Determination of foods’ total antioxidant capacity using the QUENCHER approach

Identification

**Key words**
- antioxidant capacity, direct measurement, food, Quencher approach, analytical tool

**Latest version**
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**Completed by**
- TTZ

How does it work?

**Primary objective**
- analytical tool to measure the antioxidant capacity of foods with insoluble components

**Working principle**
- Methods to measure antioxidant capacity are limited to soluble products. Therefore, foods with insoluble components need to be treated prior to measurement with chemical or enzymatic methods influencing their physical and chemical characteristics. Furthermore the extraction of antioxidants may be incomplete. Thus, the antioxidant capacity is most likely underestimated and not reliable.

The QUENCHER (QUick, Easy, New, CHEap and Reproducible) procedure works without previous extraction and hydrolysis. The solid sample is directly brought in contact with a reagent solution containing radicals. The radicals are quenched by antioxidants due to the contact at the solid-liquid interface and thereby a decolourization occurs. After centrifugation the supernatant can be spectrometrically measured. The antioxidant capacity is reversely proportional to the fluorescent signal.

File:QUENCHER procedure.pdf

**Images**

**Additional effects**
- Solid foods do not require any extraction and hydrolysis prior to antioxidant capacity measurement. more rapid than conventional methods

**Important process parameters**
- • surface area of the reacting solid: particles in the range of 140–60 mesh (0.1–0.3 mm) enable an acceptable reaction rate
- • choice of solvent: 50 % water, 50 % ethanol
- • contact time with the radical solution: ca 30 min

**Important product parameters**
- • water content: high-moisture foods should be lyophilized
- • foods with very high antioxidant capacity should be diluted with inert powdered cellulose to keep the linearity range of the method
What can it be used for?

**Products**
especially relevant for foods with insoluble parts with high antioxidant capacity (dietary-fiber-rich ingredients), which cannot be reliably measured for total antioxidant capacity with commercial methods but the analysis of liquid products is also possible after lyophilization

**Operations**
analysis of antioxidant capacity of food, during the whole processing chain

**Solutions for shortcomings**
time-saving and reliable analysis of total antioxidant capacity of soluble and insoluble food components

What can it NOT be used for?

**Products**
liquid or high moisture food products need to be lyophilized first to remove water
foods with very high antioxidant capacity should be diluted

**Operations**

**Other limitations**
freeze drying of high moisture food products might be time-consuming as well as energy-consuming
in some food matrices, the physical localization of antioxidants may impair the reaction

**Risks or hazards**
no risks

Implementation

**Maturity**
Any chemical mechanism described to measure the antioxidant capacity of foods can be adapted to direct QUENCHER procedure. The technique was successfully adapted to validated and commercially available assay kits (e.g. FRAP, ORAC).

**Modularity /Implementation**
The QUENCHER method is exemplified according to the popular and easy to use FRAP and ORAC assays using ABTS and DPPH but can also easily be adapted to other assays.

**Equipment**
Equipment according to the requirements described for FRAP, ORAC, ... assays

**Consumer aspects**
Antioxidants play an important role in the body's defense system. Antioxidant-rich diets are associated with a lower incidence of cardiovascular disease, cancers, and age-related degenerative processes. The direct measurement of total antioxidant capacity represents a useful tool to predict the health potential of antioxidant-rich products.

**Legal aspects**
Official reference methods are based upon the analysis of antioxidant compounds: e.g. fatty acids according to the analysis by gas chromatography of methyl esters of fatty acid. (ISO 5508:1990)

**Environmental aspects**
energy-consuming lyophilization process
Facilities that might be interesting for you

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<th>Title</th>
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Further Information

Institutes
Hacettepe University, UNINA - DSA

Companies
Tebu-bio

References