DETERMINATION OF ANTIOXIDANT ACTIVITY OF OLIVE OIL PHENOLIC EXTRACTS

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Introduction

Phenolic compounds are a minor species consistently present in olive oil, yet they have been shown to positively influence some physiological parameters, including anti-inflammatory properties (Miles *et al.,* 2005), and a potential to act as apoptotic inducing agents (Gill *et al.,* 2005). The aim of this study was to determine the antioxidant activity of phenolic extracts derived from monocultivar olive oils from the Maltese islands, using non cellular techniques.

Methodology

Extraction of phenolic constituents present in monocultivar olive oils was performed using solid phase extraction. The total phenolic content (TPC) was determined using Folin-Ciocalteu reagent, total flavonoid content (TFC) using the aluminium chloride method and total *o*-diphenolic content (TdPC) using Arnow's reagent. Determination of the total reducing capability of the phenolic extracts was performed using ferric-reducing antioxidant power (FRAP) assay and phosphomolybdate assay. Radical scavenging activity towards specific radicals namely DPPH, $ABTS^{+\cdot}$ and $NO\cdot$ was also determined.

Results and Discussion

The 'Malti' samples in this study were observed to have significantly lower TFC levels (p-value < 0.05 for all pairwise comparisons) when compared to the rest of the foreign olive cultivars cultivated in the Maltese islands.

Table 1: The content of different phenolic class expressed in mg/Kg for the different monocultivar olive oils present in the Maltese islands.

Cultivar	TPC GAE mg/Kg	TFC CE mg/Kg	TdPC PE mg/Kg
Bidni	153.72 ± 16.3^{ad}	202.85 ± 11.3^{a}	182.87 ± 4.8^{a}
Bidni	149.26 ± 24.3^{ad}	174.87 ± 6.2^{ab}	$153.04 \pm 5.4b^{f}$
Bidni	137.32 ± 18.5^{ac}	154.65 ± 4.2^{b}	131.69 ± 3.6^{c}
Malti	70.16 ± 7.2^{b}	32.00 ± 0.3^{d}	117.41 ± 1.6^{e}
Malti	96.21 ± 16.5^{bc}	78.38 ± 2.9^{e}	127.13 ± 1.2^{ce}
Frantoio	175.93 ± 31.2^{d}	222.80 ± 8.3^{a}	141.51 ± 6.1^{bf}
Carolea	184.13 ± 8.9^{d}	149.90 ± 5.7^{b}	162.49 ± 3.1^{bf}
Pendolino	184.38 ± 12.1^{d}	273.37 ± 10.2^{f}	129.08 ± 2.0^{ce}
Panadina	113.93 ± 24.7^{c}	78.17 ± 1.6^{e}	152.60 ± 4.8^{f}
Picholine	235.41 ± 25.3^{e}	303.55 ± 23.8^{f}	138.89 ± 6.7^{c}

Results expressed as mean ± 1SD for analysis of four replicates. Superscript letters in the same column represent statistically distinct homogeneous subsets as determined by ANOVA post hoc LSD analysis at a 5% confidence level.

References

Gill , C.I. , Boyd , A. , McDermott , E. , McCann , M. , Servili , M. , Selvaggini , R. , Taticchi , A. , Esposto , S. , Montedoro , G. , McGlynn , H. , Rowland , I. , 2005 . Potential anti-cancer effects of virgin olive oil phenols on colorectal carcinogenesis models in vitro . Int. J. Cancer 117 , 1 – 7

Miles , E.A. , Zoubouli , P. , Calder , P.C. , 2005 . Differential anti-inflammatory effects of phenolic compounds from extra virgin olive oil identified in human whole blood cultures . Nutrition 21 , 389 – 394 .

Antioxidant activity was significantly correlated with the total flavonoid content rather than the *o*-diphenolic content

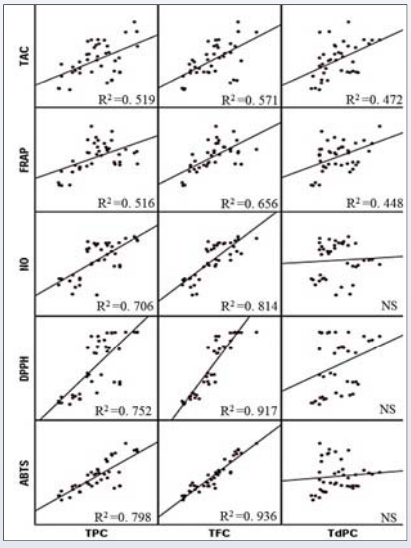

Figure 1: Correlation analysis between the observed total phenolic content (1st column), total flavonoid content (2nd column) and total diphenolic content (3rd column) against the observed antioxidant activity determined using $ABTS^{+\cdot}$ (1st row), DPPH (2nd row), $NO\cdot$ (3rd row), FRAP (4th row) and TAC (5th row). Figures in each graph represent the correlation coefficient using Pearson's correlation analysis. NS represents no significant correlation was observed at the 5% confidence interval.

The spatial distribution of the different olive oils based on the variation in their phenolic content and the antioxidant activity could be seen following a principal component analysis.

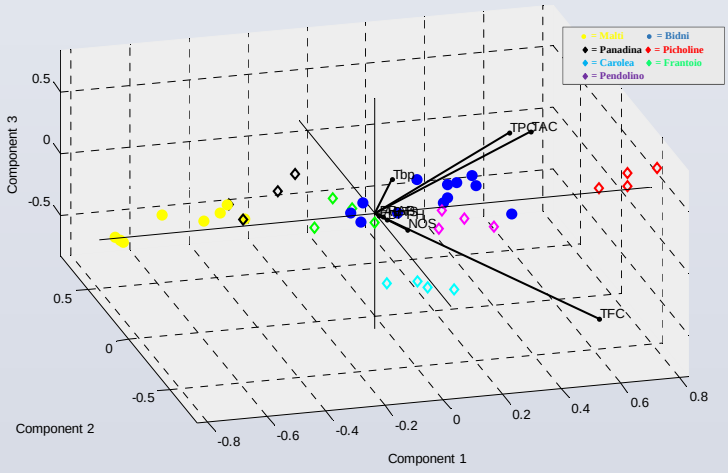

Figure 2: Principle component analysis showing clustering of the different monocultivar olive oils based on their phenolic content and observed antioxidant activity. Dots represent the indigenous Maltese cultivars while diamonds represent foreign cultivars grown in the Maltese islands.

Conclusions

The flavonoid compounds present within the olive oil phenolic fraction had a strong influence on the antioxidant activity. The content of the different phenolic classes and the antioxidant varied significantly between the different cultivars, causing distinct clustering.

Acknowledgements

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