



FLAVAN-3-OL COMPOSITION OF STRAWBERRIES

F. Lopes-da-Silva¹, C. Santos-Buelga, J.C. Rivas-Gonzalo, M.T. Escribano-Bailón

Unidad de Nutrición y Bromatología. Facultad de Farmacia. Universidad de Salamanca. Campus Miguel de Unamuno, 37007 Salamanca. Spain
¹Escola Superior Agrária. Instituto Politécnico de Bragança. Campus de Santa Apolónia, 5301-855 Bragança. Portugal

INTRODUCTION AND AIM

During processing and storage of strawberry-derived products a change of colour takes place from the original bright red to a brown hue. Flavan-3-ols should play a role in these processes through their interactions with anthocyanins and their direct involvement in browning reactions. As a part of a project aiming to elucidate the processes involved in colour changes in strawberry-derived products, the flavan-3-ol composition of strawberry has been studied.

METODOLOGY

MATERIAL

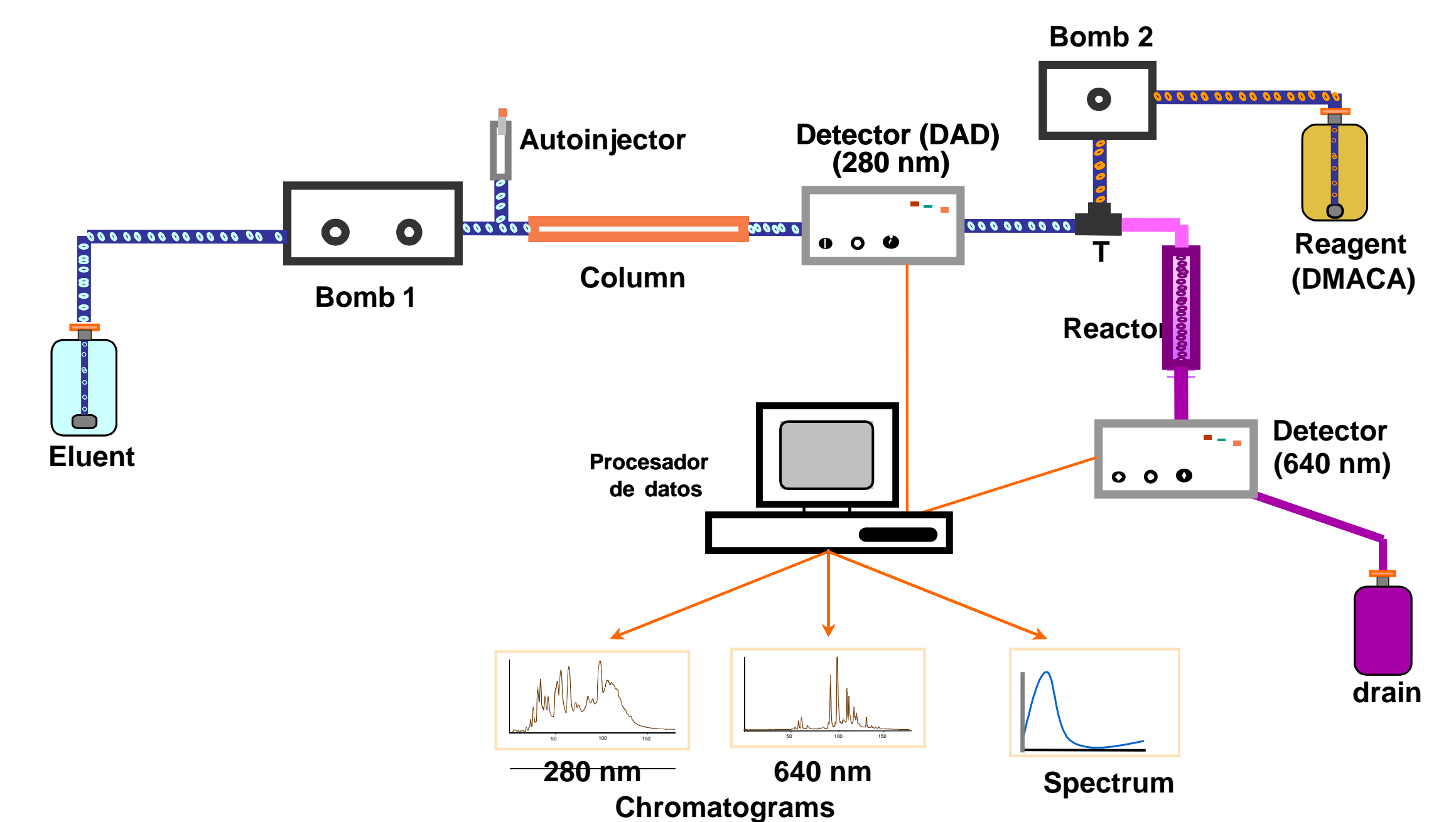
Samples of five strawberry varieties (*Camarosa*, *Eris*, *Oso Grande*, *Tudnew* and *Carisma*) from two different harvests (2001 and 2002).

