

## ANALYSIS OF ANTHOCYANINS IN STRAWBERRY VARIETIES

LOPES-DA-SILVA F., M. T. ESCRIBANO-BAILÓN, A. M. GONZÁLEZ-PARAMÁS, J. C. RIVAS-GONZALO and C. SANTOS-BUELGA

Laboratorio de Nutrición y Bromatología. Facultad de Farmacia. Universidad de Salamanca. Campus Miguel de Unamuno. 37007. Salamanca (Spain); E-mail: [csb@usal.es](mailto:csb@usal.es)

The anthocyanin composition of five strawberry varieties (Camarosa, Carisma, Eris, Oso Grande and Tudnew) was analysed by HPLC using DAS and MS detection, according to a previously described method [1]. The composition of five varieties was characterised by the presence of three majority anthocyanins: cyanidin-3-glucoside (Cy-glc, peak 2 in the chromatogram of Figure 1), pelargonidin 3-glucoside (Pg-glc, peak 5) and pelargonidin 3-rutinoside (Pg-rut, peak 7). These three compounds constituted more than 95% of the anthocyanin composition in the five varieties studied. Pg-glc greatly predominated in all of them, followed by Pg-rut, except in the variety Eris where Cy-glc was the second anthocyanin (Table 1).

Several minority anthocyanins were detected in the samples analysed, with Camarosa and Tudnew exhibiting the largest diversity of compounds. A chromatogram corresponding to a sample of the variety Tudnew is shown in Figure 1. All minority anthocyanins detected in the varieties Carisma, Eris and Oso Grande were found to be derived from cyanidin, whereas in Camarosa and Tudnew not only cyanidin derivatives (peaks 4 and 13), but also compounds derived from pelargonidin (peaks 1, 3, 9a, 9b, 11, 12 and 14), malvidin (peaks 6 and 8) and delphinidin (peak 10) were detected. According to their retention characteristics, UV-visible and mass spectra and fragmentation patterns in LC-MS analysis, the following minority anthocyanins could be tentatively identified: Pg 3,5-diglucoside (peak 3), Cy 3-rutinoside (peak 4), Pg 3-arabinoside (peak 9b), Pg 3-malonylglucoside (peak 11) and Pg 3-succinylglucoside (14). Furthermore, molecular ion of peak 9a ( $m/z$  at 607) was coherent with a Pg disaccharide (hexose + pentose) acylated with acetic acid, and that of peak 13 ( $m/z$  at 463) with a methylglucoside of Cy.

**Table 1-** Contents of anthocyanins in the strawberry varieties analysed (results expressed as  $\mu\text{g Pg-glc/g}$  strawberry)\*.

	Cy-glc	Pg-glc	Pg-rut	Total anthocyanins
Camarosa	22 $\pm$ 6 (6,5%)	261 $\pm$ 36 (77,1%)	43 $\pm$ 7 (12,6%)	339 $\pm$ 43
Tudnew	20 $\pm$ 7 (3,7%)	468 $\pm$ 124 (85%)	33 $\pm$ 13 (6,1%)	547 $\pm$ 146
Carisma	8 $\pm$ 2 (2,9%)	242 $\pm$ 49 (88,3%)	15 $\pm$ 5 (5,5%)	275 $\pm$ 56
Eris	23 $\pm$ 7 (10%)	185 $\pm$ 66 (80%)	13 $\pm$ 5 (5,6%)	231 $\pm$ 81
Oso Grande	20 $\pm$ 2 (5,7%)	289 $\pm$ 34 (82,3%)	29 $\pm$ 2 (8,2%)	351 $\pm$ 38

\* mean  $\pm$  standard deviation (n=5).

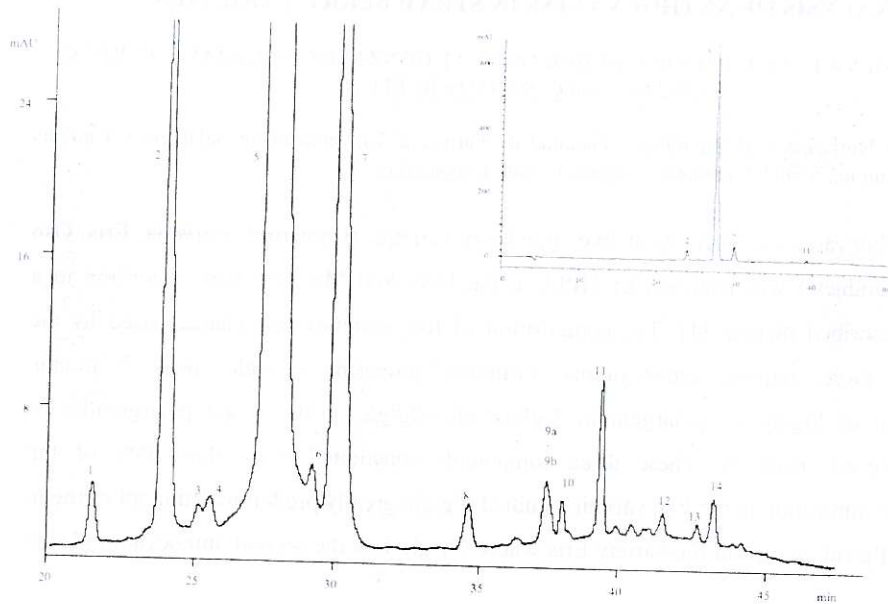


Figure 1- HPLC chromatogram (zoom) recorded at 520 nm corresponding to a strawberry sample of the variety Tudnew. The small window shows the complete chromatogram.

#### Acknowledgements

Thanks are due to Junta de Castilla y León (Spain) for financial support (project reference SA086/01). Author Lopes da Silva is funded by the European Commission and Government of Portugal through the Programme PRODEP III.

#### References

- [1] LOPES-DA-SILVA F., PASCUAL-TERESA S., RIVAS-GONZALO J., SANTOS-BUELGA C., 2002. Identification of anthocyanin pigments in strawberry (cv Camarosa) by LC using DAD and ESI-MS detection. *Eur. Food Res. Technol.*, **214**, 248-253.