



# Oxygen Radical Absorbance Capacity (ORAC) Assay

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**Tradename:** PhytoCycle® Orange

**Code:** 16925

**CAS #:** 7732-18-5 & 84012-28-2 (or) 8028-48-6 & 1686112-36-6 (or) 68333-16-4

**Test Request Form #:** 6947

**Lot #:** N200818K

**Sponsor:** Active Concepts, LLC; 107 Technology Drive Lincolnton, NC 28092

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**Principle Investigator:** Michael Hovis

**Test Performed:**

Oxygen Radical Absorbance Capacity (ORAC)

## Introduction

Reactive oxygen species (ROS) are generated by normal cellular processes, environmental stresses, and UV irradiation. ROS are dangerous to cellular structures and functional molecules (i.e DNA, proteins, lipids) as they act as strong oxidizing agents or free radicals. The oxygen radical absorbance capacity (ORAC) assay is a standard method used to assess antioxidant capacity of physiological fluids, foods, beverages, and natural products. The assay quantitatively measures a sample's ability to quench free radicals that have the potential to react with and damage cellular components.

Oxygen Radical Absorbance Capacity (ORAC) assay was conducted to assess the antioxidant capacity of **PhytoCycle® Orange**.

## Assay Principle

This assay is based upon the effect of peroxy radicals generated from the thermal decomposition of 2, 2'-azobis-2-methyl-propanimidamide dihydrochloride (AAPH) on the signal intensity from the fluorescent probe, fluorescein, in the presence of an oxygen radical absorbing substance. The degree of change is indicative of the amount of radical damage and the presence of antioxidants results in an inhibition in the free radical damage to the fluorescein. The antioxidant protection of the sample can be calculated by comparing it to a set of known standards. Trolox®, a water soluble vitamin E analog, with known antioxidant capabilities is used in this ORAC assay as the standard for measuring the antioxidant capacity of unknown substances. ORAC values, expressed in  $\mu\text{M}$  of Trolox® equivalents (TE), are calculated using the area under the curves (AUC) of the test product, Trolox®, and the control materials. Trolox® equivalency is used as the benchmark for antioxidant capacity of mixtures since it is difficult to measure individual components.

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## Materials

- A. Equipment:** Synergy H1 Microplate reader (BioTek Instruments, Winooski, VT); Gen5 software (BioTek Instruments, Winooski, VT); Pipettes
- B. Buffers:** 75mM Potassium Phosphate (pH 7.4); Deionized H<sub>2</sub>O
- C. Reagents:** 2,2'-Azobis(2-methylpropionamide) dihydrochloride (AAPH) (153mM); 6-Hydroxy-2,5,7,8-tetramethylchromane-2-carboxylic acid (Trolox<sup>®</sup>); Fluorescein Sodium Salt (4nM)
- D. Preparation:** Pre-heat (37°C) Synergy H1 Microplate reader; Prepare Trolox<sup>®</sup> standards, sample dilutions, fluorescein solution, and AAPH.
- E. Microtitre Plates:** Corning 96 Well Black Side/Clear Bottom Microplates

## Methods

Solutions of **PhytoCycle<sup>®</sup> Orange** and Trolox<sup>®</sup> (positive control) were prepared in 75mM potassium phosphate buffer. Materials were prepared at three different concentrations/dilutions. Trolox<sup>®</sup> was used as a reference for antioxidant capacity and prepared at a concentrations ranging from 12.5 µM to 100 µM in 75mM potassium phosphate buffer.

For the ORAC assay, 25µL of test material and Trolox<sup>®</sup> were combined with 150 µL of fluorescein in 75mM potassium phosphate buffer and incubated in the Synergy HT Microplate reader at 37°C for 30 minutes. At the end of the incubation period, 25µL of AAPH (153mM in 75mM potassium phosphate buffer) were pipetted into each well. Fluorescent measurements were then taken every 2 minutes for approximately 2 hours at an excitation wavelength of 485nm and an emissions wavelength of 520nm.

The AUC and Net AUC values of the standards and samples were determined using Gen5 2.0 Data Reduction Software (BioTek Instruments) using the below equations:

$$AUC = 0.5 + \frac{R2}{R1} + \frac{R3}{R1} + \frac{R4}{R1} + \dots + \frac{Rn}{R1} \rightarrow \text{Where } R \text{ is fluorescence reading}$$

$$\text{Net AUC} = AUC_{\text{sample}} - AUC_{\text{blank}}$$

The standard curve was obtained by plotting the Net AUC of different Trolox<sup>®</sup> concentrations against their concentration. ORAC values of samples were then calculated automatically using the Gen5 software to interpolate the sample's Net AUC values against the Trolox<sup>®</sup> standard curve. ORAC measurements for the test material were expressed in micro molar Trolox<sup>®</sup> equivalents (µMTE), where 1 ORAC unit is equal to 1 µMTE.