EXTRACTION

Samples were subjected to repeated extraction with 75% aqueous methanol; after centrifugation, the solvent was evaporated in vacuum to obtain an aqueous extract.

ANALYSIS

Flavan-3-ol composition was analysed by HPLC using detection after chemical reaction with *p*-dimethylaminocinnamaldehyde (DMACA) [1].



RESULTS

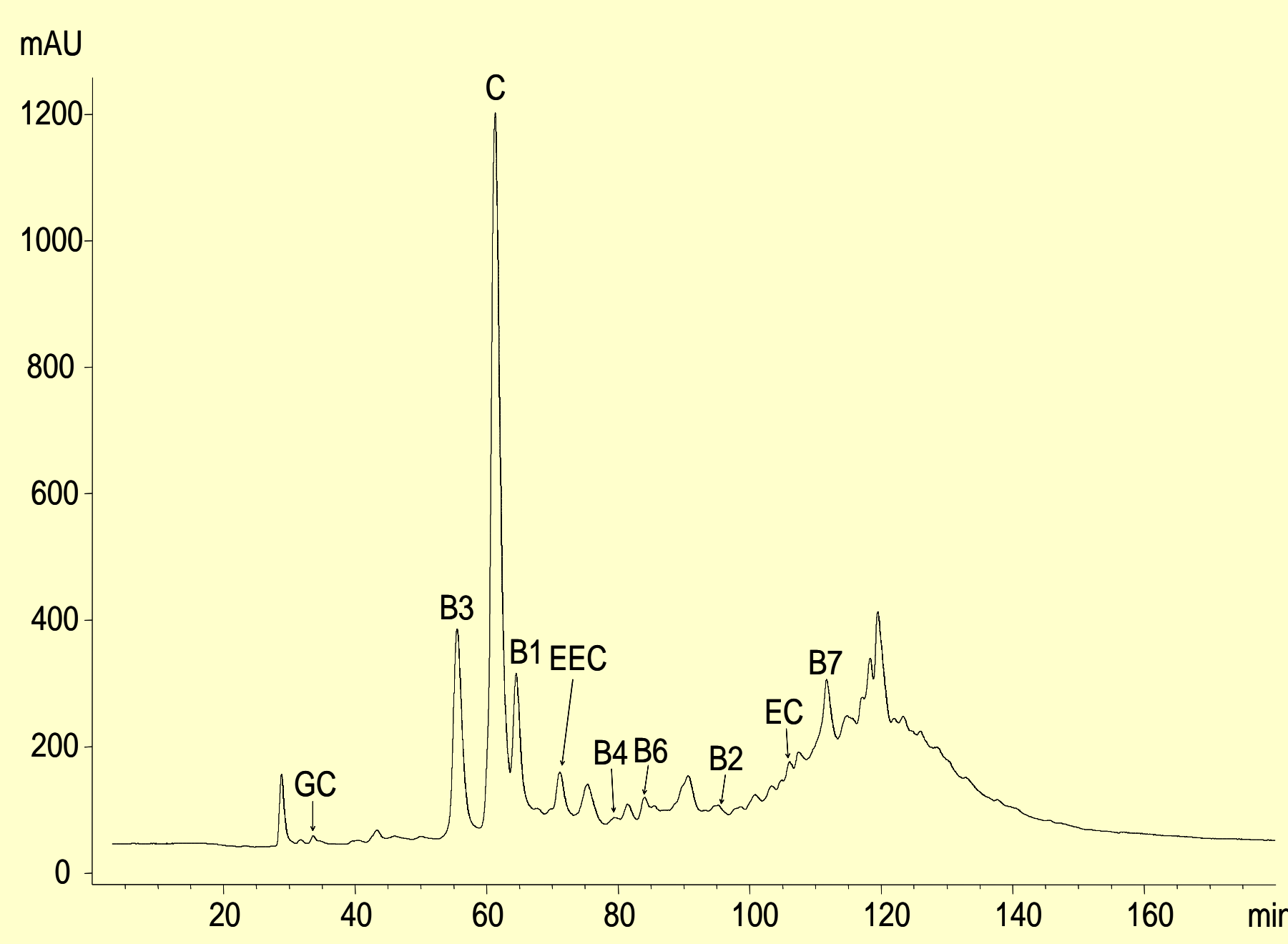


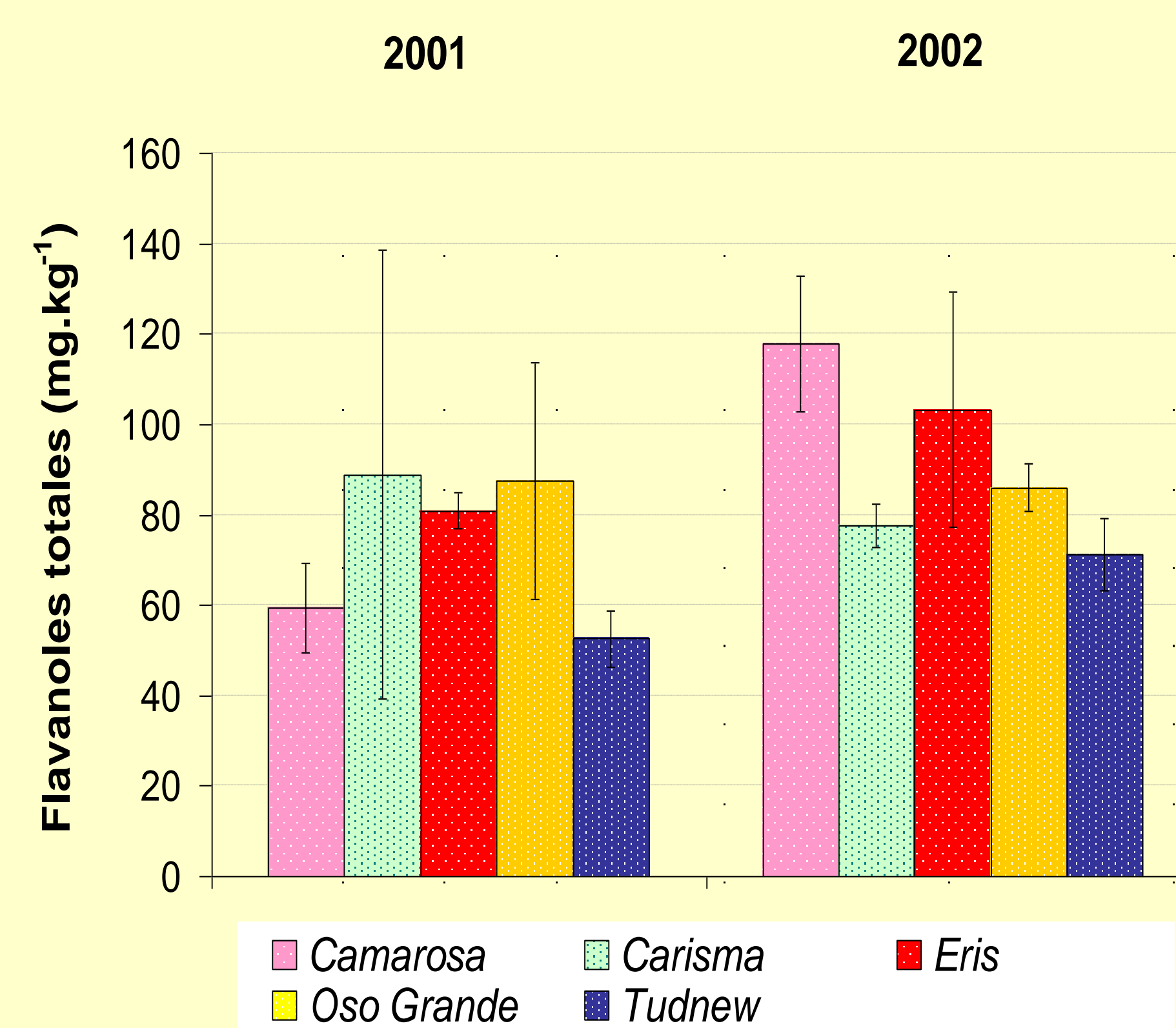
Figure 1 - HPLC chromatogram recorded at 640 nm after reaction with DMACA, showing the flavanolic profile of a sample of strawberry cv Camarosa. Peak identification in table 1.

