Evaluation of Bioactive Phenols in Blueberries from Different Cultivars

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Introduction

- BLUEBERRY is native from the **northern hemisphere**, belonging to the genus *Vaccinium* and family Ericaceae.
- The blueberry is known as the "**longevity fruit**" due to its health properties, mostly associated to the phenolic composition.
- **Fruit quality** in blueberries has become associated with its levels of phenolics and flavonoids as well as the overall antioxidant capacity.
- Blueberries have among the **highest antioxidant capacity** of all the fruits and vegetables, although this varies greatly among cultivars.
- The **phytochemical content** of blueberries is highly variable depending on multiple factors.

- Phenolic compounds, such as **flavonoids and anthocyanins**, are the major **pigments** in blueberries and are partly responsible for their high antioxidant activity.
- Other antioxidants are present in blueberries, like **carotenoids** and **ascorbic acid** in small amounts, along with elevated levels of **tocopherols**.
- Blueberry has recently been recognized as a **functional food** because of emerging evidence of its health-promoting properties:
  - Protecting against degenerative diseases and those of the nervous system;
  - Preventing chronic disorders, such as coronary heart diseases or stroke;
  - Preventing certain types of cancer.

The content of phenolics in berries is affected by many factors including:

- ✓Genetic differences,
- ✓Pre-harvest environmental conditions,
- ✓The degree of maturity at harvest,
- ✓Differences in growing locations,
- ✓Storage conditions.

Objectives

The aim of this work was to characterize blueberries from three cultivars

Duke  Bluecrop  Ozarkblue 

harvested in two different farms, located in the North of Portugal,

in terms of phenolic composition:

- total phenols,
- anthocyanins
- tannins
- antioxidant activity (ABTS and DPPH).

Experimental - extraction

Blueberries

+

methanol: acetic acid (98:2)

(ultrasonic bath,1 h)

Filtration

2 x

Methanol Extracts

MeE1 / MeE2

MeOH insoluble residue

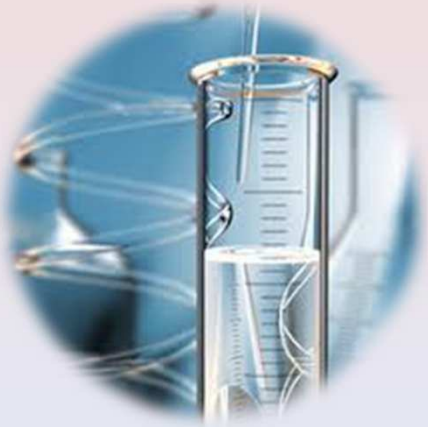
+

acetone (60% v/v)

(ultrasonic bath,1 h)

