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GCxGC/TOF, GC-MS and HPLC-DAD Characterization of Emilia Romagna Autochthon Dried Onion (*Allium cepa* L.) for Food and Nutraceutical Applications

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Summary: HPLC-DAD analysis allowed to quantify 11 flavonoids for a total amount of 4.06 mg/kg. HS-SPME-GC-MS analysis allowed to identify up to 42 volatile organic compounds; the highest peak area percentages were for dipropyl disulfide and dipropyl trisulfide. Finally, comprehensive two-dimensional GC fingerprint analysis was obtained

Keywords: dried onion rings, dried onion flakes, HS-SPME-GC-MS

Introduction

Onion (*Allium cepa* L.) is a vegetable widely used as food ingredient, with flavanols and volatile organic compounds as sulfur compounds as main bioactive constituents [1]. Dried onion has gained increasingly attention as alternative to the fresh onion for industrial and domestic uses; in the powdered form, it could be a very easy to use functional food ingredient [2]. GC-MS is the tool of choice for the analysis of these volatile compounds, even though 2D-GC/MS/TOF is gaining increasingly attention for volatile metabolite profiling [3]. Aim of this work was phenolic and volatile characterization of dried samples of onion rings and onion flakes by HPLC-DAD, HS-SPME-GC-MS and 2DGC-MS/TOF.

Experimental

Samples of dried onion rings and onion flakes were been provided by Officinali Agribioenergia factory, Medicina (Bologna), Italy. The dried samples were deep-frozen with liquid nitrogen and immediately chopped with mortar and pestle, until a homogenous powder was obtained. Phenolic composition of samples was analyzed and quantified by HPLC-DAD. Volatile organic profiling was carried out by both HS-SPME-GC-MS and 2DGC-MS/TOF analyses. For both the two kind of GC-MS, volatile organic compounds were absorbed from the headspace of a 20 ml screw cap vial suitable for SPME by the coating material of a 2-cm trivalent fiber (DVB/CAR/PDMS), working at 60°C, for 10 min under orbital shaking. Then, they were immediately desorbed at 280°C in a GC injection port, separated in a GC system (Agilent 7890a GC) equipped with an Agilent DB InnoWAX column (length 50 m, id 200 µm, df 0.40 µm) and detected by a quadrupole mass spectrometry (Agilent 5975C MSD).

Regarding GC×GC analyses, the VOCs were separated in an Agilent GC 7890B equipped with an Agilent flow modulator system and a HP-5MS UI column (0.18x0.18mm, 20 m) coupled with a InnoWAX column 0.23x0.32 mm, 5 m. Then, they were detected on a TOF-DS Markes detector.

A tentative compounds identification was performed by comparing mass spectra of each peak with those reported in mass spectral databases and identification was then confirmed by comparing their retention index.

Results and conclusions

HPLC-DAD analysis allowed to quantify 11 flavonoids for a total amount of 4.06 mg/g in onion flakes and 2.91 mg/g in onion rings.

Figure 1 shows the total ion chromatogram obtained by the HS-SPME-GC-MS analysis of the onion flakes, while figure 2 shows the contour plot obtained by the 2DGC-MS/TOF analysis of the onion rings.

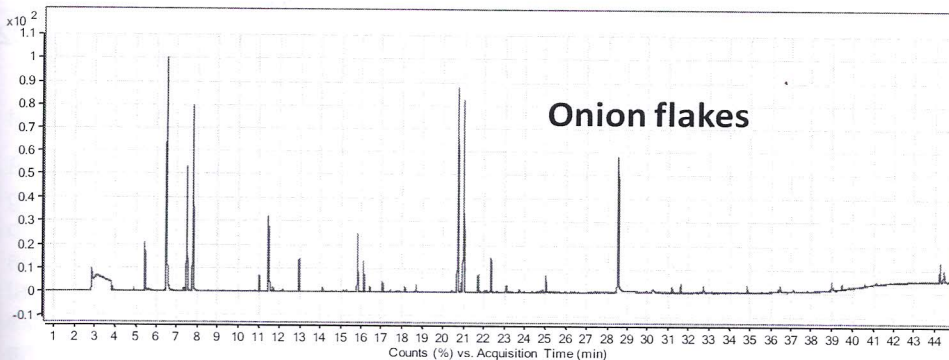


Figure 1. Total Ion Chromatogram (TIC) by HS-SPME-GC-MS analysis of dried onion flakes

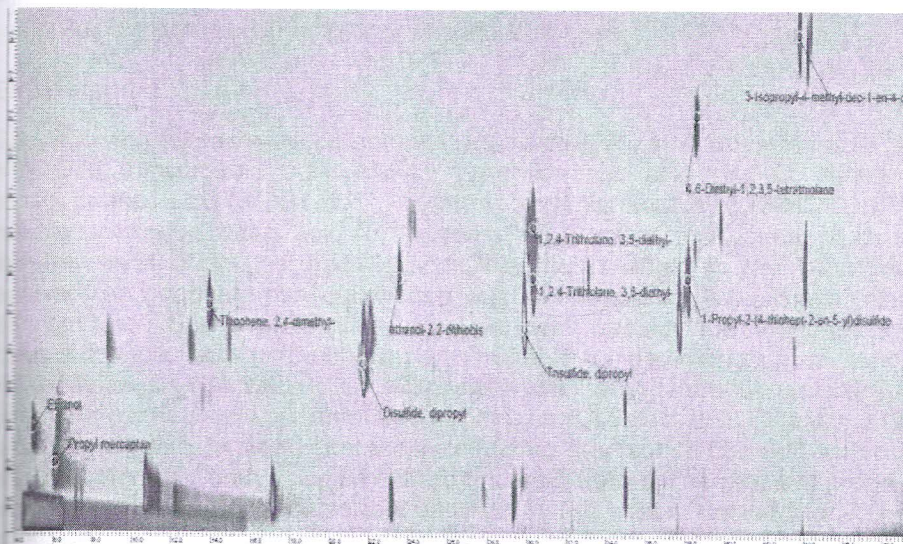


Fig.2. contour plot from GCxGC/TOF analysis of dried onion rings.

Dipropyl disulfide was the main component of both the samples, with percentage higher than 50% of the total volatile organic compounds (VOCs) in onion ring, calculated as area percentage on total area of the identified VOCs.

Comprehensive two-dimensional GC fingerprint analysis confirmed that dipropyl disulfide and dipropyl trisulfide were the most abundant VOCs. In conclusion, an innovative product from territorial certified and organic onion (*Allium cepa* L.) in two dried different forms, aimed to food and nutraceutical uses, were characterized for their phenolic and volatile fractions.

To the authors knowledge, this work is the first characterization of onion samples by 2DGC-MS/TOF

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References

1. Colina-Coca, C. et al., *Talanta*, 103, 2013, 137-144
2. Rodan-Marin, E. et al., *British Journal of Nutrition*, 102, 2009, 1574-1582
3. Ieri, F. et al., *Advances in Horticultural Sciences*, 31(2), 2017, 141-147