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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

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HAL Id: hal-02804466

<https://hal.inrae.fr/hal-02804466>

Submitted on 5 Jun 2020

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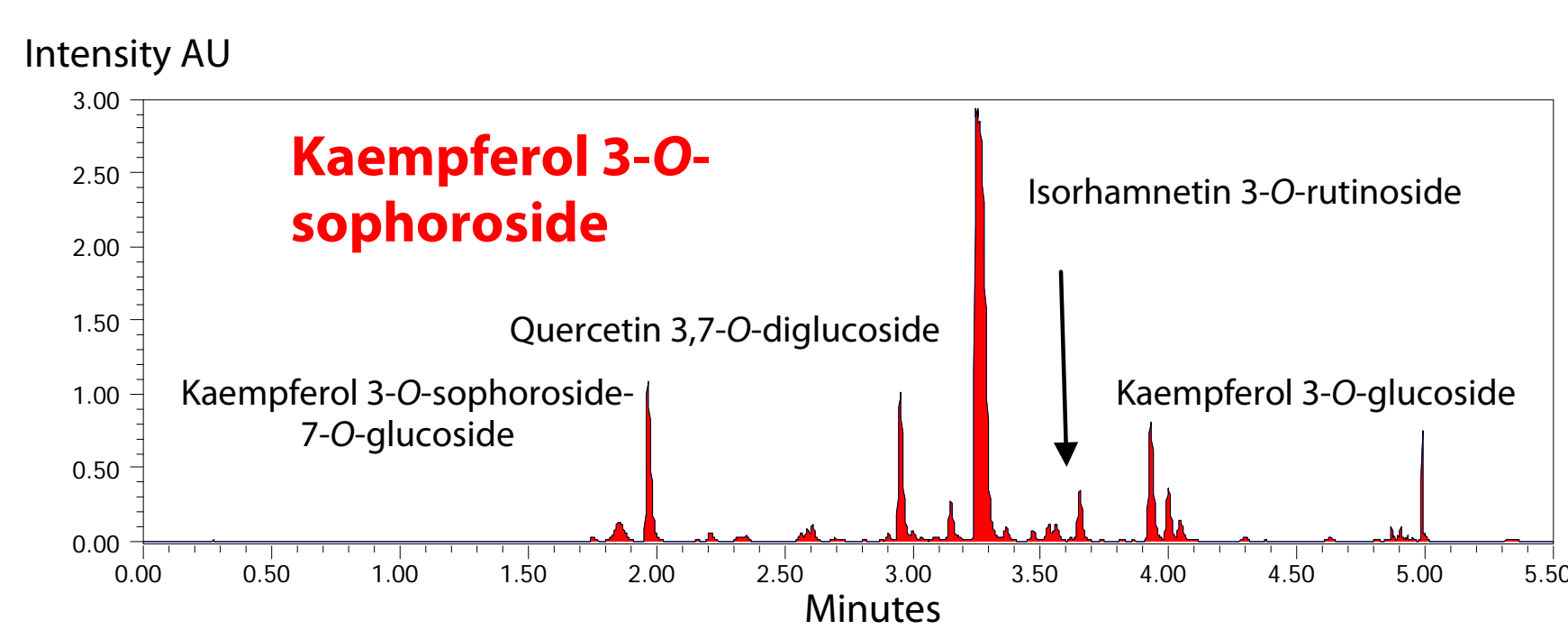
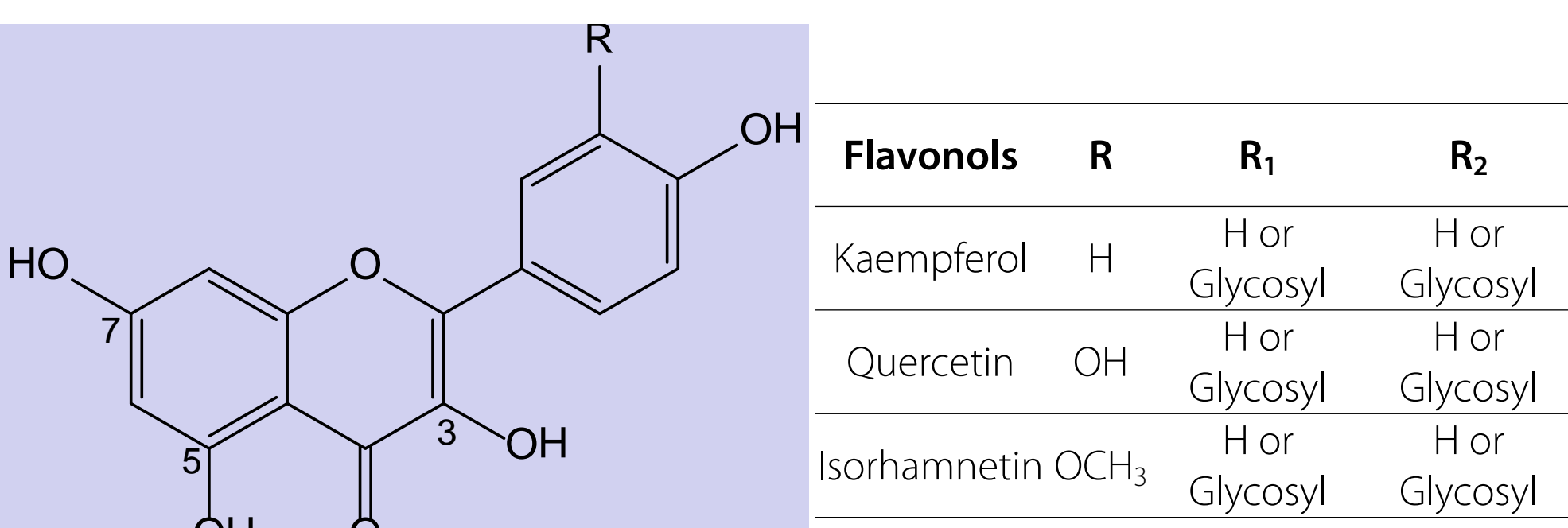
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Introduction

