markedly decrease the content of tannins but without changing the aroma of treated wine. Usual doses of PVPP for a gentle modification of tannin contents ranges from 15 to 40 g.100L^{-1}. In wines with too high colour and oxidised, old and worn our taste it can be applied in doses up to the legal maximum of 80 g.100L^{-1} (Steidl, 2002).

MATERIALS AND METHODS

Wines

The red and rosé wines made from the varieties 'Zweigeltrebe' (Zw) and 'Blaufränkish' (Bf) were used for the experiment. The wines were produced in the Agricultural cooperative Němčičky in vintage 2011. The grapes originated in the wine region Moravia, subregion Velké Pavlovice, wine village Němčičky. All the samples were dry, quality wines. In samples of red wine, malolactic fermentation (MLF) took place and the content of free SO_2 in all samples was adjusted to 40 mg.L^{-1}.

Clarifying agents, preparation and dosage

Changes in colour properties due to the process of clarification resulting from the application of three different doses (low, medium, high) of six clarifying agents were evaluated in two samples of red and two samples of rosé wine. For fining, a volume of 0.5 litre of wine was used in all experimental variants. Clarifying agents most frequently used in the wine-making practice were evaluated: egg white (Blancoll) in doses of 5, 10 and 15 g.100L^{-1}, bentonite (Pluxcompact) in doses of 25, 50 and 100 g.100L^{-1} (BE25, BE50, BE100), isinglass (Finecoll) in doses of 2, 5 and 10 g.100L^{-1} (IS2, IS5, IS10), a combination of 30% silica gel and gelatine (Tosil and Želatina jedlá) in doses of 50 ml.100L^{-1} + 5 g.100L^{-1}, 100 ml.100L^{-1} + 10 g.100L^{-1} and 200 ml.100L^{-1} + 20 g.100L^{-1} (SG50/5, SG100/10, SG200/20), casein (Protoclar) in doses of 20, 50 and 100 g.100L^{-1} (CAS20, CAS50, CAS100) and polyvinylpolypyrrolidon (Stabyl) in doses of 10, 30 and 60 g.100L^{-1} (PVPP10, PVPP30, PVPP60). Individual preparations were activated and applied according to package directions. Samples of fined wines were compared with untreated original wines (NON).

Samples were clarified in two replications and each of them was subsequently analysed three times. Obtained results were processed statistically and followed categorized into tables and graphs.

Physico-chemical methods

Contents of total polyphenols, total anthocyanins and values of colour intensity and hues (including an evaluation according to the CIELAB colour space) were estimated in all wine samples.

Contents of total polyphenols in red and rosé wines were measured with the Folin-Ciocalteu reagent; this assay is based on a spectrophotometric measurement of coloured products of reaction of hydroxide groups of phenolic compounds with this agent (Balík, 1998). The content of total colour forms of anthocyanins was estimated spectrophometrically using buffer solutions with pH 1 and pH 4.5 (Glories, 1984). Absorbances (A) were estimated in a 10-mm absorption cell at the wavelength of 520 nm using distilled water as a standard and concentrations of all colour forms of anthocyans were calculated as follows:

$$\text{Anthocyanins (mg.l}^{-1}) = 20 \times r \times (A_{pH1} - A_{pH4,5}),$$

where "r" represents the degree of dilution.

Intensity (I) and hue (H) of wine colour were evaluated using VIS-spectrophotometer and

absorbance values were measured in a 10-mm absorption cell at wavelengths of 420, 520 and 620 nm using distilled water as a standard (Somers and Evans, 1977). Individual colour parameters were calculated as follows:

$$I = A_{420} + A_{520} + A_{620}; H = A_{420}/A_{520.}$$

The chromaticity of wine samples in the CIELAB colour space was estimated using the colorimeter LOVIBOND RT850i. The CIE standard illuminant C was used as a simulator of daylight. Measurements were performed in a 2-mm absorption cell made of plastic and the calibration was performed using deionized water as standard.

