3rd F&V Processing conference
3- Food systems and sustainability of F&V processing

Study of bioactive compounds in by-products derived from agricultural production of vegetables and aromatic plants

Ana Ferreira[1], Manuel Brito[1,2], Dulcineia F. Wessel[1,2,3,4] *

[1] Agrarian School of Polytechnic Institute of Viseu, Quinta da Alagoa – Estrada de Nelas, Ranhados, 3500-606 Viseu
[2] CI&DETS, Polytechnic Institute of Viseu, Av. Cor. José Maria Vale de Andrade, Campus Politécnico, 3504-510 Viseu
[3] CITAB, University of Trás-os-Montes e Alto Douro, 5001-801 Vila Real
[4] LAQV-REQUIMTE, Department of Chemistry, University of Aveiro, 3810-193 Aveiro
* ferdulcineia@esav.ipv.pt

INTRODUCTION

Around the world about one third of all food produced for human consumption are wasted. Adding to the fact that the food wasted could help mitigate food scarcity in poorer region of the world, this loss can bring economical and environmental issues [1,2]. To mitigate these problems, some alternative uses are emerging, such as the recovery of phytochemical compounds with beneficial properties and the bioproduction of new added value products [2]. Phenolic compounds are present in plant materials and have antimicrobial and antioxidant properties. These properties allow its use as natural food preservatives, since they reduce oxidative reactions, responding to the consumers demand for more natural food products. The ingestion of food with these compounds is also associated to the risk reduction of certain types of cancer and chronic diseases [3].

AIM OF THE WORK

The aim of this work was to characterize some farm by-products derived from production of vegetables and aromatic herbs in terms of phenolic compounds (TPC), flavonoids content (FC) and antioxidant power by two different methods.

MATERIALS AND METHODS

The TPC was evaluated by the Folin-Ciocalteu method, the flavonoids content by the colorimetric method and the antioxidant activity was evaluated through the radical $ABTS^{+\cdot}$ inhibition and the DPPH free radical scavenging method. For each by-product, three extracts were accessed. Fourteen by-products were analyzed and they were divided into three groups: leafs (7), "fleshy" (4) and aromatic herbs (3). The analysis of the differences of each parameter evaluated between the groups was performed using the One-Way ANOVA and Kruskal-Wallis tests (α = 5%). The software SPSS (version 26) was used.

RESULTS AND DISCUSSION

Of the analyzed by-products, the group of aromatic herbs registered the highest mean, median, minimum and maximum in all parameters, and the "fleshy" one the lowest (Table 1).

Table 1 – Statistical analysis of the TPC, FC, $ABTS^{+}$ and DPPH by groups (aromatic herbs, "flesky" and leafs).

		N	Mean ± S.D.	Median	Min.	Max.	95% CI
TPC	Aromatic herbs	9	1,47 ± 0,72	1,48	0,55	2,50	0,91 - 2,02
	Fleshy	12	0,58 ± 0,24	0,48	0,33	1,09	0,43 - 0,73
	Leafs	21	0,92 ± 0,34	0,97	0,25	1,64	0,77 - 1,08
FC	Aromatic herbs	8	2,05 ± 1,89	1,03	0,22	4,56	0,47 - 3,62
	Fleshy	9	0,60 ± 0,46	0,48	0,15	1,40	0,24 - 0,96
	Leafs	19	0,60 ± 0,38	0,69	0,06	1,47	0,41 - 0,78
$ABTS^{+}$	Aromatic herbs	9	2,23 ± 1,74	1,10	0,88	4,68	0,89 - 3,57
	Fleshy	12	0,78 ± 0,34	0,79	0,30	1,27	0,56 - 0,99
	Leafs	21	1,01 ± 0,77	0,87	0,12	3,15	0,65 - 1,36
DPPH	Aromatic herbs	9	1,15 ± 1,28	0,42	0,11	2,99	0,16 - 2,14
	Fleshy	12	0,39 ± 0,22	0,39	0,09	0,70	0,25 - 0,53
	Leafs	21	0,38 ± 0,33	0,26	0,09	1,13	0,23 - 0,53

For the verified values it is worth mentioning the Lemongrass (*Cymbopogon citratus*) and the Red Chard (*Beta vulgaris* L. var *cicla*) (Figure 1).