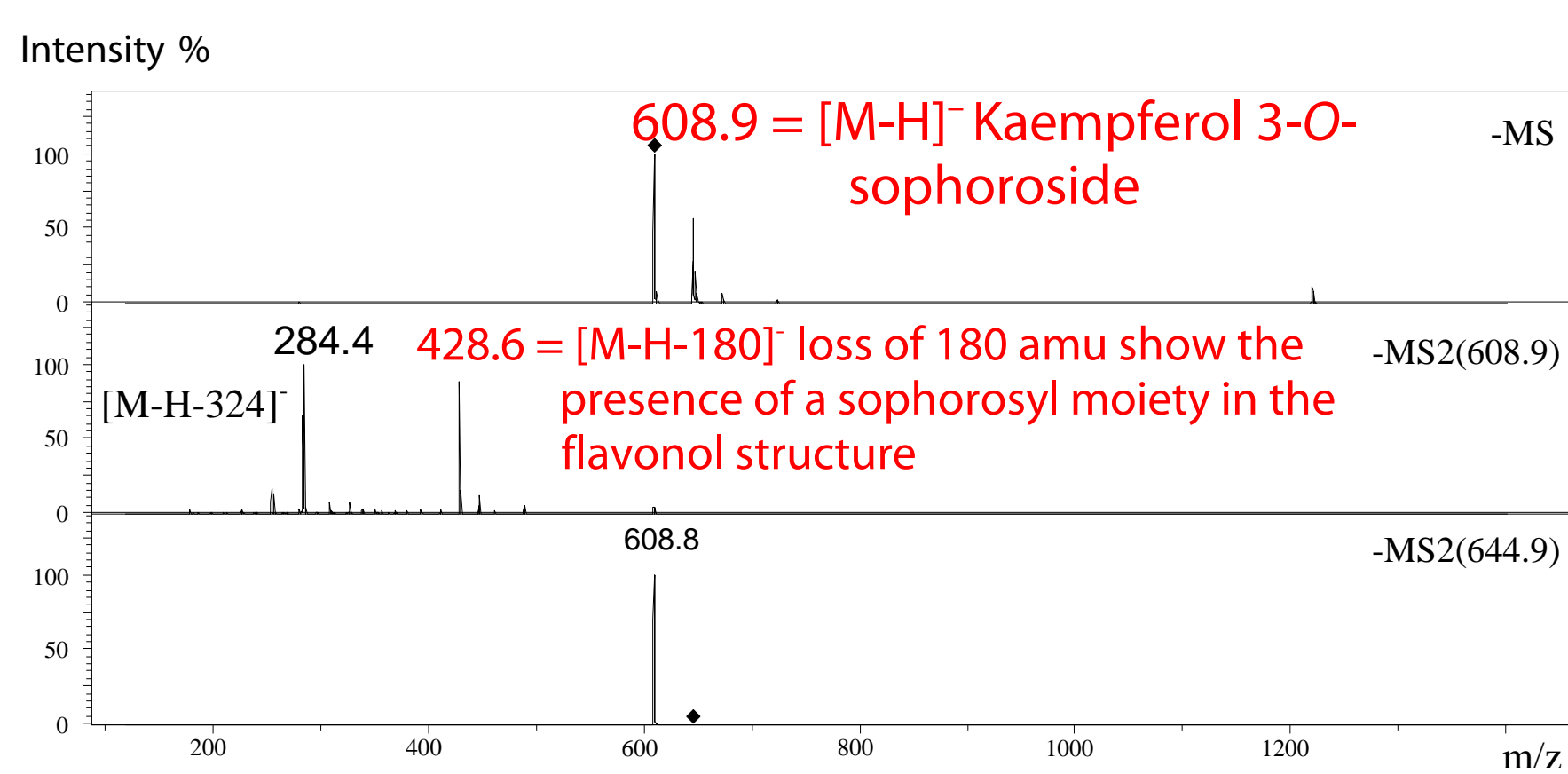
The major flavonoids and carotenoids of *Crocus sativus* L. tepals (petals and sepals) were identified using UPLC coupled to an ion trap mass spectrometer with electrospray or atmospheric pressure chemical ionization, in order to get an insight into their potential valorization.