ORAC values are also calculated in Units/milliliter (U/mL). The equation used for the calculation is shown below:

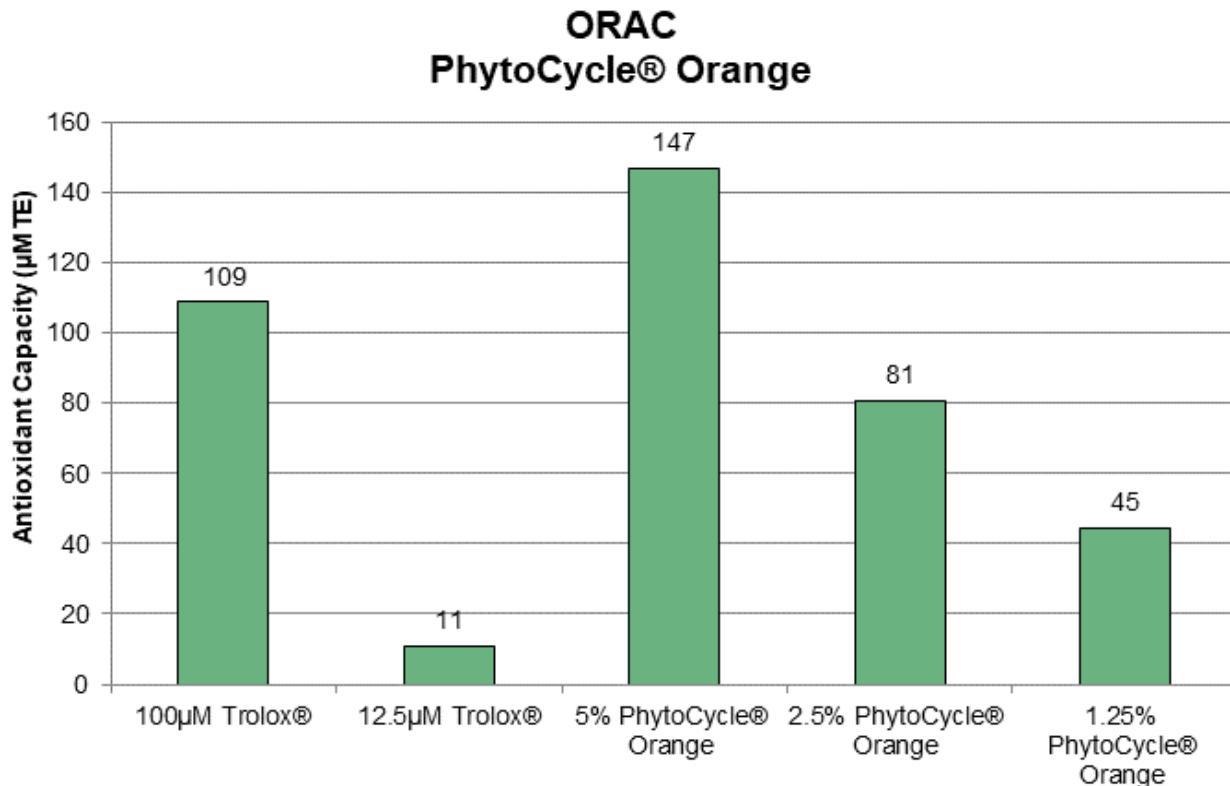
$$ORAC (U/mL) = (50 \times \text{Dilution Factor}) \times \left( \frac{AUC_{\text{Sample}} - AUC_{\text{Blank}}}{AUC_{\text{Trolox}} - AUC_{\text{Blank}}} \right)$$

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## Results

**PhytoCycle® Orange** showed very potent antioxidant activity at a 5.0% concentration.

The ORAC value expressed in U/mL for 5.0% **PhytoCycle® Orange** is 147.



**Figure 1:** Antioxidant capacities

## Discussion

As shown in figure 1, **PhytoCycle® Orange (16925)** exhibited greater antioxidant activity than 100µM Trolox®. The antioxidant capacity of **PhytoCycle® Orange** increased as the concentration increased. As a result, we can assure that its ability to minimize oxidative stress is dose dependent. Maximizing the antioxidant capacity on a cellular level allows for ROS to be dealt with at a rate that provides protection from cellular damage. This cellular damage can be seen as physical signs of aging such as wrinkles, loss of elasticity, unwanted pigmentation, and skin unevenness with slow regeneration.

It can therefore be concluded that **PhytoCycle® Orange** is capable of providing antioxidant properties and aids in the anti-aging process through protection at the cellular level.