EPR

Honey for Well-Be(e)ing

Innovation with Integrity

Honey is a complex product; it has low water activity and acidity, high sugar content, as well as a mixture of amino acids, minerals, and antioxidants. In addition to its use as a natural sweetener in foods and drinks, honey is used in many other non-food products such as cosmetics (shampoo, beauty products, lip balm), candles, and medicine:

It is well established that honey containing glucose oxidase enzyme catalyzes hydrogen peroxide (H_2O_2) formation. The production of H_2O_2 could lead to the formation of short-lived free radicals such as hydroxyl ($^{\bullet}OH$) and superoxide ($O_2^{\bullet-}$). While these reactive oxygen species (ROS) may play a part in antimicrobial activity (they are also produced by human immune cells), they are potentially damaging to tissues.

In addition to antibacterial activity, honey is known to have antioxidant capacity, which helps modulate production of free radicals. Honey is a mixture containing a number of ingredients involved in both pro-oxidant and antioxidant physiological processes and both of these roles are successfully studied by electron paramagnetic resonance (EPR) spectroscopy.

Instrumentation

EPR spectrometers successfully detect and monitor free radicals produced as part of the antimicrobial activity in honey. EPR sheds light on the radical scavenging effectiveness of honey as an antioxidant.

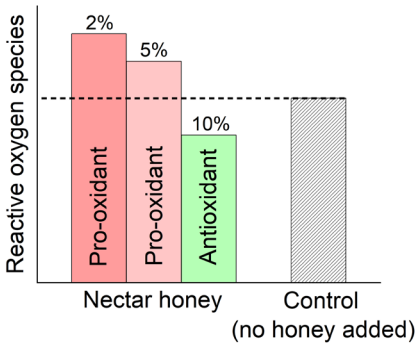
Key features include:

- Easy-to-use software
- SpinFit Liquids module to simulate and identify multiple radicals in the sample
- SpinCount module to quantify the total number of radicals and to determine the radical concentration

Peroxide related antibacterial activity of honey

- Honey may influence ROS formation via its bifunctional behavior
- Being pro-oxidant at low concentration and antioxidant at high concentration depends on the honey type
- The ability to modulate production and quenching of free radicals must be accounted for in the selection of medical honey for clinical applications

Figure 1
Effect of different honey concentrations on ROS production via Fenton reaction



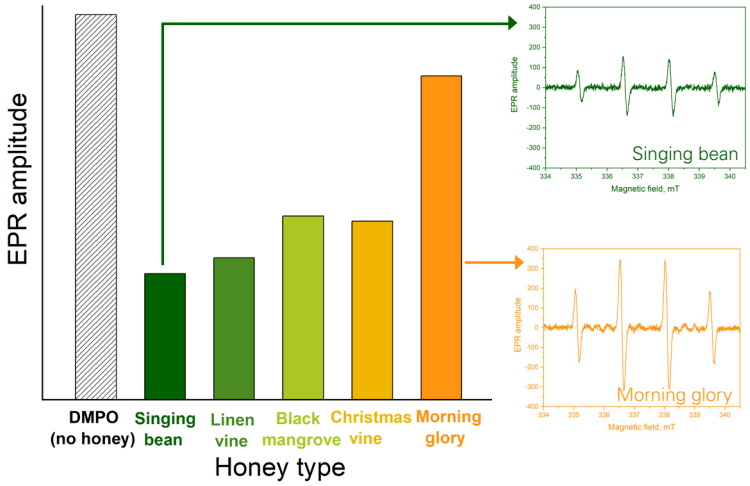


Figure 2
Hydroxyl radical scavenging activity of various honey types

Antioxidant effectiveness of honey

- Hydroxyl radical was generated via Fenton reaction and trapped by the spin trap DMPO in a honey free system
- The antioxidant ingredients of honey were able to scavenge OH-radicals, thus competing with the spin trap
- A significant decrease in the radical formation was observed with Singing bean while Morning glory was the least effective antioxidant

Figure 3
ESR5000

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