Results

Identification of Flavonols

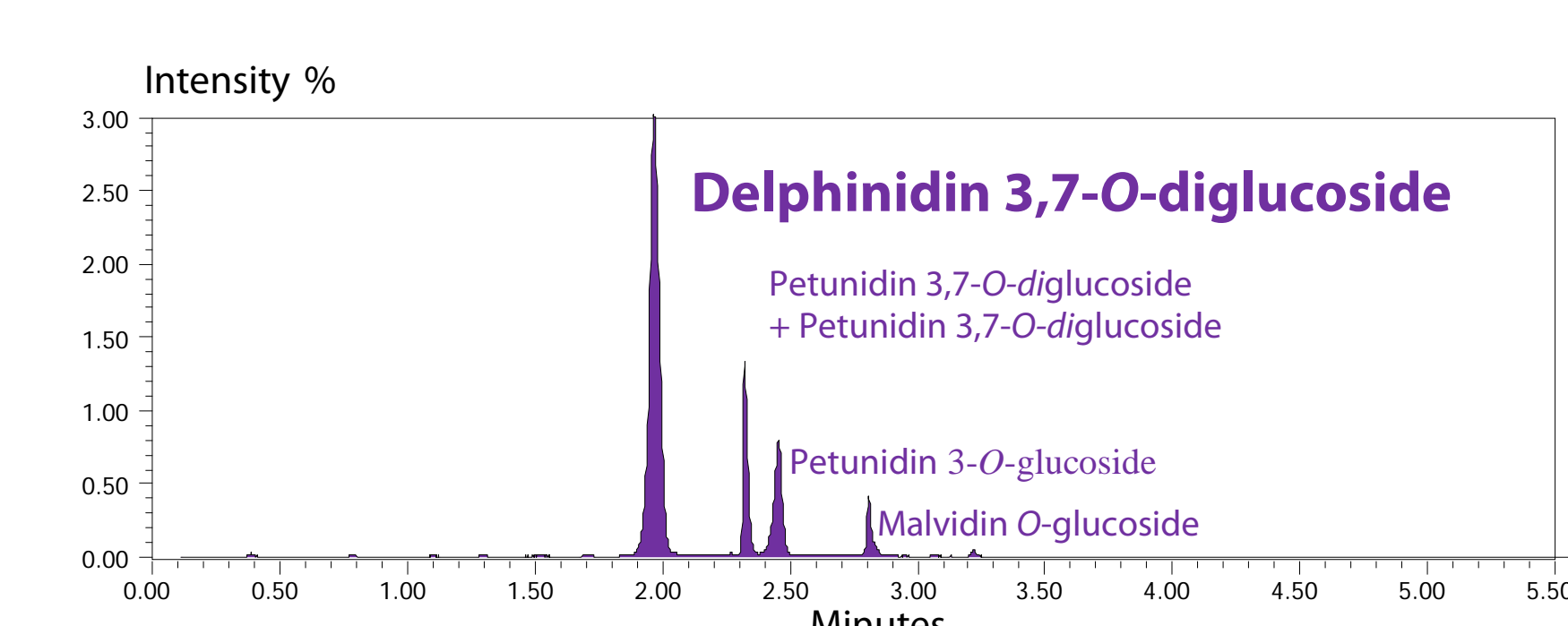
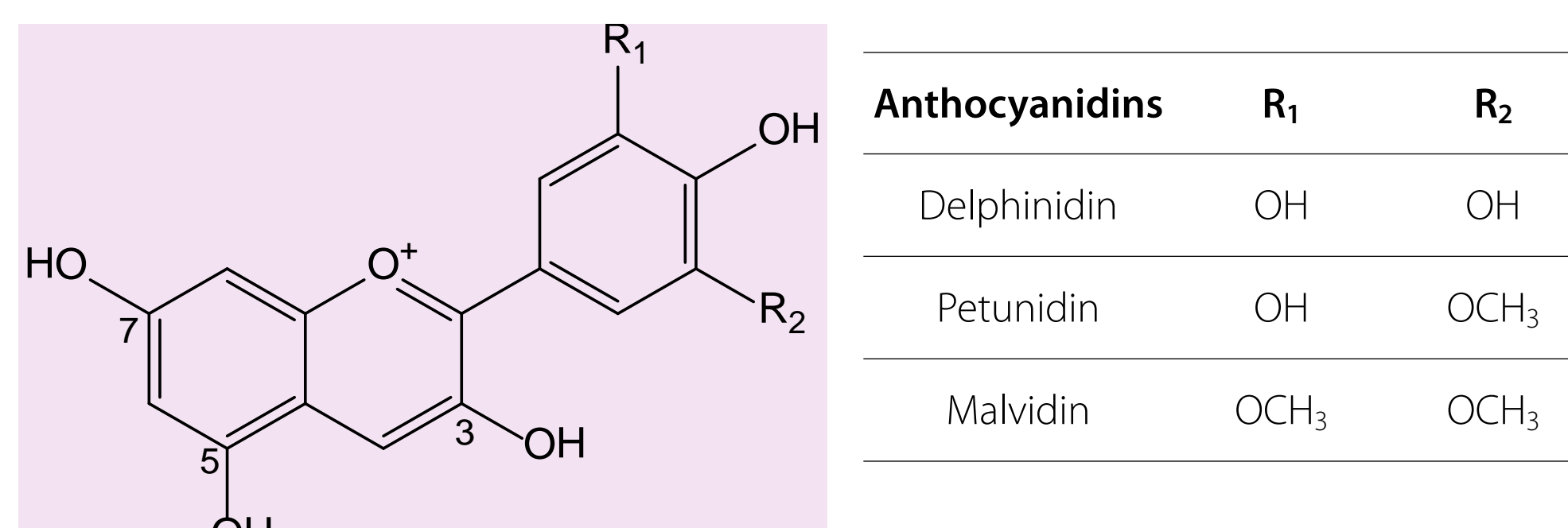