Table 1 - Retention time (Rt), maximum wavelength of absorption in UV before reaction with DMACA (λ_{max}) and identity of the flavan-3-ols found in strawberry extracts.

r.t.* (min.)	λ_{max} (nm)	Flavan-3-ol
33.7	270	(+)-galocatechin (GC)
55.6	280	C-(4,8)-C (B3)
61.4	280	(+)-catechin (C)
64.6	280	EC-(4,8)-C (B1)
71.2	280	EC-(4,8)-EC-(4,8)-C (EEC)
79.5	280	C-(4,8)-EC (B4)
84.2	280	C-(4,6)-C (B6)
100.9	280	EC-(4,8)-EC (B2)
106.2	280	(-)-Epicatechin (EC)
111.8	280	EC-(4,6)-C (B7)
117.8	280	(-)-Epicatechin-3-O-galate (ECG)

* r.t. after reaction with *p*-dimethylaminocinnamaldehyde

Figure 2 - Average contents of total flavanols (mg catechin.kg⁻¹ strawberry) and standard deviation (n=3) in the five strawberry varieties and the two harvests studied.



Average content of total flavanols was 82.55±19.3 mg/kg, although important variations were found among different samples. No apparent relation seemed to exist between variety or year and flavanol content, which can be supposed to be more influenced by edafo-climatic factors and post-harvest storage.

Table 2 - Average percentage of catechin (C), epicatechin (EC) and procyanidin dimers and trimers in the different strawberry varieties analyses.

	C (%)		C dimers (%)		C trimers (%)		EC (%)		EC dimers (%)	
	2001	2002	2001	2002	2001	2002	2001	2002	2001	2002
Camarosa	46	44	17	22	2,0	2,1	0,1	0,1	0,9	1,0
Carisma	45	40	23	26	2,6	2,3	0,2	0,1	1,2	1,3
Eris	46	43	20	28	3,2	3,5	0,2	0,2	1,1	1,4
Oso Grande	41	43	18	23	1,8	2,4	0,1	0,1	0,2	1,1
Tudnew	41	39	17	23	1,9	2,4	0,1	0,1	1,2	1,7

Table 3 - Average percentages of procyanidin B3, B1, B6 and B7 in strawberry varieties analysed.

	B3 (%)		B1 (%)		B6 (%)		B7 (%)	
	2001	2002	2001	2002	2001	2002	2001	2002
Camarosa	10,5	11,4	3,0	7,2	1,3	0,8	1,9	3,0
Carisma	13,7	13,5	4,5	8,2	1,8	0,8	3,2	3,5
Eris	11,9	12,1	3,3	11,0	1,3	0,6	3,5	4,3
Oso Grande	10,1	10,5	3,0	9,0	1,3	0,5	3,9	2,9
Tudnew	11,3	11,6	3,0	7,3	0,5	0,6	2,4	3,6

Monomeric catechin (C) was by far the most important individual flavan-3-ol in the five varieties studied (42.7%±2.7 of total flavanols on average), followed by procyanidins B3 (11.7%±1.2) and B1 (5.95%±3). Minor percentages (<1%) of dimer B2 (EC-4,8-EC), B4 (C-4,8-EC) and galocatechin and some related dimers were also found, however hardly galloyled flavanols were detected in any of the strawberry varieties analysed.

CONCLUSIONS

1 - The flavan-3-ol profile of strawberry is characterized by the presence of catechin-derived compounds (i.e., catechin monomer and procyanidin dimers B3 (catechin-(4,8)-catechin) and B1 (epicatechin-(4,8)-catechin). Procyanidins B6 (catechin-(4,6)-catechin), B7 (epicatechin-(4,6)-catechin) and trimer epicatechin-(4,8)-epicatechin-(4,8)-catechin follow in order of abundance. Epicatechin and derived oligomers represent less than 2% of total strawberry flavanols. Galocatechins and galloyled procyanidins have weak expression in the varieties studies. This composition pattern was similar for the five varieties analyzed.

2 - Great variability was observed in the flavan-3-ol contents in the different strawberry samples analysed, with no apparent relation with variety or year of harvest, pointing out that flavanol concentrations are more influenced by edafo-climatic factors and post-harvest storage.

ACKNOWLEDGEMENTS

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REFERENCE

[1] de Pascual-Teresa S, Santos-Buelga C, Rivas-Gonzalo J C (2000) Quantitative analysis of flavan-3-ols in Spanish foodstuffs and beverages. *J Agric Food Chem* 48: 5331-5337.