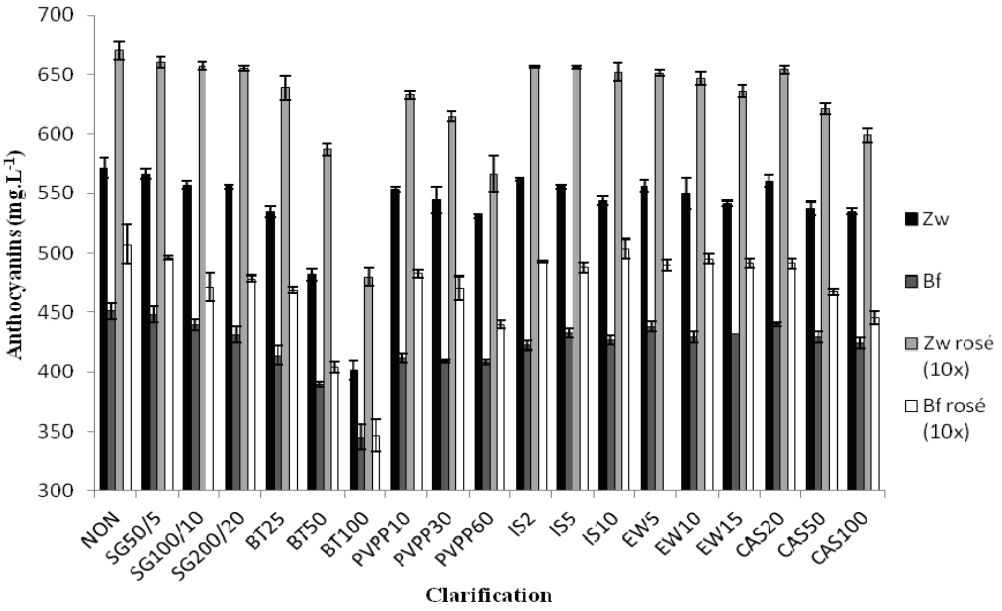
RESULTS AND DISCUSSION

In accordance with our expectations, contents of anthocyanins were decreased in all samples treated with clarifying agents. In both red varieties the most marked decrease in contents of anthocyanins was recorded after the application of medium and high doses of bentonite. In case of the 'Blaufränkish' variety, a marked decrease of anthocyanins was observed also after the addition of PVPP preparation but the dose did not influence their extent. When using all other clarifying agents, contents of anthocyanins nearly always decreased with their increasing doses; however, this decrease was not as quick as that observed after the application of bentonite. In red wines under study, a combination of silica gel plus gelatine decreased the content of anthocyanins at least.

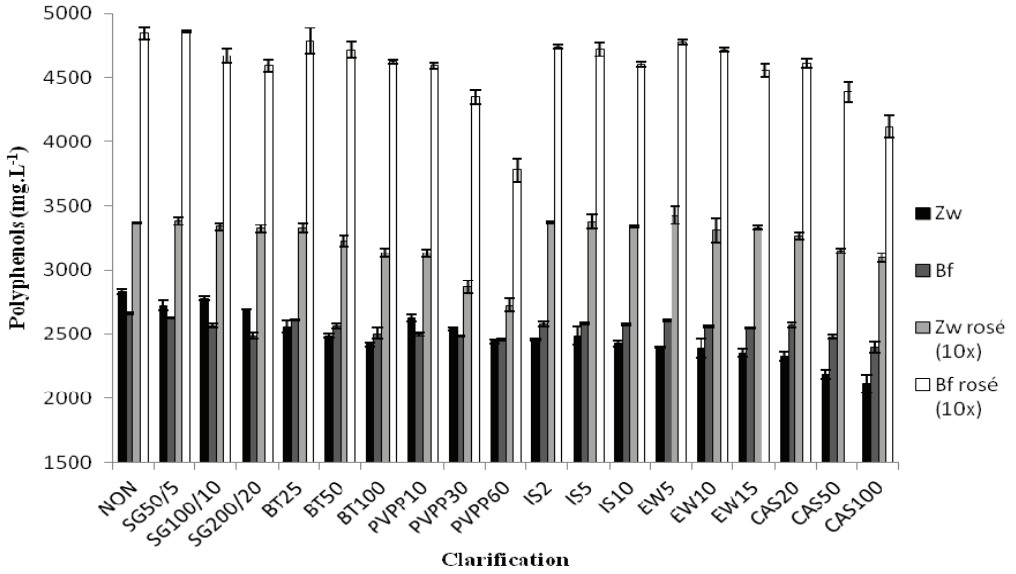
When fining rosé wines, not only bentonite but also other clarifying agents showed a more significant effect (above all PVPP and casein). Also in this case the effect of higher doses was quite obvious. As far as other clarifying agents and applied doses were concerned, their effects on the content of anthocyans in rosé wines were minimal (Fig. 1).