UPLC DAD chromatogram of methanolic extract of *Crocus sativus* tepals at 370 nm

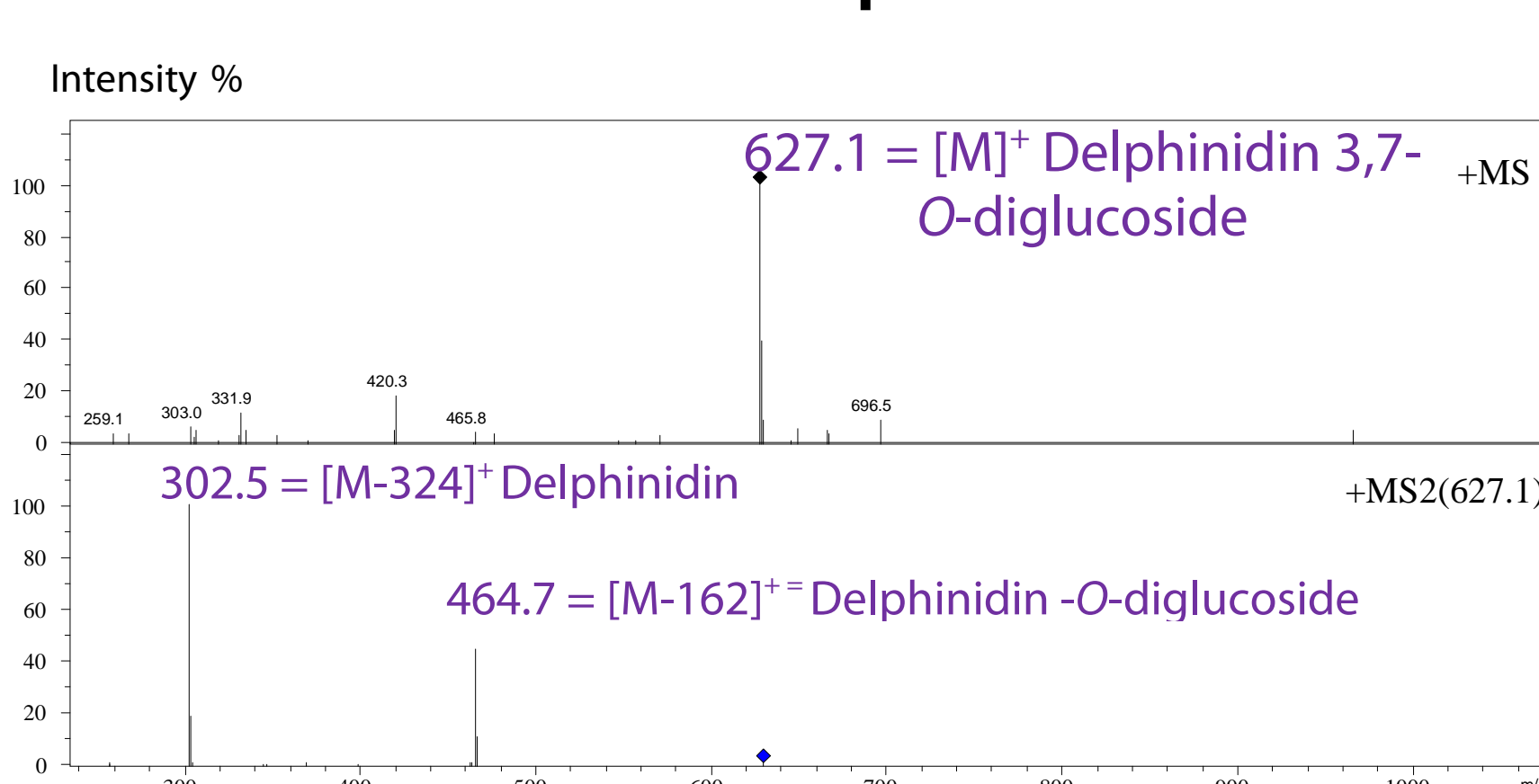