Filtration

2 x



Acetone Extracts

AcE1 / AcE2

Experimental – chemical analyses

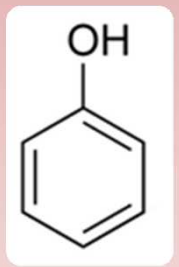
- **Quantification of total phenols**

  Folin–Ciocalteu method

  Calibration curve with standard solutions of gallic acid

  Absorbance measured at 750 nm in a UV/Vis spectrophotometer

  Results expressed as mg gallic acid equivalents per gram of sample

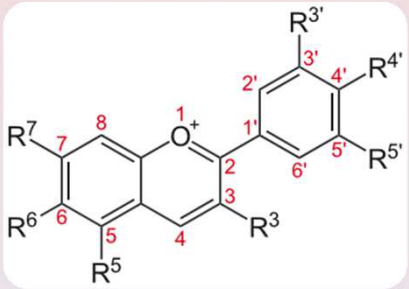


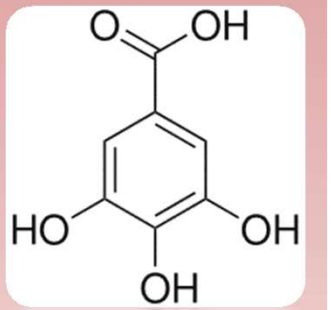
- **Quantification of anthocyanins**

  SO2 bleaching method

  Absorbance measured at 520 nm in a UV/Vis spectrophotometer

  Results expressed as mg malvidin 3 glucoside equivalents per gram of sample





- **Quantification of tannins**

  Ribereau-Gayon and Stonestreet method

  Absorbance measured at 550 nm in a UV/Vis spectrophotometer

  Results expressed as mg per gram of sample

- **Determination of Antioxidant activity**

  DPPH method

  - Absorbance measured at 515 nm in a UV/Vis spectrophotometer

  ABTS method

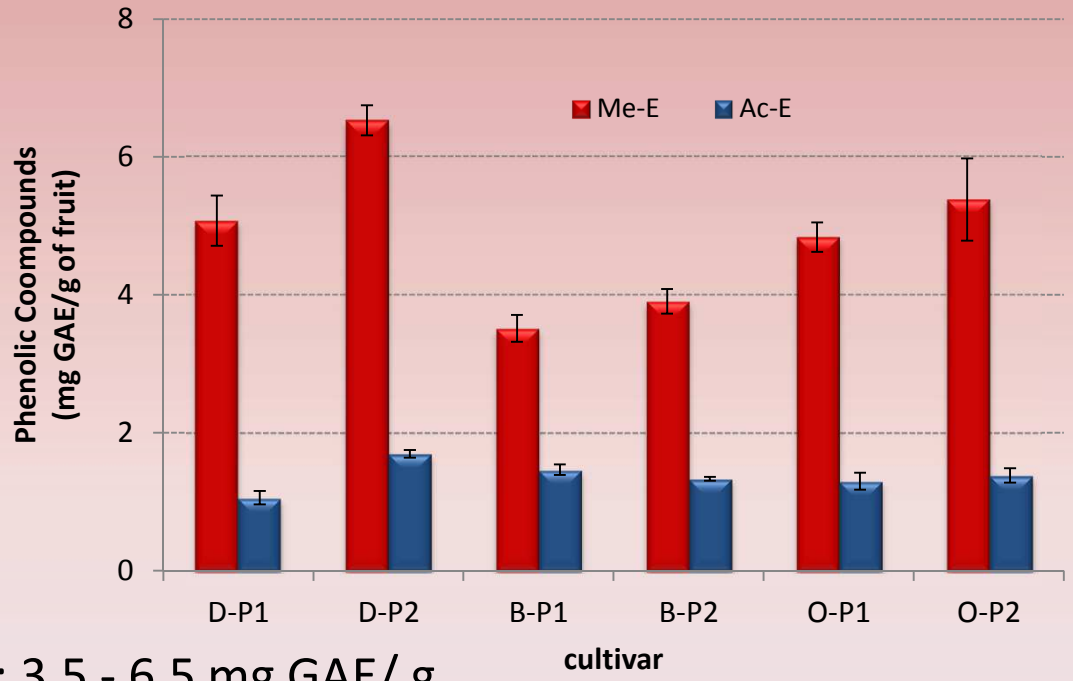
  - Absorbance measured at 515 nm in a UV/Vis spectrophotometer

