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HAL Id: hal-02804466
https://hal.inrae.fr/hal-02804466

Submitted on 5 Jun 2020

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Characterization of Flavonols, Anthocyanins and Lutein Diesters in *Crocus sativus* By-Products by Ultra Performance Liquid Chromatography Coupled to Diode Array and Ion Trap Mass Spectrometry Detections

Pascale Goupy[1,2], Maryline Abert Vian[2], Farid Chemat[2], Catherine Caris-Veyrat[1,2]

[1] INRA, UMR408, Sécurité et Qualité des Produits d'Origine Végétale, F-84000 Avignon, France.

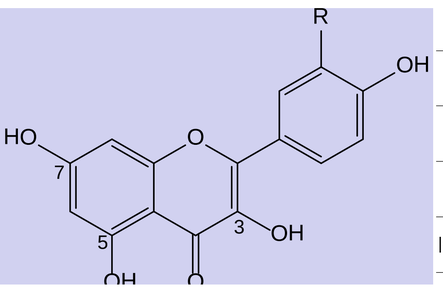
[2] Université d'Avignon, UMR408, F-84000 Avignon, France

Introduction

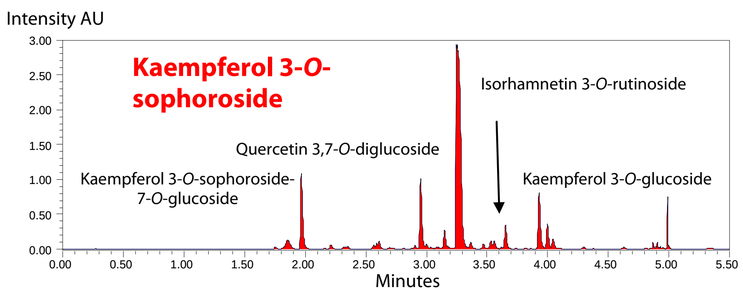
The major flavonoids and carotenoids of *Crocus sativus L.* tepals (petals and sepals) were identified using UPLC coupled to an ion trap mass spectrometer with electrospray or atmospheric pressure chemical ionization, in order to get an insight into their potential valorization.

Results

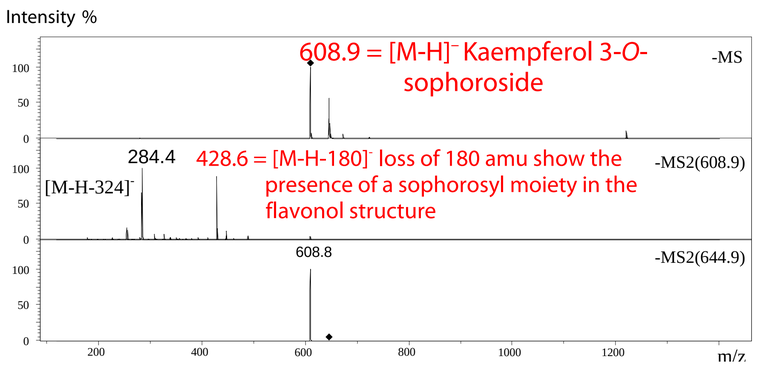
Identification of Flavonols



Flavonols	R	R_1	R_2
Kaempferol	H	H or Glycosyl	H or Glycosyl
Quercetin	OH	H or Glycosyl	H or Glycosyl
Isorhamnetin	OCH_3	H or Glycosyl	H or Glycosyl