MS fingerprints of kaempferol 3-O-sophoroside

Identification of Anthocyanins

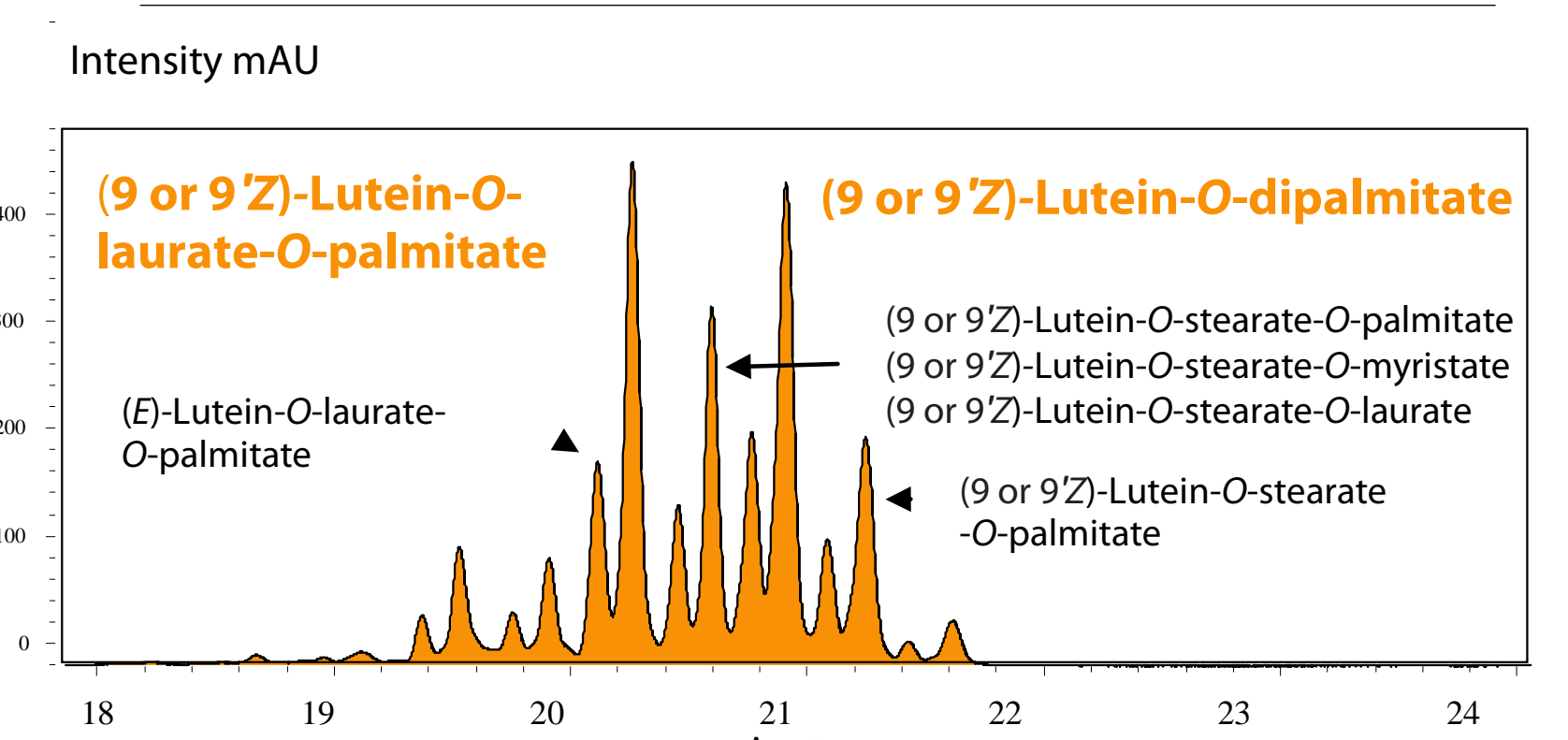
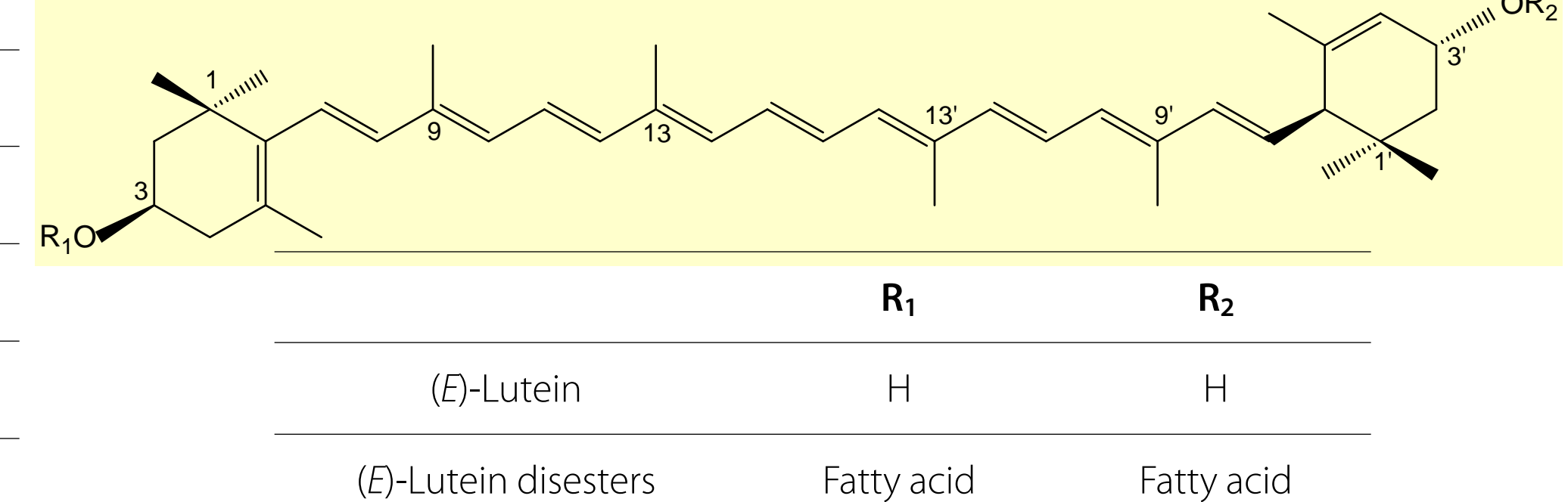


