Influence of flash thermal treatment on antioxidant activity of virgin olive oil

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Introduction

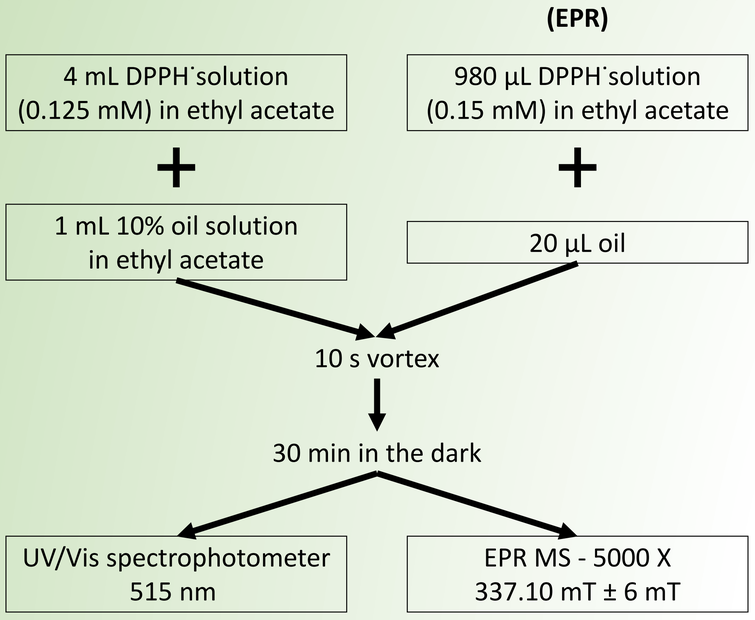
The health benefits of virgin olive oil are well known in research, but also among the general population. The unique fatty acid composition, which gives the oil good oxidative stability, is combined with a considerable amount of antioxidants, especially polyphenols, which ensures its great antioxidant activity. The composition and concentration of antioxidants is genetically predetermined, but can be influenced by the cultivation of the fruit and the technology of oil production. Nowadays, innovative technologies are being studied in detail for their application in the production of virgin olive oil. Flash thermal treatment is one of these techniques, since the regulation of temperature allows control over complex enzyme systems that influence the nutritional value, oxidative stability and sensory profile of virgin olive oil [1-3].

The aim of this study was to determine the effects of flash thermal treatment (both cooling and heating) on the antioxidant activity of virgin olive oil from four different Croatian cultivars (Oblica, Rosulja, Istarska bijelica and Levantinka).

Materials and methods

For this experiment, olive fruits of two Dalmatian (Oblica and Levantinka) and two Istrian varieties (Rosulja and Istarska bjelica) were grown in their area of origin. Flash thermal treatment was used as a malaxation pretreatment for the production of virgin olive oil on a laboratory scale using the Abencor system. The blast chiller (TECNODOM ATT05 ATTILA ABB) was used to cool the freshly ground olive paste to 15 and 20 °C, and the water bath (GRANT, SUB Aqua Pro, model: SAP12) was used to heat it to 25, 30, 35 and 40 °C. Both cooling and heating to the desired temperature took no more than 3 minutes.

The antioxidant activity of the produced oils was determined using DPPH radicals with two different techniques.



Results

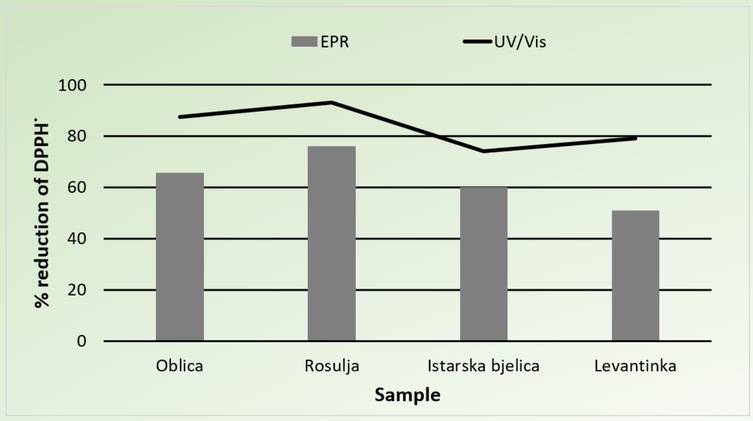


Fig. 1 Antioxidant activity of control samples of virgin olive oils produced without flash thermal treatment determined by EPR spectroscopy (columns) and UV/Vis spectroscopy (line).

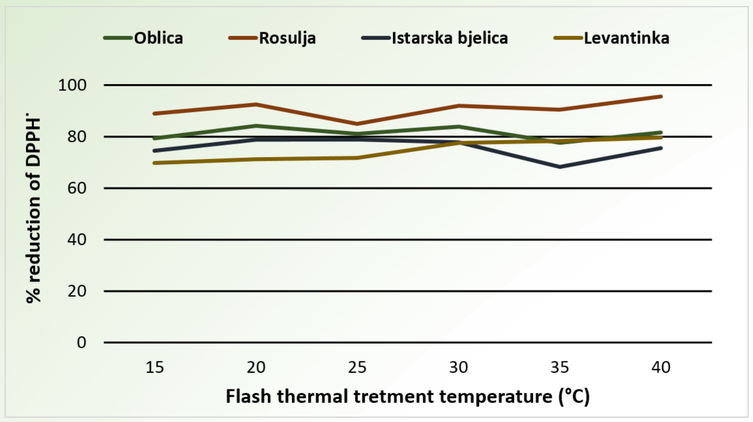


Fig. 2 Influence of temperature of flash thermal treatment on antioxidant activity of four autochthonous Croatian virgin olive oils determined by UV/Vis spectroscopy.

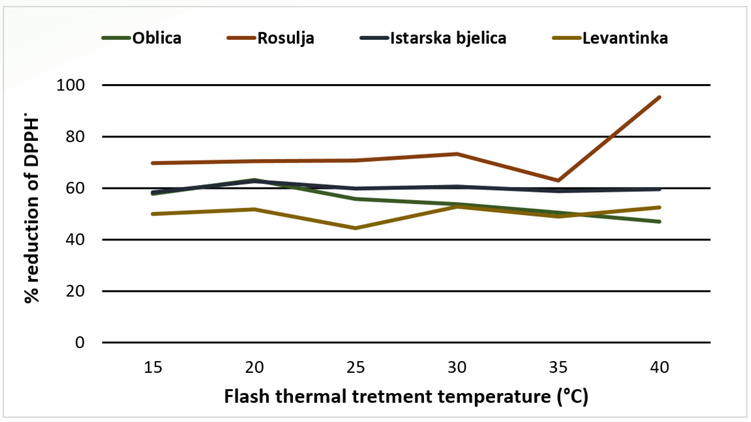


Fig. 3 Influence of temperature of flash thermal treatment on antioxidant activity of four autochthonous Croatian virgin olive oils determined by EPR spectroscopy.

Conclusions

1. The results show a significant influence of variety and pretreatment on the antioxidant activity of virgin olive oil and their interaction.
2. Rosulja had the highest antioxidant activity compared to the other three varieties.
3. In relation to the applied flash thermal treatment, Rosulja showed significantly higher antioxidant activity at the highest temperature (40 °C), while Oblica, Istarska bjelica and Levantinka responded better to mild temp. (30 °C).
4. The spectrophotometric and EPR methods for determining antioxidant activity showed good correlation (r = 0.740).

Acknowledgments

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HrZZ Croatian Science Foundation

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