

Measuring Antioxidant Properties

There are several thousand types of antioxidants themselves and each of these has different molecular weights and different numbers of free radicals that they can render harmless for each antioxidant molecule. So a simple comparison such as "A contains XX mg of isoflavone and B contains XX mg of rutin" is not an effective comparison.

For this reason a method was developed for measuring antioxidants by what volume of free radicals they can deoxidize (render harmless) per unit volume of the antioxidant (mass or volume) and many other measurement methods have been reported as well. Each measurement method has its advantages and disadvantages and this is one of the main reasons for a delay in global standardization.

But in reality there are several typical measurement methods and examples of these are listed below. Each of these indicates the antioxidant capacity as the Trolox equivalent mole number (μ mol TE) per unit volume (mass or volume) but it is important to remember that the values are meaningless unless the antioxidants are compared using results from the same measurement method.

ORAC (Oxygen Radical Absorbance Capacity) Method

This method can measure water-soluble and fat-soluble samples but the reaction mechanisms of β keratin and unsaturated fatty acids are different so these cannot be measured. The United States Department of Agriculture (USDA) uses this indicator as the standard indicator of antioxidant capacities of food.

TEAC (Trolox-Equivalent Antioxidant Capacity) Method

This method can measure both water-soluble and fat-soluble samples and is a suitable method for measuring overall antioxidant capacity but caution is required because it uses a reagent that does not exist in human bodies as its radical generation source.

FRAP (Ferric Reducing Ability of Plasma) Method

This method is suitable for analyzing serum and plant antioxidant capabilities but is not suitable for measuring compounds with thiol groups (-SH) (glutathione, protein).

DPPH (1,1-diphenyl-2-picrylhydrazyl) Method

Measurement is simple but some antioxidants do not react to DPPH. Furthermore, caution is required because DPPH is a radical that does not exist in the human body.