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Livro de Resumos do XVI Encontro de Química dos Alimentos - Bio-Sustentabilidade e Bio-Segurança Alimentar, Inovação e Qualidade Alimentar

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LC-MS profiling and biological evaluation of methanolic extracts from local varieties of *Brassica* species

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The *Brassica rapa* spp. *rapa* species develops a broad, white root with thin, light green, slightly pubescent leaves. The species is consumed in Asia, Europe and North America for its nutritional benefits with low caloric value due to its low protein and lipid content, and has been used in the preparation of soups and stews. The flavor of root and leaves is slightly bitter and has been related to the degradation of sulfur-containing compounds called glucosinolates (GLS). The isothiocyanates produce a pungent taste and sulfurous aroma when the plant tissue is bruised, playing a significant role in the organoleptic characteristics¹. In addition to flavor formation, GLS has been reported to be implicated in anti-nutritional and health-promoting effects. GLS content varies depending on species, cultivar, plant part, climatic conditions, agronomic practices, insect attack and microorganism intrusion².

Brassica napus subsp. *napobrassica* (synonymous: *B. napus* subsp. *rapifera*) grown as an annual vegetable, most are upright with alternate, often glaucous leaves and long taproots, which is well known by the names Swede and Turnip, amongst others. It is a root vegetable commonly consumed.

In 2019, a collection of 17 accessions of turnip roots (15 accessions of *B. rapa* subsp. *rapa* and 2 of *B. napus* subsp. *napobrassica*), local varieties, conserved at the Portuguese Germplasm Bank (BPGV) that were collected in north and center regions of Portugal, were grown at same environmental conditions in Braga and assessed for GLS content determination. The objectives were to determine the profile of GLS and to evaluate the biological activity for breeding purposes.

Methanolic extracts of 7 turnip accessions from different geographic origin were analysed by HPLC-HRMS. A typical glucosinolate profile is shown in Figure 1 for *B. rapa* accession BPGV03990. Gluconapin, gluconasturtiin and neoglucobrassin are the more abundant GLSs identified in extracts of the 7 turnip tubers accessions. Minority forms of GLS included gluconapoleiferin, gluco brassicanapin, glucoerucin, gluco brassin and 4-hydroxygluco brassin. The 3 D graph shown in insert (a) illustrated the variation of the peak areas of GLSs as a function of 7 turnip accessions.

The content of total phenolic compounds (TPC), for the methanolic extracts of turnips, ranged between 12.10 and 5.38 mg GAE. g⁻¹, with accession BPGV05875 showing the highest value. The antioxidant power, obtained by the FRAP method, varied between 106.41 and 51.03 μmol. g⁻¹ and showed a strong correlation with the TPC method (R² = 0.86), with sample BPGV06987 presented the highest value.

The antioxidant activity obtained by the DPPH method, expressed as EC₅₀, showed values ranging from 1.08 to 1.66 mg.mL⁻¹, higher than ascorbic acid (EC₅₀=0.04 mg.mL⁻¹), with accession BPGV05875 showing the highest antioxidant activity.

The antibacterial activity was determined in the methanolic extracts of turnips against five Gram-negative bacteria, namely *Enterobacter cloacae* (ATCC 49741), *Escherichia coli* (ATCC 25922), *Pseudomonas aeruginosa* (ATCC 9027), *Salmonella enterica* subsp (ATCC 13076), and *Yersinia enterocolitica* (ATCC 8610) and three Gram-positive bacteria, namely *Bacillus cereus* (ATCC 11778), *Listeria monocytogenes* (ATCC 19111), and *Staphylococcus aureus* (ATCC 25923). The extracts revealed a strong activity against *S. enterica* and *S.aureus* (MIC values: 5 – 2.5 mg.mL⁻¹) and most of them also revealed the capacity to inhibit *E. coli* and *Y.enterocolitica* (MIC values: 10 – 5).

The results indicate that the methanolic extracts of the 17 accessions of turnip roots with a specific GLS content, are good sources of natural antioxidants and antimicrobial compounds that can provide producers with plant sources with nutritional quality and strong potential for breeding programs.

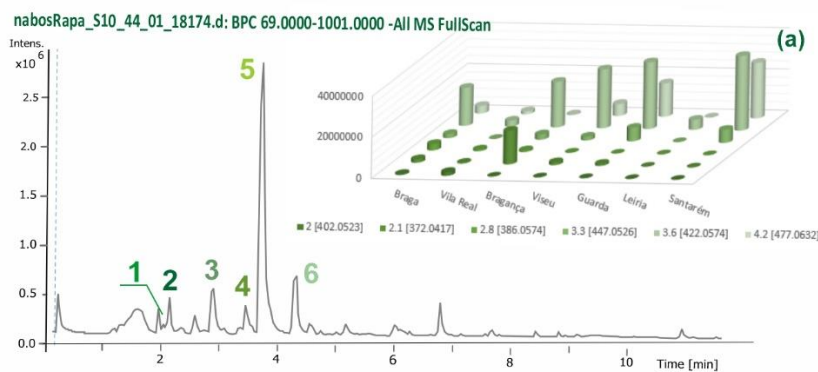


Figure 1: Total ion chromatogram obtained by HRMS in the ESI negative mode of a methanolic extract from turnip material BPGV03990: 1) gluconapoleiferin (t_R 2.0 min; m/z 402.0523); 2) gluconapin (t_R 2.1 min; m/z 307.0475); 3) glucobrassicinapin (t_R 2.8 min; m/z 386.0574); 4) glucobrassicin (t_R 3.3 min; m/z 447.0526); 5) gluconasturtiin (t_R 3.6 min; m/z 422.0574), 6) neoglucobrassicin (t_R 4.2 min; 477.0632). Insert a) 3D graph showing the variation of the peak areas of GLS as a function of 7 turnip accessions.

Key-Words: *Brassica rapa* var. *rapa*; phenolic compounds; antibacterial activity, antioxidant activity.

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