When measuring contents of total polyphenols in red wine, effects of individual clarifying agents and their doses differed in dependence on the vine variety. The effect of casein and its doses on the content of polyphenols in red wine made of 'Zweigeltrebe' grapes was very significant; after the application of 20 g.100L^{-1} and 100 g.100L^{-1}, the contents of polyphenols were decreased by 18% and by as much as 25%, respectively. As compared with other clarifying agents, the application of casein did not cause so marked difference in 'Blaufränkish' wine samples; in spite of this, however, the highest dose of casein caused also the highest decrease in the content of total polyphenols, i.e. by 10%. In experiments with 'Zweigeltrebe' wine samples, contents of total polyphenols were considerably reduced also after the application of isinglass and egg white but the effect of applied doses of these agents was not recorded. Comparable effects were observed after the application of the highest doses of bentonite and PVPP. The addition of a combination silica gel plus gelatine showed the least significant effect on the content of total polyphenols in red wine.

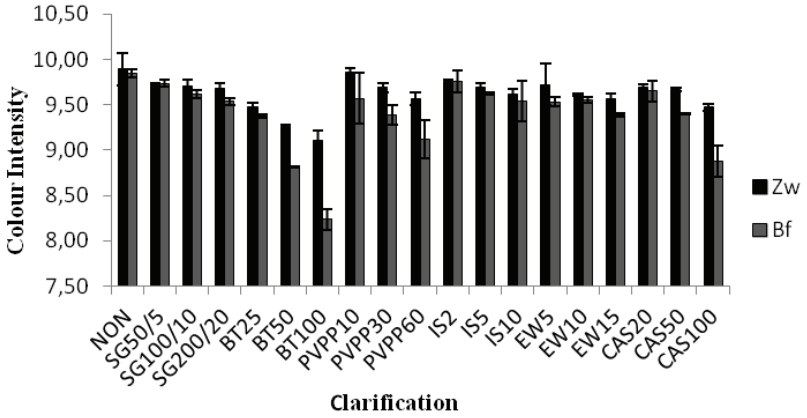
In both kinds of rosé wine, the content of total polyphenols was influenced at most by PVPP and the decrease was quite obvious. However, the doses of applied preparations were also important because in the variety 'Blaufränkish' the lowest applied dose (i.e. 10 g.100L^{-1}) caused their decrease by only 5% while the highest one (i.e. 60 g.100L^{-1}) reduced their content by as much as 22%. In the variety 'Zweigeltrebe', the effect of this clarifying agent was very similar. In this variety, the content of total polyphenols was decreased also after the application of casein and a difference was observed



1: *Changes in values of anthocyanins as caused by the clarification of red and rosé wines (value of rosé wines magnified tenfold)*



2: *Changes in values of total polyphenols as caused by the clarification of red and rosé wines (value of rosé wines magnified tenfold)*



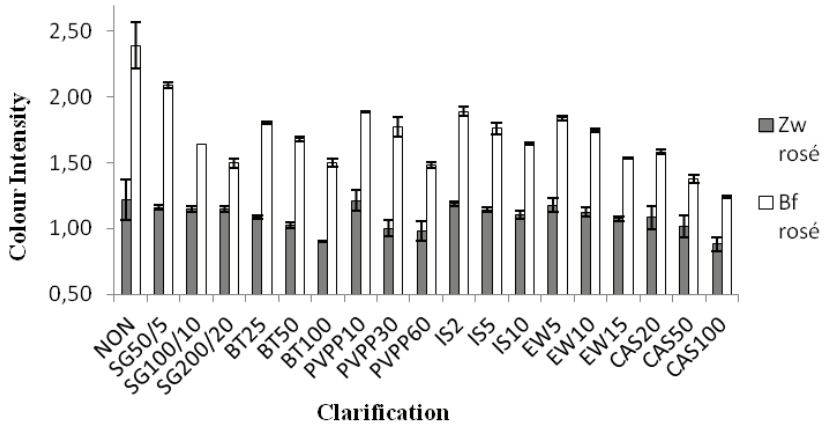
3: *Comparison of changes in colour intensity of clarified red wines*

only after the application of the highest dose (the loss of total polyphenols was equal to 15 %). Other clarifying agents showed only a negligible effect on the content of total polyphenols (Fig. 2).

