



UNIVERSITÀ DEGLI STUDI DI SALERNO



UNIVERSITÀ DEGLI STUDI DI SALERNO
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Relazione del III anno

*Valorisation of wild edible and medicinal plants through
phytochemical analyses and evaluation of their potential
biological properties*

Dottorando

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Abstract

The aim of this PhD project was the valorisation of wild food and medicinal plants selected by ethnobotanical research and ecological data through phytochemical investigations and studies of their potential biological properties. During the first year, we focused the attention on the flowers extract of *Crataegus laciniata* Ucria (Rosaceae), wild-growing in western Sicily. LC-MS analyses showed 41 compounds in the flower extract (CLF), mainly C- and O-flavonoid derivatives. The flower extract indicated strong antioxidant potential in DPPH, ABTS, and FRAP assays. In addition, CLF exhibited anti-melanogenic effects in *Danio rerio* (zebrafish) and significant inhibitory activity against tyrosinase, α -amylase, and α -glucosidase enzymes. The findings imply that CLF can be a promising source of bioactive compounds for application in pharmaceutical and cosmeceutical industries. Then, the second year, fruit extracts of different *Crataegus* species and variety were studied. The LC-MS analysis of *Crataegus* fruit extracts exhibited 25 major components, mainly flavonoids, phenolic acids, and fatty acids. Quantitative analysis using UHPLC-MS showed species-specific differences: *C. laevigata* and *C. zichichianus* were rich in hyperoside, *C. azarolus* contained the highest levels of cyanidin-O-glucoside, while *C. azarolus* sub. *aronica* showed the highest vitexin content. The extracts exhibited antioxidant activity in DPPH, ABTS, and FRAP assays, and demonstrated inhibition of α -glucosidase, suggesting potential antidiabetic properties. Moreover, the phytochemical investigation of stem bark extracts of *Cedrela odorata* (Meliaceae) aimed at identifying new lignan and neolignan derivatives with potential antiangiogenic properties, was carried out. From the polar extract, two previously undescribed 8',9'-bis-nor-neolignans, 9-acetyltoonin C and *threo*-guaiacylglycerol- β -methyl vanillate ether were isolated and structurally elucidated by spectroscopic analyses. Together with structurally related lignans from our in-house library, these compounds were evaluated for antiangiogenic activity using the *Danio rerio* (zebrafish) embryo model. Compounds 9-acetyltoonin C and *erythro*-4,7,9,9'-tetrahydroxy-3,3'-dimethoxy-8-O-4'-oxyneolignan showed the strongest inhibition of blood vessel formation, with compound *threo*-guaiacylglycerol- β -methyl vanillate ether displaying an effect comparable to the reference compound 2-methoxyestradiol. In addition, a phytochemical study of the exudate of *Lavandula pubescens*, a species traditionally used in Saudi Arabia for its antibacterial and anti-inflammatory properties, led to the isolation of ten new diterpenoids (including four with unusual structures) and four known pimarane derivatives from the exudate. Fractions and pure compounds of *L. pubescens* were also studied for their anti-inflammatory activity against THP-1 cells. During the third year a chemical the investigation of arial part extract of *L. pubescens* was performed and led

to the isolation of several diterpenoids, including fifteen new and thirteen known compounds belonging to abietane, labdane, and pimarane-type skeletons. Their structures were determined by 1D and 2D NMR spectroscopy, HRESIMS analyses. Furthermore, antimicrobial activity of the extracts and subsequently fractions, and molecules was evaluated. The diterpene 15,16-dihydroxy-entpimar-8(9)ene emerged as a promising antibacterial molecule against *Staphylococcus epidermidis*. Moreover, during my visiting research at Leiden University, I focused on preliminary study of the metabolite profile of ten *Salvia* plant exudates and corresponding leaves through a multi-platform analytical approach (GC, LC, and HPTLC).

Techniques

Use of analytical and semipreparative HPLC and BIOTAGE. the use of LTQ-Orbitrap XL Mass Spectrometer (Thermo Scientific®). The use of database for bibliographic research and of software for data analyses. Analysis of chemical profiles using NMR, GC-MS, LC-MS, and HPTLC.

