

Procyanidins Characterization, Antioxidant and Antifungal Activities of Lingonberry Leaves and Stems

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CONTEXT



Aerial parts of lingonberry (*Vaccinium vitis-idaea* L.) are used as food and dietary supplements due to their nutritional value and richness in antioxidant polyphenols. In particular, plant phenolic compounds provide antioxidant activity in the protection of dietary lipids from oxidation. The aim of the present study is to characterize the procyanidins of lingonberry leaves and stems and to evaluate their potential of to be used as antimicrobial agents, as well as antioxidants

MATERIALS AND METHODS



Lingonberry leaves and stems

- Harvested in the middle of September 2018 from Borca (Neamt, Romania).
- Natural dried (ND) at room temperature
- Ground to powder for a final particle size < 0.315 mm.

Analysis of procyanidins using thioacidolysis

- Procyanidins were characterized by their subunit composition and their average degree of polymerization (mDP).
- The mDP of procyanidins was measured by calculating the molar ratio of all the flavan-3-ol units (thioether adducts plus terminal units) to (-)-epicatechin and (+)-catechin corresponding to terminal units.

HPLC analysis of procyanidins

- Separations were performed using an - Agilent Technologies 1200 chromatograph with UV-DAD detector.
- 250 mm x 4 mm Licrocart (Licrospher PR-18 5µm) column (Merck, Darmstadt, Germany) operated at 30 °C.
- The mobile phase consisted of water/acetic acid (97.5:2.5, v/v) (eluent A) and acetonitrile (eluent B) at the flow rate of 1 mL/min.

Preparation of phenolic extracts by Accelerated Solvent Extraction

- Solvent: 50% aqueous EtOH
- 2 static cycle, 5 and 10 min
- Temperature: 40 °C
- Flush volume: 50%
- Pressure: 1500 psi



ASE 350 extractor
Thermo Scientific, Dionex

Antioxidant activity by autoxidizing methyl linoleate (MeLo)

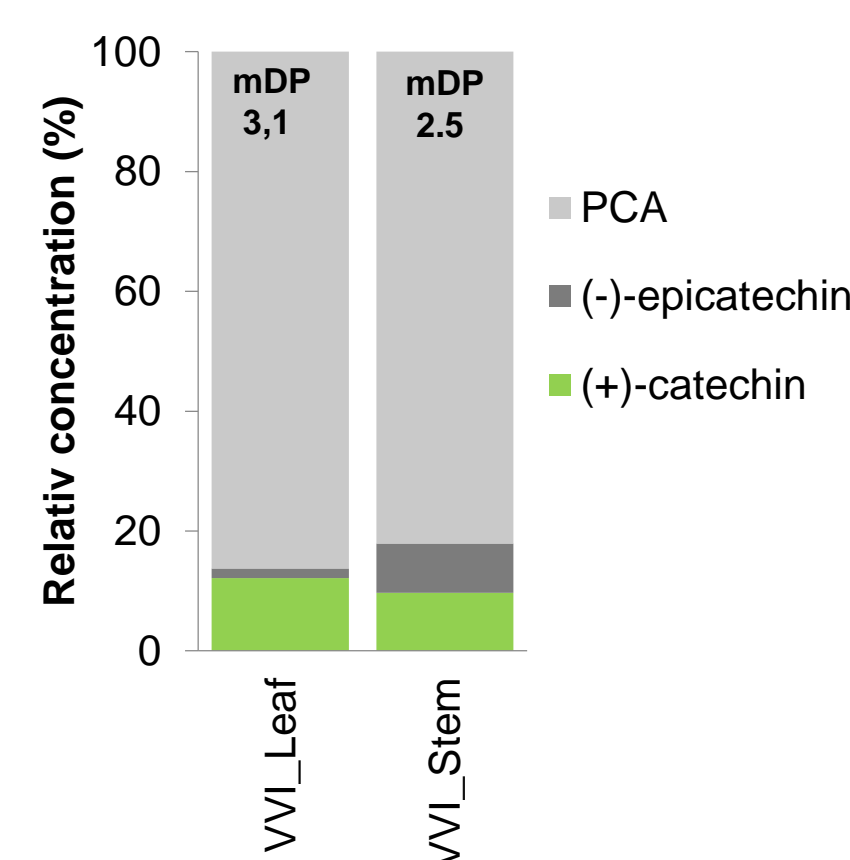
- Polyphenolic extracts were added to MeLo (0.2 g) and oxidation of MeLo was carried out in the dark at 40 °C.
- Aliquots (10 mg) at the starting point and after 72 h of oxidation were dissolved in isooctane.
- Conjugated diene absorption at 234 nm was measured.