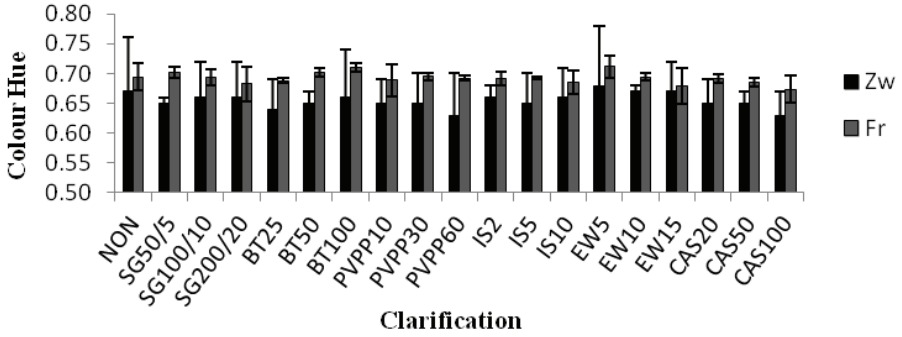
In samples of both red wines, the colour intensity was influenced at most by bentonite; concretely, in 'Blaufränkish' wine samples already the lowest dose of this agent (i.e. 25 g.100L^{-1}) reduced the intensity of colour much more than all other clarifying agents applied in their highest doses. As far as samples of 'Zweigeltrebe' wines were concerned, the results were not so explicit because their effect on colour intensity was obvious not only after the application of bentonite but also of other clarifying preparations (excepting the combination silica gel plus gelatine) (Fig. 3).

As compared with red wine samples, the percentage losses in colour intensity values of rosé wines were higher and the resulting values were significantly dependent on the variety. In general, the most marked effect on the colour intensity was observed after the application of casein, which reduced values of this parameter by as much as 48% after the application of the highest dose (100 g.100L^{-1}); in case of the variety 'Zweigeltrebe', the colour intensity value was decreased by 32% after its application. Significant effect was observed also after the application of higher doses of bentonite and PVPP, above all in 'Zweigeltrebe' rosé wine samples. In rosé wine made of the variety 'Blaufränkish', effects of other clarifying agents were also recorded (in contradistinction to the variety 'Zweigeltrebe') (Fig. 4).

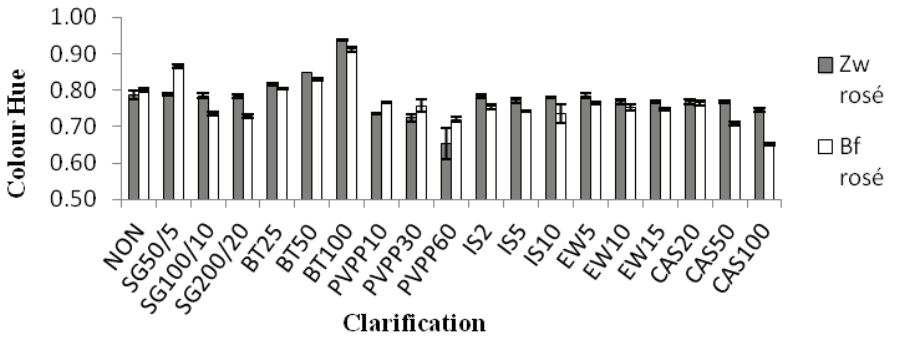
Decreasing values of colour hues indicated their changes in the direction to brighter tones while the higher ones were associated with a shift to mostly undesirable red brick or even brownish colour hues. Experimental results indicate different effects of individual clarifying preparations on values of colour hue of individual red wine samples. A positive effect on wine made of 'Zweigeltrebe' grapes was observed after the application of the lowest dose of bentonite and the highest doses of PVPP and casein. Other clarifying agents did not



4: *Comparison of changes in colour intensity of clarified red wines*



5: *Comparison of changes in colour hue of clarified red wines*



6: *Comparison of changes in colour hue of clarified rosé wines*

show any significant effect on colour hues of wine made of these grapes. In case of the 'Blaufränkish' variety only the highest dose of casein showed a positive effect on the colour hue of wine. Negative results were observed after the application of bentonite (above all in the highest dose). Effects of other preparations and doses on colour hues were also insignificant (Fig. 5).

A significant negative effect of bentonite on hue values of rosé wine samples was also observed because the intensity of brownish tones (undesirable above all in this wine) was increased. In samples of 'Zweigeltrebe' rosé wine, a very positive effect of all doses of PVPP on hue values was recorded. In 'Blaufränkish' wine samples, the most positive effect of casein was observed, especially after the application of higher doses of this preparation. All other clarifying agents showed only a negligible effect on changes in hue, regardless to applied doses (Fig. 6).