UPLC DAD chromatogram of methanolic extract of *Crocus sativus* tepals at 530 nm

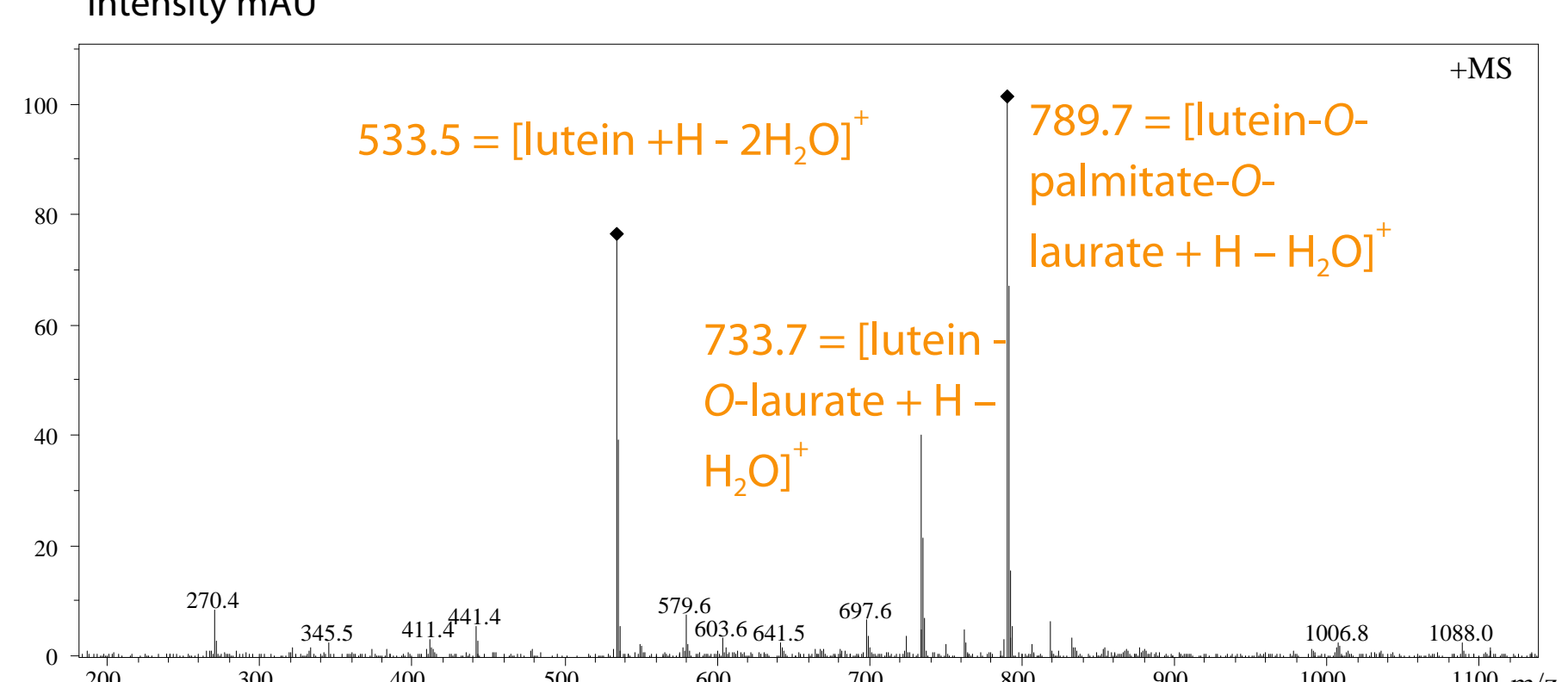


MS fingerprints of delphinidin 3,7-O-diglucoside

Identification of Lutein diesters



UPLC DAD chromatogram of acetic 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: $4804 \pm 233 \mu\text{g g}^{-1}$ 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%, respectively of the total lutein diesters.

❖ With $21.46 \pm 0.98 \text{ mg} \cdot 100 \text{ g}^{-1}$ 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 agents¹.

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