Antifungal activity test of lingonberry phenolic extracts

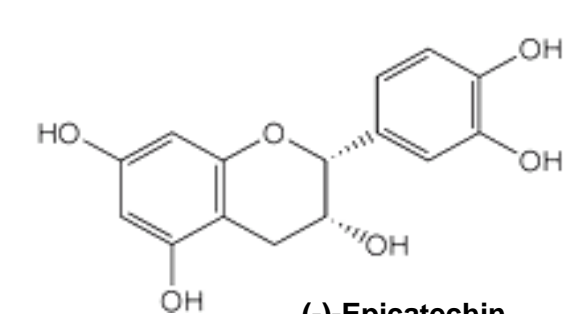
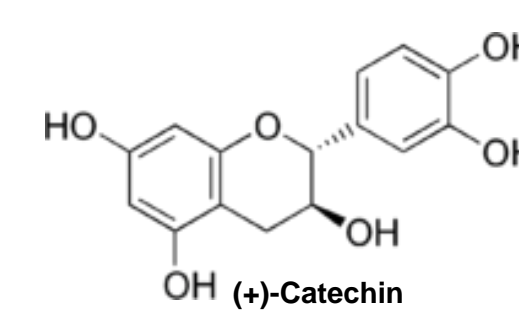
- Fungi: *Aspergillus niger* and *Penicillium expansum*.
- Incubation of fungi: at 25 °C for 7 days, on MEA (Malt Extract Agar) medium.
- Volume of extract tested: 1000 µl of 50% aqueous ethanol extracts from leaves and stems.
- Results were expressed as Radial inhibition percentages.

RESULTS AND DISCUSSIONS

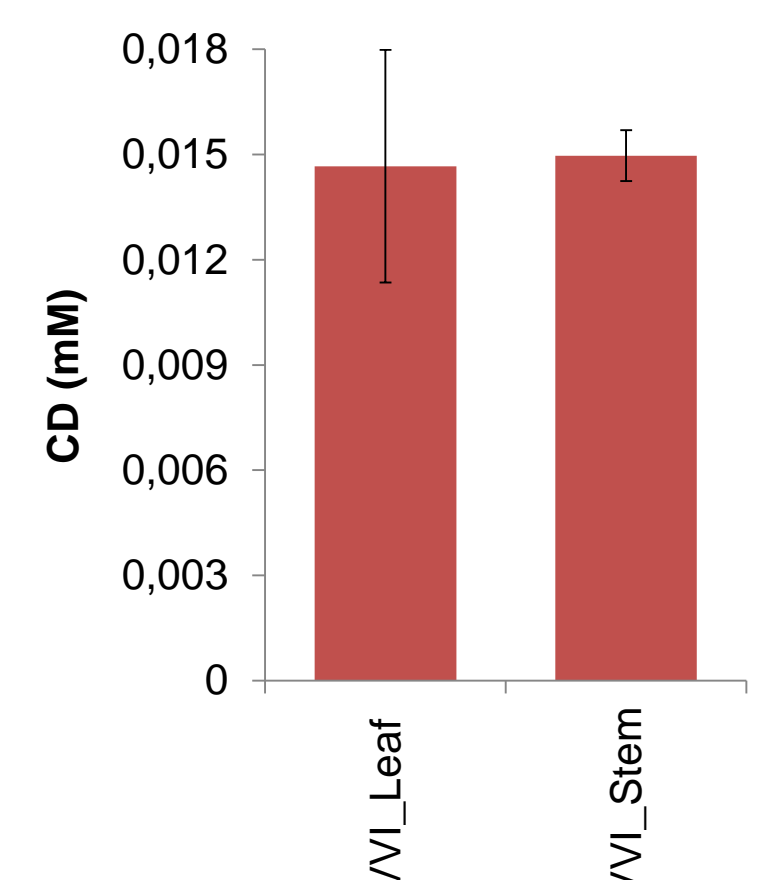
Flavan-3-ol composition and mDP



- ✓ In leaves, the flavanol monomers were detected as (+)-catechin and (-)-epicatechin, the former being highly preponderant.
- ✓ Almost similar amounts of flavanol monomers were quantified in stems.