In samples of clarified wines, values of colour parameters CIE L*a*b* were estimated as well. In red wines, the value of luminance L* was affected at most by bentonite applied in medium and highest doses because, as compared with a untreated original wine (NON sample), the L* values were increased at most. After the application of all other clarifying agents, only minimum differences in changes of the L* value were observed; however,

I: *Changes in values of colour parameters CIE L*a*b* as caused by the clarification of red wines (average ± standard deviation)*

Clarification	Colour coordinates											
	L*				a*				b*			
	Zw		Bf		Zw		Bf		Zw		Bf	
NON	27.26 ± 0.16		36.88 ± 0.10		58.46 ± 0.00		59.70 ± 0.00		23.94 ± 0.13		18.64 ± 0.40	
SG50/5	27.42 ± 0.16		37.69 ± 0.20		58.52 ± 0.09		59.72 ± 0.10		23.71 ± 0.30		18.99 ± 0.30	
SG100/10	27.93 ± 0.00		37.67 ± 0.20		58.88 ± 0.00		59.66 ± 0.10		23.07 ± 0.10		18.50 ± 0.40	
SG200/20	28.31 ± 0.20		38.70 ± 0.20		59.14 ± 0.10		60.06 ± 0.00		22.32 ± 0.30		17.77 ± 0.50	
BT25	29.42 ± 0.10		39.19 ± 0.10		60.10 ± 0.00		59.64 ± 0.00		21.91 ± 0.10		17.95 ± 0.30	
BT50	31.25 ± 0.00		41.28 ± 0.20		61.07 ± 0.00		59.65 ± 0.20		19.37 ± 0.00		15.82 ± 0.30	
BT100	34.95 ± 0.10		45.99 ± 0.20		61.98 ± 0.00		60.12 ± 0.10		14.55 ± 0.00		12.88 ± 0.30	
PVPP10	27.84 ± 0.00		36.94 ± 0.50		58.78 ± 0.00		59.74 ± 0.10		22.82 ± 0.10		18.28 ± 0.80	
PVPP30	28.25 ± 0.00		37.80 ± 0.70		59.09 ± 0.00		59.71 ± 0.00		22.60 ± 0.20		18.16 ± 0.40	
PVPP60	29.12 ± 0.00		38.36 ± 0.10		59.78 ± 0.00		59.78 ± 0.10		21.61 ± 0.10		17.01 ± 0.10	
IS2	27.52 ± 0.00		37.15 ± 0.30		58.66 ± 0.10		59.90 ± 0.10		23.90 ± 0.00		18.28 ± 0.30	
IS5	27.86 ± 0.10		37.84 ± 0.38		58.89 ± 0.00		59.88 ± 0.06		23.34 ± 0.10		18.44 ± 0.09	
IS10	28.20 ± 0.10		38.24 ± 0.19		59.15 ± 0.00		60.02 ± 0.05		23.02 ± 0.30		17.76 ± 0.32	
EW5	27.93 ± 0.00		37.86 ± 0.54		59.02 ± 0.00		59.90 ± 0.02		23.65 ± 0.00		18.74 ± 0.18	
EW10	28.43 ± 0.00		38.12 ± 0.39		59.48 ± 0.00		59.95 ± 0.07		23.31 ± 0.00		18.23 ± 0.32	
EW15	28.99 ± 0.10		39.15 ± 0.41		59.86 ± 0.00		60.22 ± 0.03		22.42 ± 0.10		17.34 ± 0.10	
CAS20	27.82 ± 0.00		37.73 ± 0.19		58.84 ± 0.10		59.55 ± 0.16		23.37 ± 0.20		17.80 ± 0.42	
CAS50	28.41 ± 0.00		38.48 ± 0.25		59.24 ± 0.00		59.57 ± 0.11		22.32 ± 0.20		16.89 ± 0.08	
CAS100	29.69 ± 0.10		40.05 ± 0.07		60.01 ± 0.10		59.61 ± 0.05		20.50 ± 0.10		15.03 ± 0.20	

a trend of increasing luminance was associated with the increasing doses of clarifying preparations.

