

eBASIS user's guide on antioxidant properties

This user guide specifically covers new data added to eBASIS in 2018 concerning antioxidant properties.

Background

Over the last decade, extractable and non-extractable compounds have become key in the evaluation/determination of antioxidant properties of food matrices¹. This has led to the inclusion into eBASIS of quality evaluated data on the content and on the contribution to antioxidant properties of extractable and non-extractable compounds. This guide will help you use the database to search for, and produce reports, on new compositional and activity data on extractable and non-extractable antioxidants alongside standard searches for compositional data of individual bioactive compounds.

What new data does eBASIS contain?

We have included data on the following:

- Extractable polyphenols (EPP)
- Non-extractable polyphenols (NEPP)
- Extractable proanthocyanidins (EPA)
- Hydrolysable polyphenols (HPP)
- Non-extractable proanthocyanidins (NEPA)

What are these compounds?

Easily extractable polyphenols (free forms) (**EPP**), are solubilized by aqueous-organic solvents, whereas less extractable polyphenols are bound forms, remaining in the residue of aqueous-organic extract². Extractable polyphenols, that are readily solubilized by aqueous-organic solvents, comprise low molecular weight compounds from several classes and subclasses of polyphenols, including proanthocyanidins (dimers and trimers) and hydrolysable tannins of low molecular weight.

In contrast, non-extractable polyphenols (**NEPP**) remain in the residues of the previous extractions and can only be released by hydrolysis treatments, either chemical or enzymatic. The extraction and analysis procedures are developed and performed in relation to the food item within each food group, the type of bonds with the food matrix as well as the nature and structure of the target compounds³.

NEPP consist of²:

- a) polymeric polyphenols (non-extractable proanthocyanidins; **NEPA**) –these are high-molecular-weight proanthocyanidins that are free in the food matrix and proanthocyanidins that are complexed with protein or cell wall polysaccharides.
- b) small phenolic compounds linked to carbohydrates, mainly polysaccharide constituents of dietary fibre, and to proteins (hydrolysable polyphenols; **HPP**) –these include several classes of bioactive components e.g., hydrolysable tannins or hydroxycinnamic acids, linked to carbohydrates and proteins via covalent bonds, hydrogen bonds and/or hydrophobic interactions.

Finding the data in eBASIS

You can prepare a report on this new composition and/or activity data by selecting one or all of the following compound classes and subclasses using the standard eBASIS search procedures:

- Extractable polyphenols (EPP)
- Non-extractable polyphenols (NEPP)
- Extractable proanthocyanidins (EPA)
- Hydrolysable polyphenols (HPP)
- Non-extractable proanthocyanidins (NEPA)

When creating your composition report it is advisable to include “**analytical method name**” and “**units**” in your output fields. This allows you to compare and aggregate data in the excel download. Examples of searchable analytical methods and units included for composition and activity information are:

- The content of EPP/NEPP/EPA/NEPA/HPP- Antioxidant content : HPLC, etc. The data is provided as documented in the original publication e.g. milligrams of EPP/NEPP/EPA/NEPA/HPP per kilogram of food in fresh or dry weight.
- The contribution of EPP/NEPP/EPA/NEPA/HPP to properties- Antioxidant activity was evaluated by ABTS assay, DPPH assay, FRAP assay, ORAC assay and Folin-Ciocalteu assay. The ABTS assay data is reported as mM trolox per kilogram of food, the FRAP assay data is expressed as mM Fe₂SO₄ per kilogram of food, the ORAC assay data is expressed as mM trolox per kilogram of food, etc.. At the moment the main antioxidant properties assays are inserted in the system, but data from other ones are welcome.

Example searches

In order to help you select the best search criteria and reporting fields, here are two examples concerning the activity data:

1. Search and report for *Contribution of extractable polyphenols (EPP) to antioxidant properties in strawberry:*

Search criteria:

food plant: strawberry;
compound class: Extractable polyphenols (EPP);
unit: mmol/Kg FW;

Report fields:

food plant: strawberry, as specified by search criteria;
compound class: Extractable polyphenols (EPP), as specified by search criteria;
compound: report will indicate this field as Not applicable (EPP);
analytical method name: report will include FRAP assay;
analytical method: report will provide description of extraction procedure, details on assay used e.g. “the contribution of EPP to antioxidant properties was evaluated by FRAP assay”, and a description of assay methodology;
average level: report will detail unique level for each row of data;
unit: mmol/Kg FW, as specified by search criteria;
purpose of the method: report will detail purpose of the method, e.g. Evaluation of the contribution of EPP to antioxidant properties in strawberry;
extraction and preparation: one of selected items related to the specific procedure;
activity: report will detail further information, e.g. Antioxidant properties of EPP were here reported and expressed as FRAP value.

2. Search and report for *Contribution of Non-extractable polyphenols (NEPP) to antioxidant properties in strawberry:*

Search criteria:

food plant: strawberry;
compound class: Non-extractable polyphenols (NEPP);
unit: mmol/Kg FW;

Report fields:

food plant: strawberry, as specified by search criteria;

compound class: Non-extractable polyphenols (NEPP), as specified by search criteria;
compound: report will indicate this field as Not applicable (NEPP); **analytical method name:** report will include FRAP assay;
analytical method: report will provide description of extraction procedure, details on assay used e.g. “the contribution of NEPP to antioxidant properties was evaluated by FRAP assay”, and a description of assay methodology;
average level; report will detail unique level for each row of data;
unit: mmol/Kg FW , as specified by search criteria;
purpose of the method: report will detail purpose of the method, e.g. Evaluation of contribution of NEPP to antioxidant properties in strawberry;
extraction and preparation: one of selected items related to the specific procedure;
activity: report will detail further information, e.g. Antioxidant properties of NEPP were here reported and expressed as FRAP value .

Additional useful information:

Composition and activity data are referred to and searchable via **compound class**; extractable polyphenols (EPP), Non-extractable polyphenols (NEPP), Extractable Proanthocyanidins (EPA), non-extractable proanthocyanidins (NEPA), hydrolysable polyphenols (HPP).

The **compound** field is not applicable at the present. In future the field **compound class** will be linked to field **compound** to allow for new classes and subclasses of extractable and non extractable antioxidants, since new studies are being published on single extractable and non-extractable compounds

analytical methods is important for comparison of data: i.e. FRAP assay, DPPH assay, ORAC assay, ABTS assay, Folin-Ciocalteu assay

How much data does eBASIS contain?

eBASIS contains 1300 references and 42K datapoints on the composition of individual bioactive compounds in food plant. In September 2018 eBASIS now includes quality evaluated data for the 5 new classes and subclasses from 28 additional references, creating 470 data points on 60 plants

References

- ¹Durazzo, A.; Lucarini, M. (in press). A Current Shot and Re-thinking of antioxidant research strategy. *Brazilian Journal of Analytical Chemistry*.
- ²Durazzo, A. Extractable and Non-extractable polyphenols: an overview. In: Saura-Calixto, F.; Pérez-Jiménez, J. (Eds). Non-extractable Polyphenols and Carotenoids: Importance in Human Nutrition and Health. *Food Chemistry, Function and Analysis* No. 5, Royal Society of Chemistry, London, UK, 2018 , pp. 37.
- ³Durazzo, A. (2017). Study Approach of Antioxidant Properties in Foods: Update and Considerations. *Foods*, 6, 17.

Contact us:

Please contact jenny.plumb@quadram.ac.uk or alessandra.durazzo@crea.gov.it if you have any queries or comments on how we can improve this data for you.