



# PROCYANIDINS CHARACTERIZATION AND ANTIFUNGAL ACTIVITY OF LINGONBERRY LEAVES AND STEMS

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## CONTEXT



The demand for the identification of edible sources rich in phenolic antioxidants as well as the development of new natural plant additives to be used as functional foods has been a great preoccupation in recent years.

Leaves and stems of lingonberry (*Vaccinium vitis-idaea* L.) are known as natural sources of food and dietary supplements due to their richness in bioactive polyphenols [1, 2, 3, 4].

Fruits and aerial parts of lingonberry are natural sources of:

Dietary supplements

Food

Pharmaceutical products

Beverage

Health benefits of lingonberry

Urinary tract infections protection Neuroprotective effects

Anti-inflammatory activity

Colon cancer protection

## MATERIALS AND METHODS



Lingonberry leaves and stems

- Harvested in August and the middle of September 2017 from Borca (Neamt, Romania).
- Natural dried (ND) at room temperature and freeze dried (FD).
- 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) [1].
- 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.

Antifungal activity of phenolic extracts of lingonberry

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

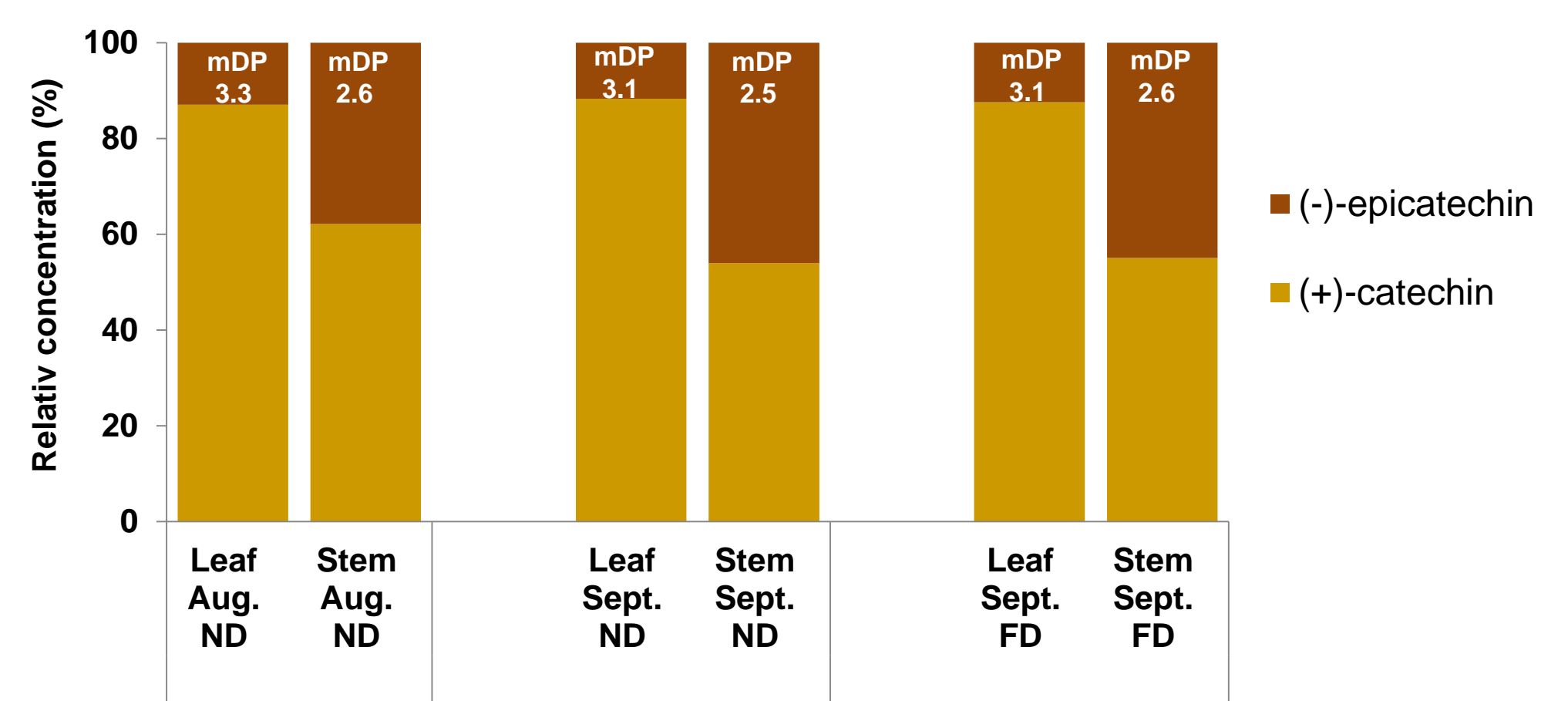


Antifungal activity test

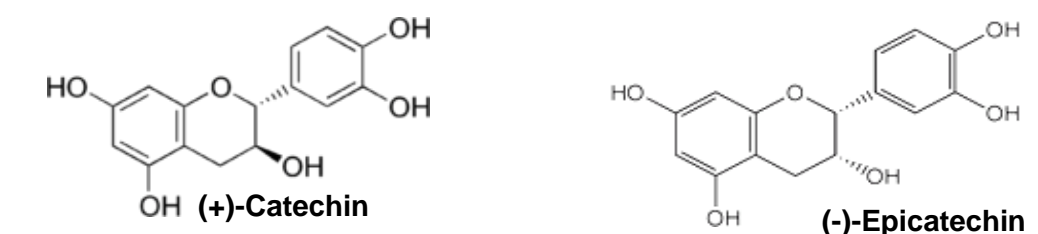
- Fungi: *Aspergillus niger* and *Penicillium expansum*.
