

Evaluation of Longevity, Antibacterial, Antioxidant and Anti-inflammatory Efficacies of Honey Extracted from Lozenges

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Introduction

Honey Production

- Hive bees work nectar and reduce its moisture to ~18% (brings sugars above the saturation point to prevent fermentation)
- Hive bees partially digest nectar (breakdown sugars, starches, and proteins), also incorporate enzymes from saliva

Honey Products

- **Medicinal:** treatment of eczema (salves, creams), treatments of sore throat (lozenges, tea), etc.
- **Manuka honey:** "medicinal" honey – meets specific enzyme and antioxidant requirements
- **Cosmetic:** inclusion in lip balms, cleanser, skin care products, etc.

Floral and Regional Origins

- Literature focuses on analysis of honey from different floral or regional origins
- **Floral origins:** monofloral and multifloral honeys and different nectar types
- **Regional origins:** areas of a growing region, a country, or different countries

Methods of Analysis

- **Physical:** electric, rheological, colour, polarization, etc.
- **Constitutional:** moisture, sugar, enzymes, HMF, pH, vitamins, minerals, amino acids, polyphenols, etc.
- **Biological:** antioxidant, antimicrobial, anti-inflammatory, immunomodulatory activities, etc.

Phenolic Components

- Secondary Plant Metabolites

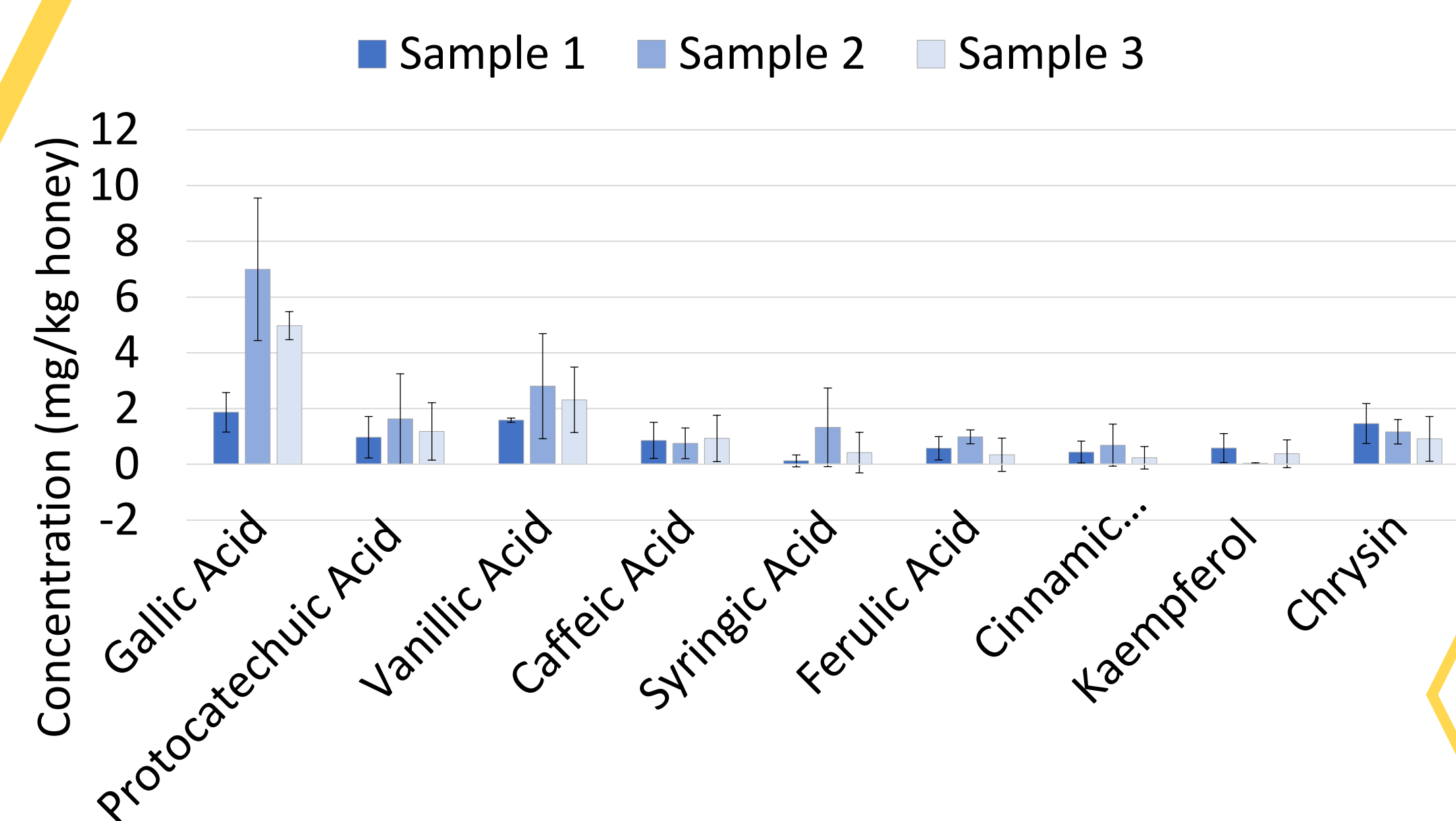


Figure 1. Analysis of Phenolic Components for Honey Samples

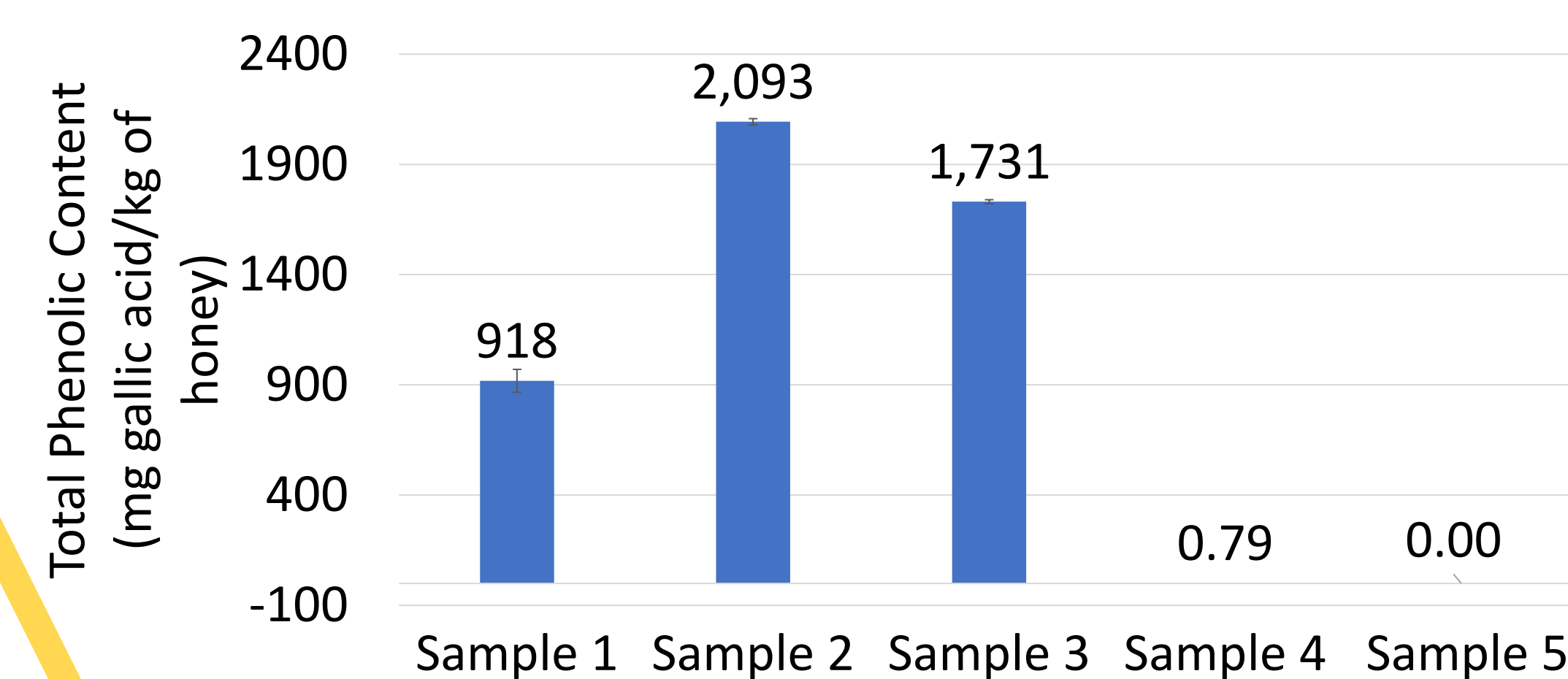
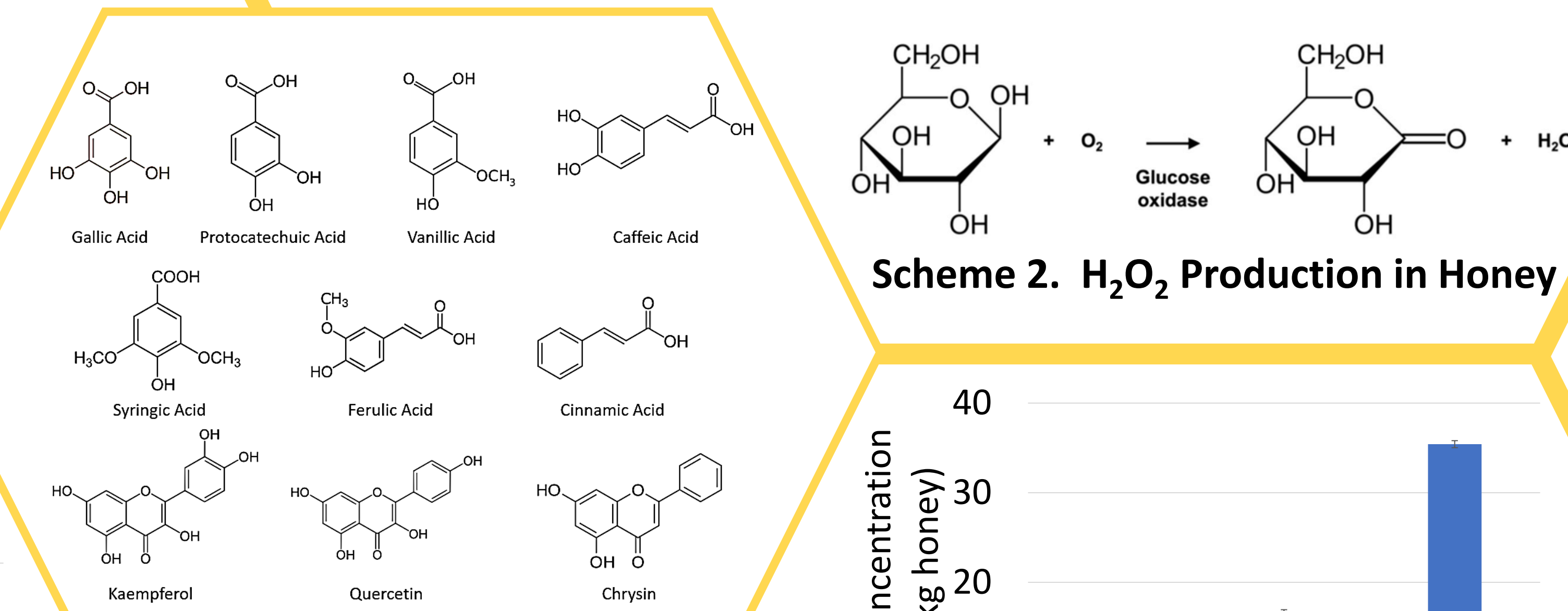