A more marked effect of bentonite than that of other clarifying preparations could be observed also in case of trichromatic parameters a* and b*. Final changes in parameter a* values indicated a marked difference in effects of bentonite on red wine varieties because even the lowest dose of this preparation caused in case of the variety 'Zweigeltrebe' a significant increase in the red colour saturation after the application of the lowest dose of bentonite while that of 'Blaufränkish' red wine was decreased. Values of the parameter b* were also influenced at most by application of medium and high doses of bentonite. As far as the variety 'Blaufränkish' was concerned, the effect of medium and high doses of casein were the most obvious. After the application of these doses of clarifying agents, a greater decrease in values of parameter b* in the direction to the lighter shade of yellow colour was recorded.

The values of colour parameters L*a*b* of clarified red wines samples are presented in Tab. I.

In rosé wines, marked changes in values L*, a* and b* after the application of different preparations were observed as well. In case of the 'Zweigeltrebe' variety, the most efficient were preparations casein, bentonite and PVPP (bentonite and PVPP were more efficient above all after the application of higher doses). The wine colour was markedly lighter, its intensity lower and values of the parameter b* shifted in the direction to the lighter shade of yellow colour. Other clarifying agents showed only a minimum effect on trichromatic parameters of wine made of the 'Zweigeltrebe' grapes. In case of 'Blaufränkish', however, the differences between the NON (control) sample on the one hand and treated ones on the other were obvious after the application of all doses of clarifying agents. However, the effect of casein was the most pronounced (and in case of parameter a* also that of the highest dose of bentonite).

A comparison of the values of colour parameters L*a*b* of rosé wine samples under study is presented in Tab. II.

The application of bentonite decreased at most the content of total anthocyanins not only in red but also rosé wines under study. As mentioned by Balík (2010), the content of anthocyanins in red wines clarified with Na-Ca bentonite in the dose of 100 g.100L^{-1} was reduced in average by 13% and 11.5% in red and rosé wine samples, respectively. In this experiment, however, it was demonstrated that after the clarification with bentonite the losses of anthocyanins were percentually lower in samples of red wine than in rosé ones. In red and rosé wine samples, the application of bentonite in the dose of 100 g.100L^{-1} decreased in average the content of anthocyanins by 26% and 29%, respectively. As far as other clarifying agents were concerned, it was found out that they did not show so marked effect on the content of anthocyanins as bentonite.

As compared with data published by Balík *et al.* (2007) who reported a decrease in the content of

II: *Changes in values of colour parameters CIE L*a*b* as caused by the clarification of rosé wines (average ± standard deviation)*

Clarification	Colour coordinates					
	L*		a*		b*	
	Zw rosé	Bf rosé	Zw rosé	Bf rosé	Zw rosé	Bf rosé
NON	93.31 ± 0.16	88.75 ± 0.13	8.80 ± 0.23	14.14 ± 0.21	2.19 ± 0.06	2.66 ± 0.01
SG50/5	93.57 ± 0.02	89.21 ± 0.09	8.46 ± 0.01	12.82 ± 0.18	2.15 ± 0.01	2.95 ± 0.06
SG100/10	93.61 ± 0.02	90.45 ± 0.07	8.41 ± 0.07	12.55 ± 0.11	2.14 ± 0.01	1.86 ± 0.03
SG200/20	93.64 ± 0.02	91.17 ± 0.07	8.40 ± 0.04	11.68 ± 0.14	2.12 ± 0.01	1.71 ± 0.02
BT25	93.92 ± 0.02	89.87 ± 0.06	7.73 ± 0.01	12.54 ± 0.14	2.04 ± 0.02	2.68 ± 0.02
BT50	94.34 ± 0.02	90.49 ± 0.07	7.05 ± 0.06	11.54 ± 0.14	2.02 ± 0.01	2.80 ± 0.01
BT100	95.08 ± 0.01	91.60 ± 0.18	5.75 ± 0.01	9.51 ± 0.29	2.18 ± 0.01	3.15 ± 0.07
PVPP10	93.37 ± 0.08	89.36 ± 0.03	9.18 ± 0.15	13.58 ± 0.01	1.70 ± 0.03	2.44 ± 0.02
PVPP30	94.53 ± 0.06	90.20 ± 0.03	7.78 ± 0.12	12.78 ± 0.02	1.41 ± 0.04	2.03 ± 0.01
PVPP60	94.98 ± 0.08	91.57 ± 0.14	7.73 ± 0.41	11.43 ± 0.21	1.04 ± 0.07	1.46 ± 0.04
IS2	93.43 ± 0.02	89.08 ± 0.05	8.62 ± 0.02	13.99 ± 0.07	2.13 ± 0.02	2.37 ± 0.01
IS5	93.63 ± 0.02	89.62 ± 0.08	8.44 ± 0.01	13.48 ± 0.13	2.09 ± 0.01	2.16 ± 0.01
IS10	93.80 ± 0.03	90.41 ± 0.43	8.23 ± 0.05	12.55 ± 0.68	2.09 ± 0.10	1.94 ± 0.13
EW5	93.66 ± 0.05	89.66 ± 0.01	8.41 ± 0.03	13.26 ± 0.02	2.04 ± 0.02	2.33 ± 0.02
EW10	93.78 ± 0.04	90.28 ± 0.12	8.34 ± 0.11	12.64 ± 0.21	1.89 ± 0.03	2.01 ± 0.06
EW15	94.13 ± 0.02	91.24 ± 0.01	7.88 ± 0.02	11.50 ± 0.01	1.78 ± 0.02	1.71 ± 0.01
CAS20	94.06 ± 0.09	90.98 ± 0.12	7.90 ± 0.01	11.55 ± 0.23	1.79 ± 0.05	1.96 ± 0.06
CAS50	94.54 ± 0.09	91.84 ± 0.05	7.34 ± 0.04	10.94 ± 0.03	1.60 ± 0.04	1.35 ± 0.02
CAS100	95.09 ± 0.05	92.54 ± 0.07	6.72 ± 0.01	10.65 ± 0.10	1.43 ± 0.00	0.72 ± 0.01