- Incubation of fungi: at 25 °C for 7 days, on MEA (Malt Extract Agar) medium.
- Volume of extract tested: 1000 µl of 50% aqueous ethanol extracts from leaves and stems.
- Results were expressed as Radial inhibition percentages.

## RESULTS AND DISCUSSIONS

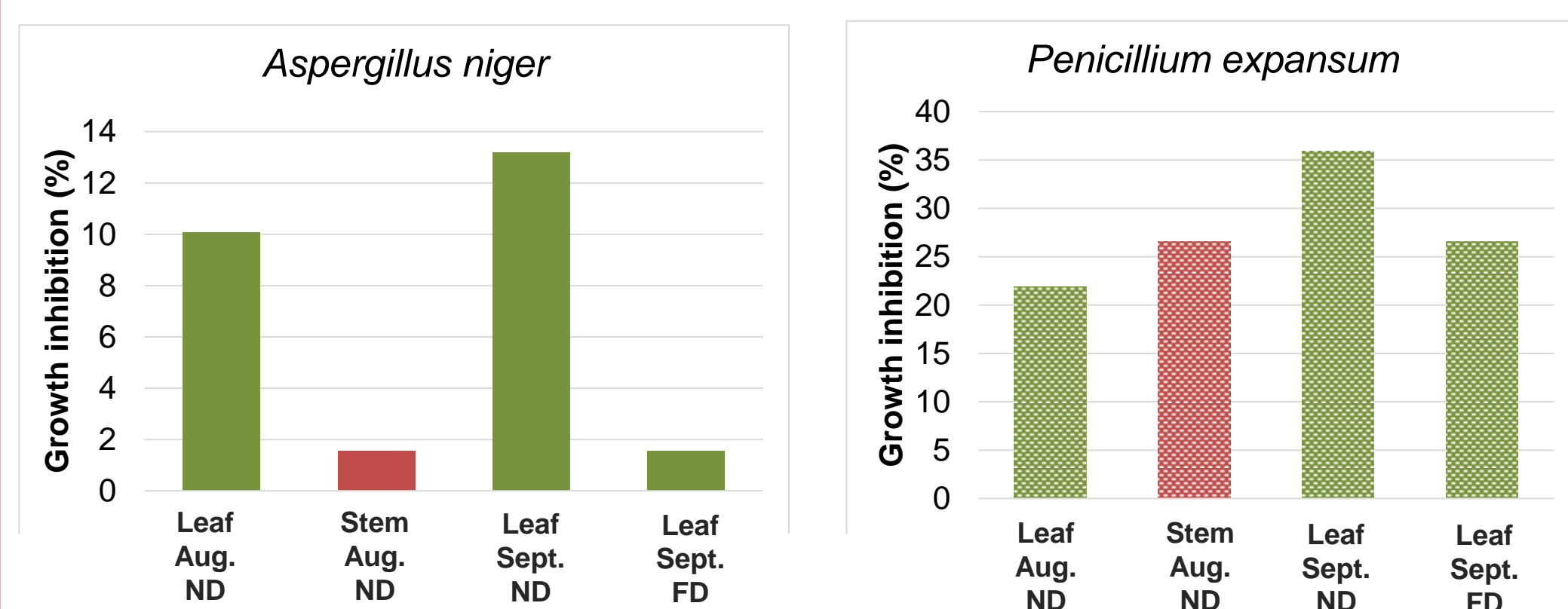
Flavan-3-ol composition and mDP in bilberry leaves, stems and fruits determined by HPLC following thioacidolysis.



- ✓ 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.
- ✓ Procyanidins contain (+)-catechin and (-)-epicatechin as both extension and terminal units.



Evaluation of the antifungal activity of lingonberry extracts



- ✓ The lingonberry extracts show a stronger antifungal activity against *Penicillium expansum*, compared to *Aspergillus niger*.
- ✓ For both fungi, the highest inhibition rate was obtained for extract from leaves harvested in September and natural dried.

## References:

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- Ieri F. et al., Phytochemical Analysis, 24, 467-475.
- Kylli P. et al., Journal of Agricultural and Food Chemistry, 59, 3373-3384.
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## CONCLUSIONS

- Results from this study indicated that all aerial parts of lingonberry are suitable for valorization as sources of natural procyanidins.
- Phenolic compounds from lingonberry leaves can have important applications as natural antifungal agents.

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