Figure 2. Total Phenolic Analysis for Honey Samples

Figure 3. Phenolic Acids and Flavonoids



Hydroxymethyl Furfural (HMF)

- HMF should be less than 40mg/kg honey

Diastase Activity

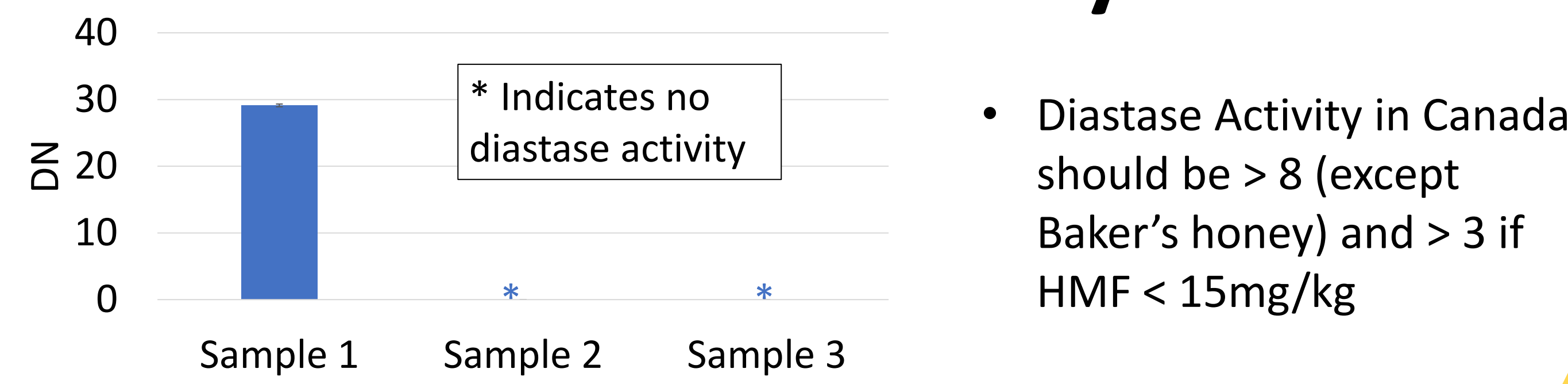
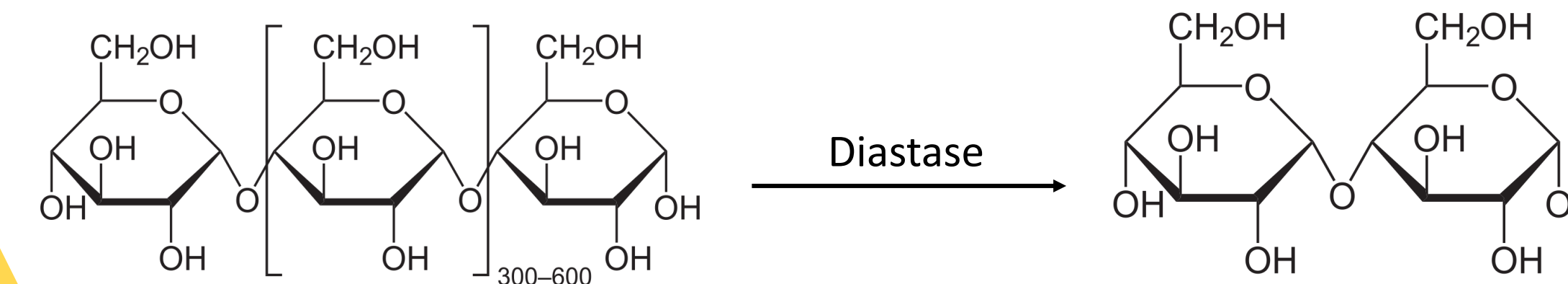