  Calibration curve with standard antioxidant Trolox

  Results expressed as µmol of trolox equivalents per gram of sample

Results

- **Total phenols**



TP in methanol extracts: 3.5 - 6.5 mg GAE/ g

TP in acetone extracts: 1.1 -1.75 mg GAE/ g

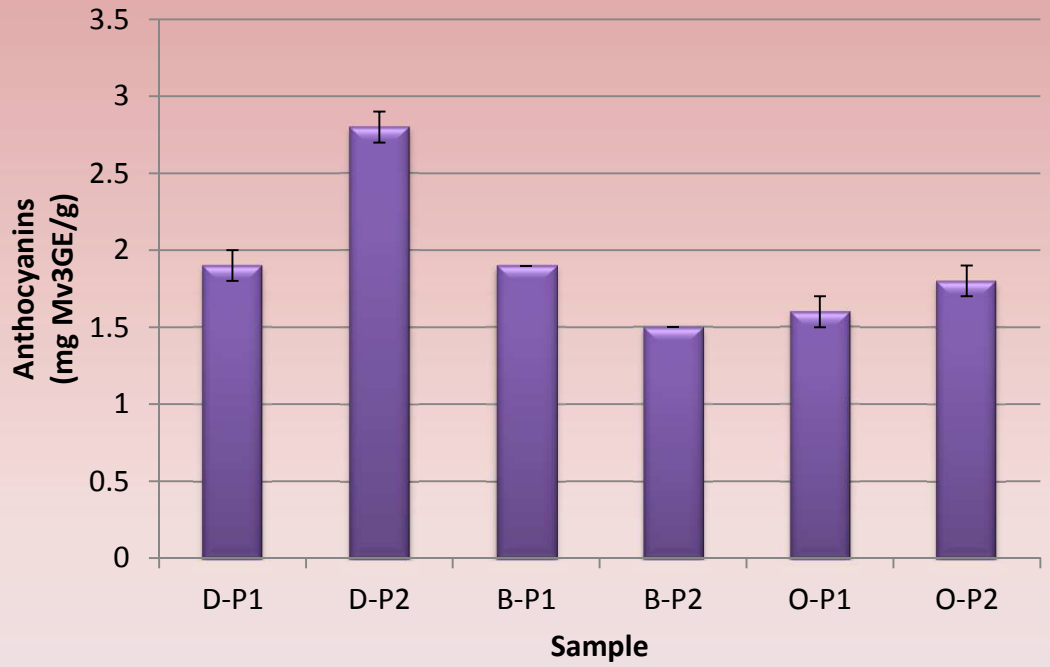
Phenols were preferentially recovered in methanol extracts (75-83%)