Publications

- Mirabile, S., D'Angelo, V., Germanò, M.P., **Pouramin Arabi, S.**, Parisi, V., Raimondo, F.M. and Rosa, E., **2023**. Chemical Profile and Health-Promoting Activities of *Crataegus laciniata* (Rosaceae) Flowers. **Plants**, 13(1), p.34. <https://doi.org/10.3390/plants13010034>
- Iobbi, V.; **Pouramin Arabi, S.**; Bisio, A.; D'Angelo, V.; Germanò, M. P.; Braca, A.; De Tommasi, N. 8',9'-Bis-nor-neolignans from *Cedrela odorata* and their antiangiogenic activity. **Phytochemistry Letters** **2024**, 64, 13–18. <https://doi.org/10.1016/j.phytol.2024.09.002>
- Cacciola, A., **Pouramin Arabi, S.**, D'Angelo, V., Donadio, G., Maria Raimondo, F., Santoro, V., Rosa, E., Germanò, M. P., & De Tommasi, N. (n.d.). Polyphenolic characterization, antioxidant and antidiabetic activities of *Crataegus* spp. fruit extracts. 2025, Journal of Food Science:

Attendance at congress/conferences/ schools

- "1st HR MS School "Metabolomics in natural product research, University of Catania, September. 22nd 2023. (Attended).
- Pouramin, S., Parisi, V. Bader A., Rosa E., and De Tommasi N. "**Isolation and biological evaluation of ent-pimarane diterpenoids from *Lavandula pubescens* Decne**" Presented at 1st Intersociety Congress of plant-based products for health; the role of medicinal plants in modern medicine: University of Padua, Jun ,15-17th 2023; Poster 255.
- 3rd HR-MS school " the Spectrometry Division of Mass of the Italian Chemical Society, University of Salerno, 30 th Nov-1 th Dec 2023.

- **Pouramin, S.,** Parisi, V., Bader, A., Rosa, E., and De Tommasi, N. “**Nano-phytosome delivery system loaded with *Crataegus laciniata* (Rosaceae) flowers extract: whitening properties**” Presented at 72 International Congress on Natural Products Research (**GA**), Krakow, July 13_17,2024; Poster 664.
- Parisi, V., **Pouramin, S.,** Nocera, R., Rosa, E., Bader, A., E., Gazzillo, E., Chini, M.G., Bifulco, G., and De Tommasi, N. “**New Diterpenes with Potential Antiinflammatory Activity from *Lavandula pubescens Decne***” Presented at 25th Conference on Isoprenoids, Naples, September 17/19/09/2024; oral communication.
- **Pouramin, S.,** Parisi, V., Nocera, R., Rosa, E., Bader, A., and De Tommasi, N. “**Diterpenes with Potential Anti-Inflammatory Properties from *Lavandula pubescens Decne***” Presented at 2nd Intersociety Congress on Plant-Based Products for Health, The Role of Medicinal Plants in Modern Medicine, Naples, April 10–12, 2025, Federico II Conference Center, Via Partenope 36. Oral Presentation (Speaker).
- **Pouramin, S.,** Parisi, V., Nocera, R., Veneziano, M., Severino, L., Scivicco, M., & Cacciola, N. A. “***Lavandula dentata* L.: chemical composition and biological activity**” Presented at the 73 International Congress on Natural Products Research (**GA**), Naples, August 31_September 3, 2025; Poster 352.
- Cacciola, A., D’Angelo, V., Germanò, M.P., Mirabile, S., Raimondo, F.M., **Pouramin Arabi, S.,** Rosa, E., Santoro, V., De Tommasi, N., Chiocchio, I., Mandrone, M., Trincia, S., Sanna, C., Mastinu, A., Abate, G., & Sweeney, E.M. “**Ferruccio Poli Polyphenolic characterization, antioxidant and antidiabetic activities of *Crataegus* spp. fruit extracts**” presented at the 119° Congresso della Società Botanica Italiana X INTERNATIONAL PLANT SCIENCE CONFERENCE (IPSC) TERAMO, 11 - 13 SEPTEMBER 2024; Poster 106.
- Benayache, F., **Pouramin, S.,** Fadel, H., Donadio, G., Nocera, R., Parisi, V., D’Angiolo, M., Braca, A., & De Tommasi, N. “**Antibacterial activity and phytochemical characterisation of aerial parts of *Cedrus atlantica***” Presented at the 73 International Congress on Natural Products Research (**GA**), Naples, August 31_September 3, 2025.
- Rosa, R., Mirabile, S., Valeria D’Angelo, Paola Germanò, M., **Pouramin Arabi, S.,** & Parisi, V., “**Pharmaceutical and cosmetic potential of *crataegus laciniata* (Rosaceae) flowers extract**” Presented at 4th MS-NatMed Day, Salerno, Italy, February, 15-16, 2024; Poster 06.