total anthocyanin pigments in red wines treated with egg white and a simultaneous increase in the overall intensity of wine colour, the results of this study indicated a decrease in the content of anthocyans in red and rosé wine samples treated with the highest dose of egg white (in average by 4.7% and 4.2%, respectively) as well as a simultaneous decrease in the intensity of wine colour. In this study, the best results were obtained after the application of the highest dose of the mixture silica gel plus gelatine (i.e. 200 g.100L^{-1} + 20 g.100L^{-1}). This treatment showed to be the most considerate because the percentage losses of total anthocyans in red and rosé wine samples were only 2.5% and 4.0%, respectively.

CONCLUSION

In all samples treated with clarifying agents contents of anthocyanins were decreased. The most marked loss of total monomeric anthocyanins was observed after the application of bentonite, especially after the application of higher doses of this preparation. As far as contents of total anthocyanins and polyphenols were concerned, the application of a mixture of silica gel and gelatine showed to be the most considerate fining method of both red and rosé wines. As compared with red wine samples, the percentage losses in colour intensity of rosé wines were higher and the resulting values were significantly dependent on the variety. Higher clarifying doses of bentonite increased brownish hue, especially for rosé wines.

SUMMARY

The aim of this experiment was to determine, how does the using of selected clarifying agents in different doses affect values of colour parameters of red and rosé wines. Selected clarifying agents were added in various doses to red and rosé wines that have been made from the same vine varieties ('Blaufränkish' and 'Zweigeltrebe'). After the clarification, contents of total monomeric anthocyanins and total polyphenols were estimated in all treated wine samples, as well as the colour intensity, hues and parameters CIE L*a*b*.

In accordance with our expectations, contents of anthocyanins were decreased in all samples treated with clarifying agents. The most marked loss of total monomeric anthocyanins was observed after the application of bentonite. As compared with red wine samples, the percentage losses in luminance values (i.e. in colour intensity) of rosé wines were higher and the resulting values were significantly dependent on the variety. As far as contents of total anthocyanins and polyphenols were concerned, the application of a mixture of silica gel and gelatine showed to be the most considerate fining method of both red and rosé wines.

In wines, increasing the value of luminance L* was affected at most by using of clarifying preparations applied in medium and highest doses as compared with a untreated original wine. This is related to a decrease of colour intensity by using higher doses of clarifying agents.
For healthy red and rosé wines that don't need any drastic doses of preparations by the clarification is possible to use all of these clarifying agents. Bentonite, PVPP and casein appears to be less appropriate in view of influence on the colour of the wine. Friendlier to the colour red and rosé wines is mainly the combination of silicic acid with gelatin, isinglass and egg white. Among the less suitable in terms of impact on the color of the wine, however, include, friendlier to color red and rosé wines is especially the combination of silica gel with gelatin, as well as isinglass and egg white.

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