Overall TP in cv. Duke (D): 6.1 - 8.2 mg GAE/g

in cv. Bluecrop (B): 4.9 - 5.2 mg GAE/g

in cv. Ozarkblue (O): 6.1 - 6.8 mg GAE/g

❑ Total anthocyanins

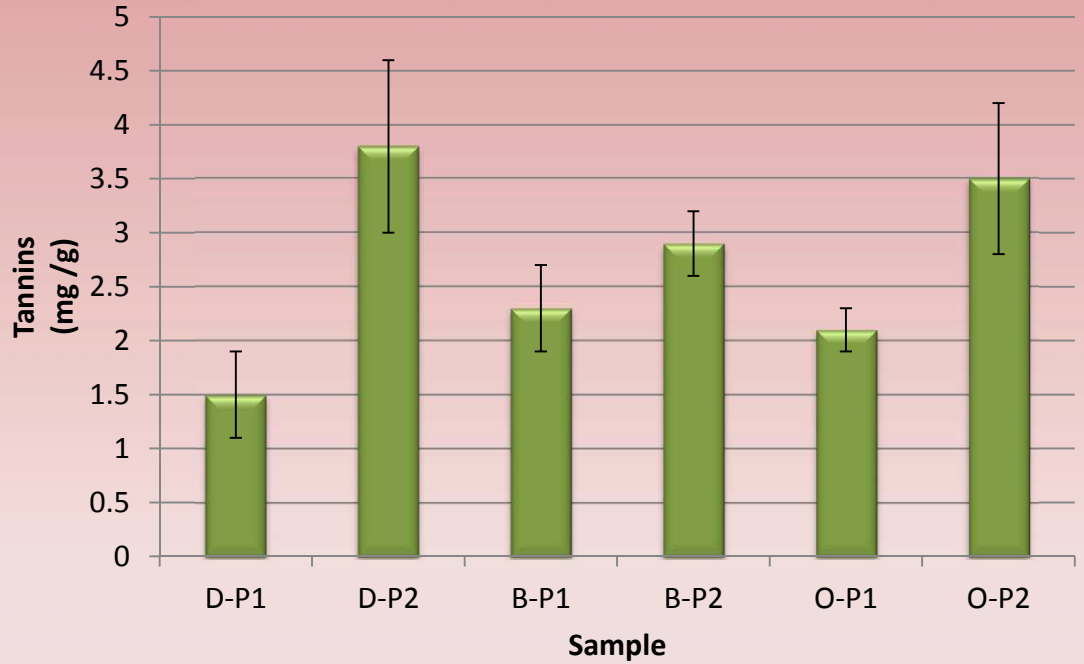


Anthocyanins: 1.5 - 2.8 mg EMv3G/g

The higher content in cv. Duke

Different contents for different producers

❑ Total tannins



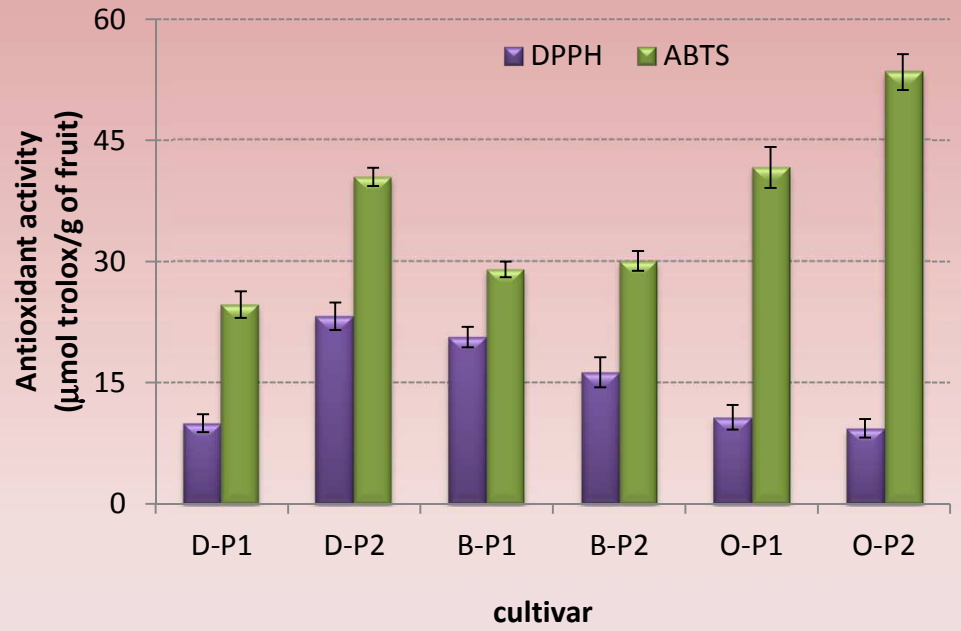
Tannins in cv. Duke (D): 1.5 - 3.8 mg /g

