Nutrition and Dietetics MSc

An Evaluation of the Antioxidant and Antimicrobial Properties of Bee Products Commercially Available in the UK

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Abstract

Bee products such as honey and propolis have been used medicinally for centuries. More recent research has seen specific types of honey such as manuka honey used in wound healing and propolis as a constituent of mouthwashes and throat lozenges. The present study determined the antioxidant and antimicrobial activities of a number of widely available bee products in the UK. The disc diffusion method was utilised to assess the antibacterial activity of the bee products using a range of bacteria known to cause infection in humans. The ferric- reducing antioxidant power (FRAP) assay was utilised to assess the antioxidant activity of the bee products. The results demonstrated that bee products had antibacterial and antioxidant capacity but with considerable variation.

The most potent effect was observed using manuka 30+ against *S.epidermidis* (33mm mean zone of inhibition when applied undiluted compared to 11mm when using standard honey). Other bee products were of much less potency including propolis which demonstrated no significant antimicrobial activity.

However, the antioxidant capacity of propolis tablets was 95 µmol/l per 1mg/ml (95,000 µmol/l per 1 gram tablet). The most potent honey tested was manuka 30+ which was 9.0 µmol/l per 1mg/ml (4500µmol/l for a 5g portion) compared with standard honey 5.0 µmol/l per 1mg/ml (2500 µmol/l for a 5g portion).The antioxidant activity of propolis was also demonstrated in human saliva. The FRAP value of the saliva from a single human subject was evaluated following the intake of propolis containing lozenges compared with a control (boiled sweet). These biological effects may be significant *in vivo* and have particular relevant in the prevention in disease in humans. However, further work is needed in the form of randomised controlled trials.

Declaration of original work

“I hereby declare that work contained herewith is original and is entirely my own work unless otherwise indicated. It has not been previously submitted in support of a Degree, qualification or other course”.

Signed:

Laura Ross

Contents

List of Figures

List of Tables

List of Abbreviations

- Oxidative stress (OS)
- Reactive oxygen species (ROS)
- Superoxide anion (O_2^-)
- Hydrogen peroxide (H_2O_2)
- Hydroxyl radical (OH^-)
- Peroxynitrite radical ($OONO^-$)
- Superoxide dismutase (SOD)
- Ferric- reducing antioxidant power (FRAP)
- Ethanol extracts (EEP)
- 1,1-diphenyl-2-picrylhydrzyl (DPPH)
- Minimum inhibitory concentration (MIC)
- *Staphylococcus aureus (S.aureus)*
- *Escherichia coli (E.coli)*
- *Staphylococcus epidermidis (S.epidermidis)*
- *Streptococcus mutans (S.mutans)*
- Tea Tree Honey 12+ (TT12+)
- Tea Tree Honey 16+ (TT16+)
- Tea Tree Honey 18+ (TT18+)
- Manuka 5+ (M5+)
- Manuka 30+ (M30+)
- Standard Honey (SH)
- Artificial Honey (AH)
- Royal Jelly (RJ)
- Bee Pollen (BP)
- Quercetin (QU)
- Naringenin (NAR)
- Cinnamic Acid(CA)
- Propolis Resin (PR)
- Propolis Tablet (PT)