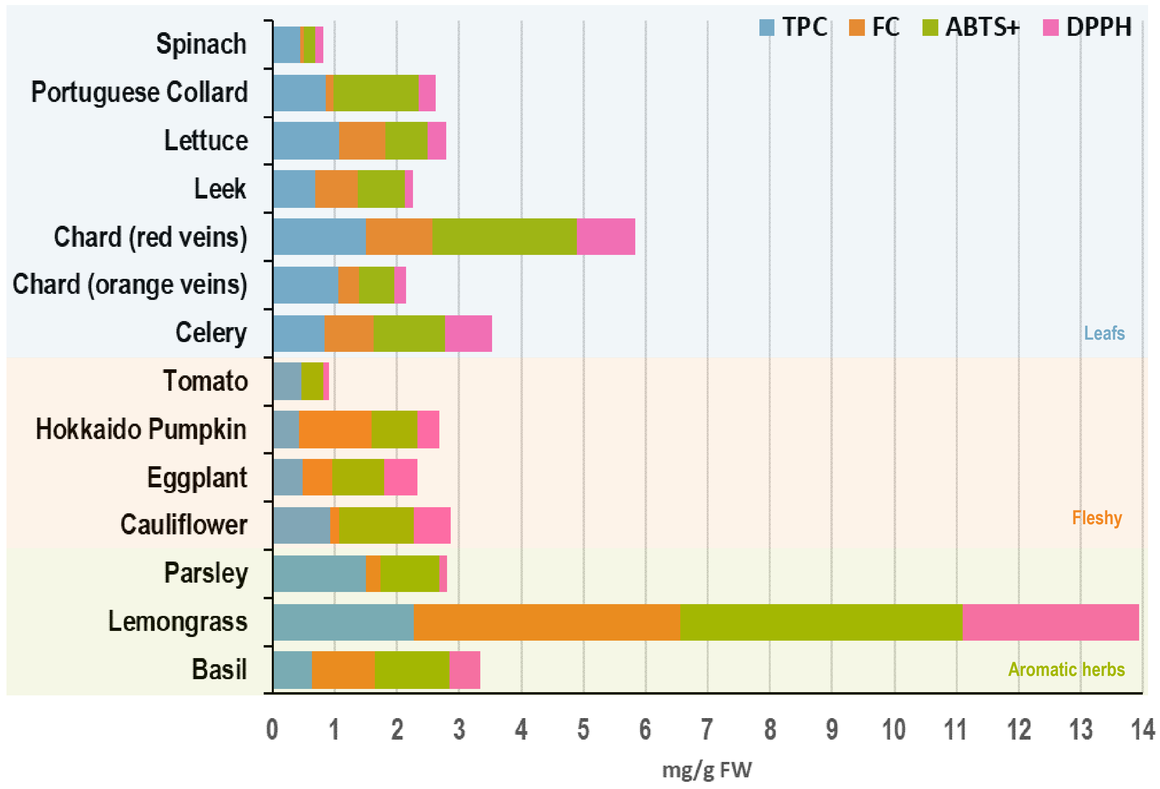

Figure 1 – Quantities resulting from the parameters evaluated (TPC, FC, $ABTS^{+}$ and DPPH) by by-product.

In terms of total phenolic content, by the One-Way ANOVA, there are statistically significant differences between the "fleshy" group and the remaining two groups (p=0.001) (Figure 2A).

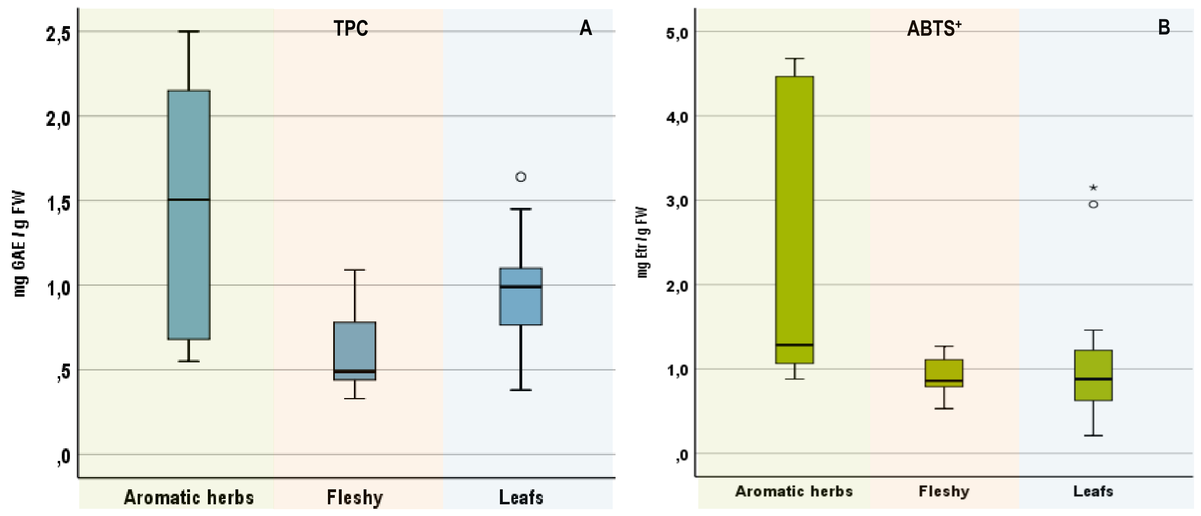

Figure 2 –TCP (mg EAG / g FW) (A) and $ABTS^{+}$ (mg Trolox eq / g FW) (B) by groups (aromatic herbs, "flesky" and leafs).

The results of ABTS assay showed, by the Kruskal-Wallis test, statistically significant differences between the aromatic herbs group and the leafs and "fleshy" groups (p<0,05) (Figure 2B).

Both DPPH method and flavonoid content determination didn't show statistically significant differences between the groups.

CONCLUSIONS

Although there is an emphasis on the antioxidant potential of aromatic herbs, the leafs, given the determined values and the quantities of the farmer by-products, reveal themselves as an interesting source of added value compounds.

REFERENCES

[1] Carciochi, R., D'Alessandro, L et al., 2017, in Ingredientes Extraction by Physicochemical Methods in Food, A. Grumezescu, A. Holban, Academic Press, chapter 4.
[2] Cruz, M., Bastos, R. et al., 2018, Journal of Cleaner Production, 193, 652-660
[3] Tohidi, B., Rahimmalek, M. et al., 2017, Food Chemistry, 220, 153-161

ACKNOWLEDGEMENTS

The authors would like to thank the company Vasco Pinto & Agostinho Sousa – Produtos Hortícolas e Ervas Aromáticas Lda for the supply of by-products and the financial support of the Waste2Value operational group PDR2020-1.0.1-FEADER-032314 under Compete 2020 operational program competitiveness and internationalization. Thanks are due to Polytechnic Institute of Viseu and FCT/MCT for the financial support for the CITAB research Unit (FCT UIDB/04033/2020 and UIDP/04033/2020) and LAQV-REQUIMTE research Unit (FCT UIDB/50006/2020) through national funds and, where applicable, co-financed by the FEDER, within the PT2020 Partnership Agreement.