in cv. Bluecrop (B): 2,3 – 2,9 mg/g

in cv. Ozarkblue (O): 2,1 – 3,5 mg/g

Blueberries from Producer 2 with higher tannins contents for all cultivars

❑ Antioxidant activity



DPPH AA: 9.3 – 23.2 µmol TE/g

ABTS AA: 24.7 – 53.4 µmol TE/g

Higher discrepancy between methods for cv. Ozarkblue

Differences between producers more important for cv. Duke

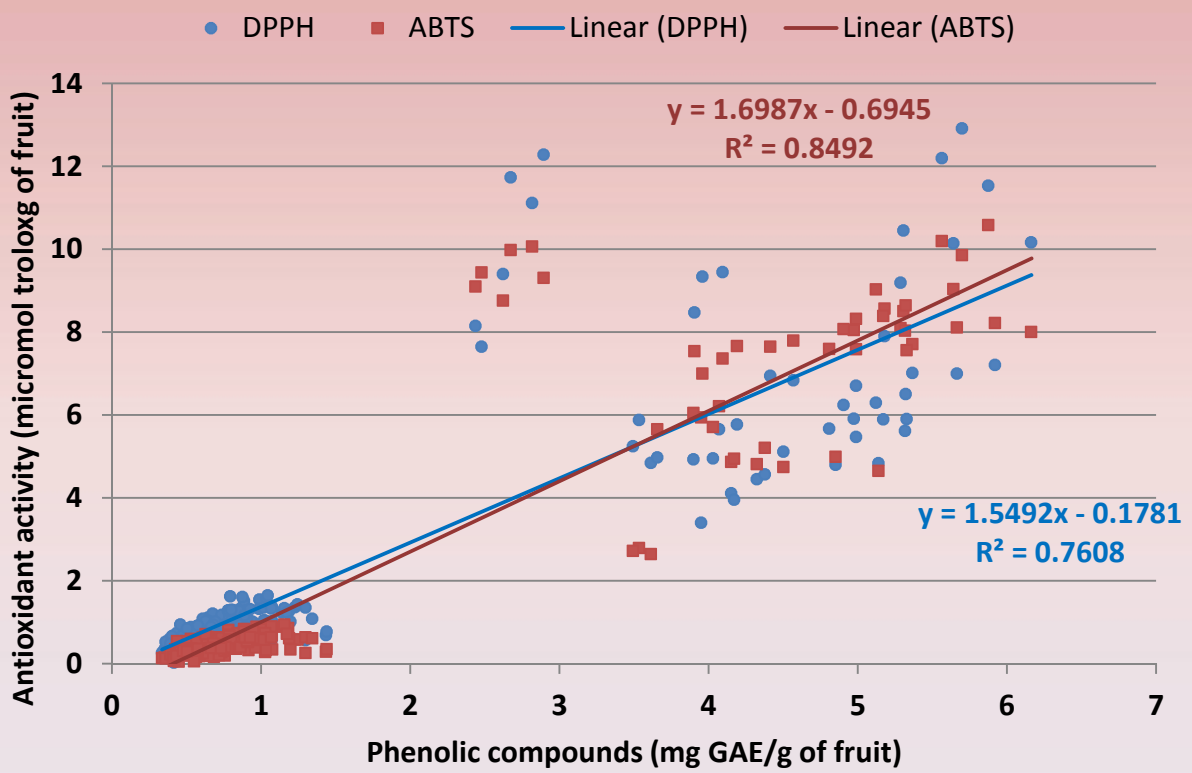
❑ Correlation between TP and AA by DPPH and ABTS methods

TPxABTS

R = 0.8492

TPxDPPH

R = 0.7608



About 80% of the antioxidant activity quantified in blueberries is owing to the presence of phenolic compounds

Conclusions

- ✓ The amount of total phenols quantified varied from 4.9 to 8.2 mg GAE/g, being mainly extracted by methanol as compared to acetone. Duke cv. showed higher phenolics contents.
- ✓ Total anthocyanins ranged from 1.5 to 2.8 Mv3GE/g, being higher for cv. Duke.
- ✓ Tannins ranged from 1.5 to 3.8 mg/g Mv3GE/g , being lower for cv. Bluecrop.
- ✓ The phenolic compounds present in blueberries depended mainly on cultivar, but also on the conditions of production.

Conclusions

- ✓ The antioxidant activity varied according to the method applied.
- ✓ The antioxidant activity measured by DPPH varied from 9.3 to 23.2 μmol TE/g.
- ✓ The antioxidant activity measured by ABTS varied from 24.7 to 53.4 μmol TE/g.
- ✓ In all samples, the AA measured by ABTS was higher than by DPPH.
- ✓ About 80% of the antioxidant activity in blueberries quantified by both methods was owing to the presence of phenolic compounds.

Acknowledgment

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Centro de estudos
em Educação, Tecnologias e Saúde


Thank You
شكراً
Gracias