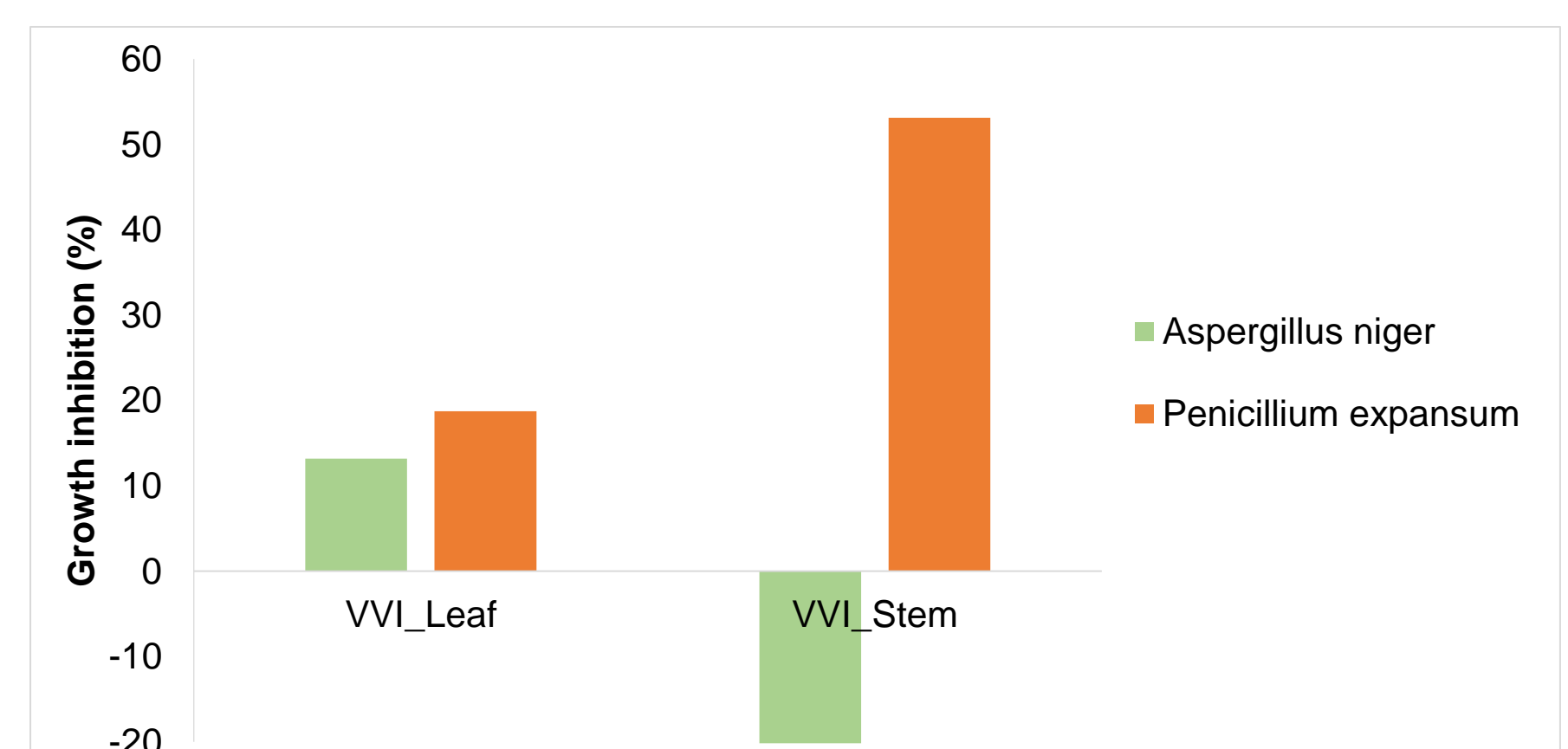


Antioxidant activity



- ✓ The antioxidant activity (methyl linoleate test) was higher in stems than in leaves extracts.

Evaluation of the antifungal activity of lingonberry extracts



- ✓ The lingonberry extracts show a stronger antifungal activity against *Penicillium expansum*, compared to *Aspergillus niger*.

CONCLUSIONS

- Results from this study indicate that leaves and stems of lingonberry are suitable for valorization as sources of natural antioxidants and antimicrobial ingredients in foods or as feedstocks for the production of herbal supplements.
- Phenolic compounds from lingonberry leaves can have important applications as natural antifungal agents.