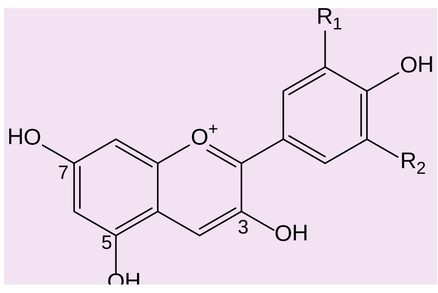


UPLC DAD chromatogram of methanolic extract of *Crocus sativus* tepals at 370 nm

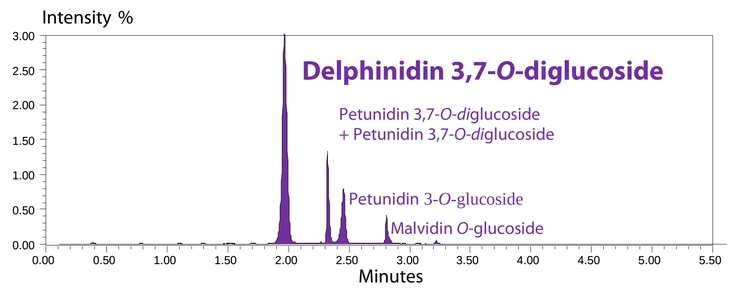


MS fingerprints of kaempferol 3-*O*-sophoroside

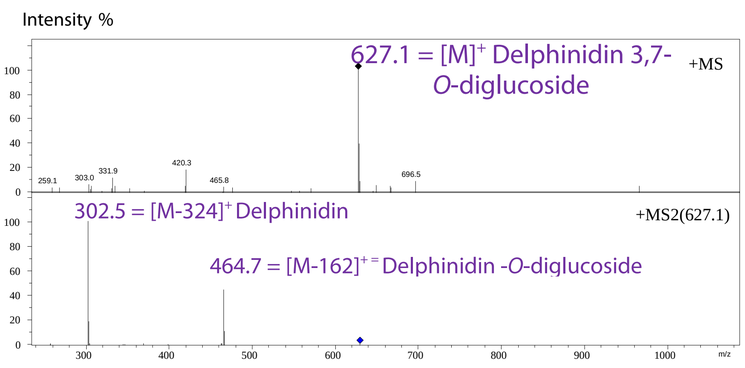
Identification of Anthocyanins



Anthocyanidins	R_1	R_2
Delphinidin	OH	OH
Petunidin	OH	OCH_3
Malvidin	OCH_3	OCH_3



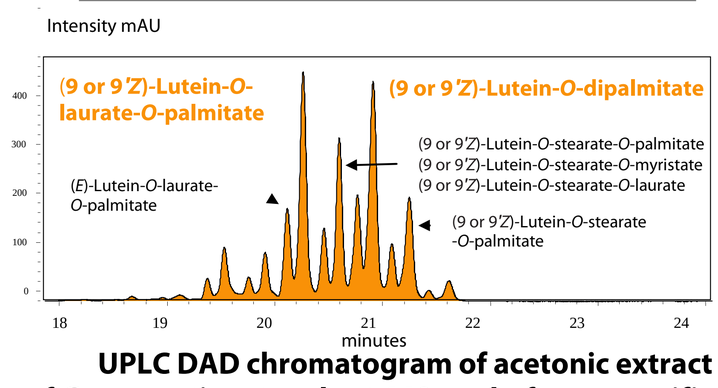
UPLC DAD chromatogram of methanolic extract of *Crocus sativus* tepals at 530 nm



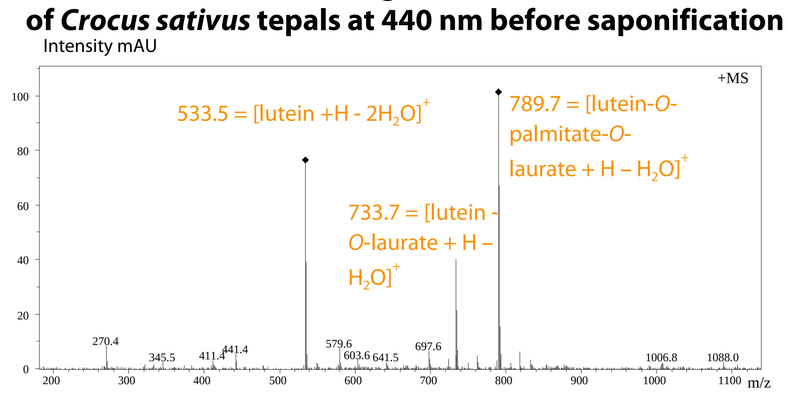
MS fingerprints of delphinidin 3,7-*O*-diglucoside

Identification of Lutein diesters

	R_1	R_2
(*E*)-Lutein	H	H
(*E*)-Lutein diesters	Fatty acid	Fatty acid



UPLC DAD chromatogram of acetonic extract of *Crocus sativus* tepals at 440 nm before saponification



MS fingerprints of *(E)*-lutein-*O*-laurate- *O*-palmitate

❖**Nineteen flavonols** were identified: kaempferol, quercetin and isorhamnetin glycosides as mono-, di- or tri-glycosides .

❖Major flavonols (84.0% of total flavonol content) were kaempferol glycosides

❖Main compound was kaempferol 3-*O*-sophoroside.

❖Newly flavonols were identified: isorhamnetin 3-*O*-sophoroside, kaempferol 3-*O*-rutinoside and quercetin 3-*O*-glucoside 7-*O*-rhamnoside.

❖**Five anthocyanins** reported as delphinidin, petunidin and malvidin glycosides which contribute to the cyanic colors (purple, lilac, mauve and blue) of Crocus sativus flowers

❖Main anthocyanin identified was delphinidin 3,7-*O*-diglucoside.

❖For the first time, anthocyanins were quantified in *Crocus sativus* tepals: 4804 ± 233 µg g^{-1} DW.

❖**Fourteen lutein diesters** with lauric, myristic, palmitic and stearic acids were identified in *Crocus sativus* tepals for the first time. No previous work reported the presence of lutein esters or diesters in *Crocus sativus*.

❖Main lutein diesters were (9 or 9′*Z*)-lutein-*O*-laurate-*O*-palmitate and (9 or 9′*Z*)-lutein-*O*-dipalmitate which represented 20% and 16%, respectivelyof the total lutein diesters.

❖With 21.46 ± 0.98 mg. 100 g^{-1} DW, lutein diesters content is comparable to food products.

Conclusion

Our results show that *Crocus sativus* tepals are a valuable source of potentially interesting phytochemicals (flavonols, anthocyanins, lutein) and could constitute a workable source of antioxidants and coloring agents[1].

Reference Goupy, P.; Vian, M. A.; Chemat, F.; Caris-Veyrat, C. Industrial Crops and Products **2013**, 44, 496-510.

UMR408 SQPOV
Domaine Saint-Paul
Site Agroparc
CS 40509
84914 Avignon Cedex 9

International Congress on Green Extraction of Natural Products GENP
Avignon, France, April 16-17, 2013.