Figure 7. Diastase Activity of Honey Samples



Scheme 3. Breakdown of Starch into Maltose by Diastase

H₂O₂ and Antibacterial Activity

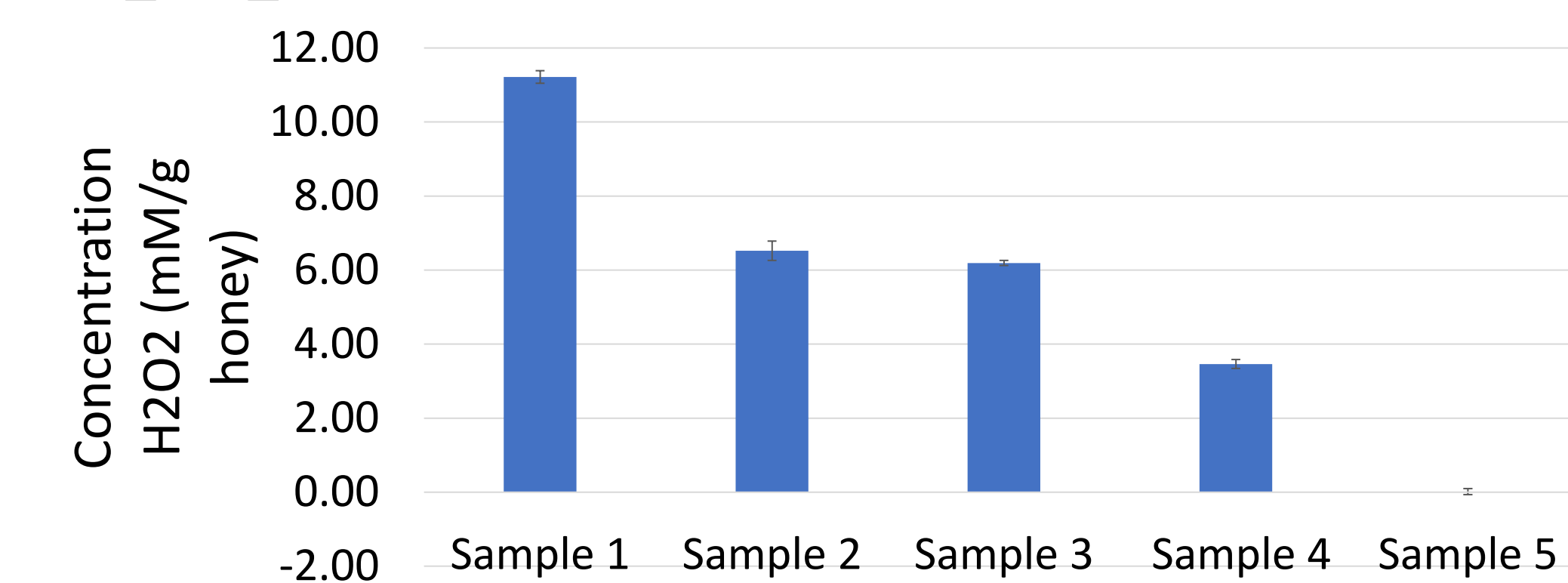


Figure 5. H₂O₂ Content of Honey Samples

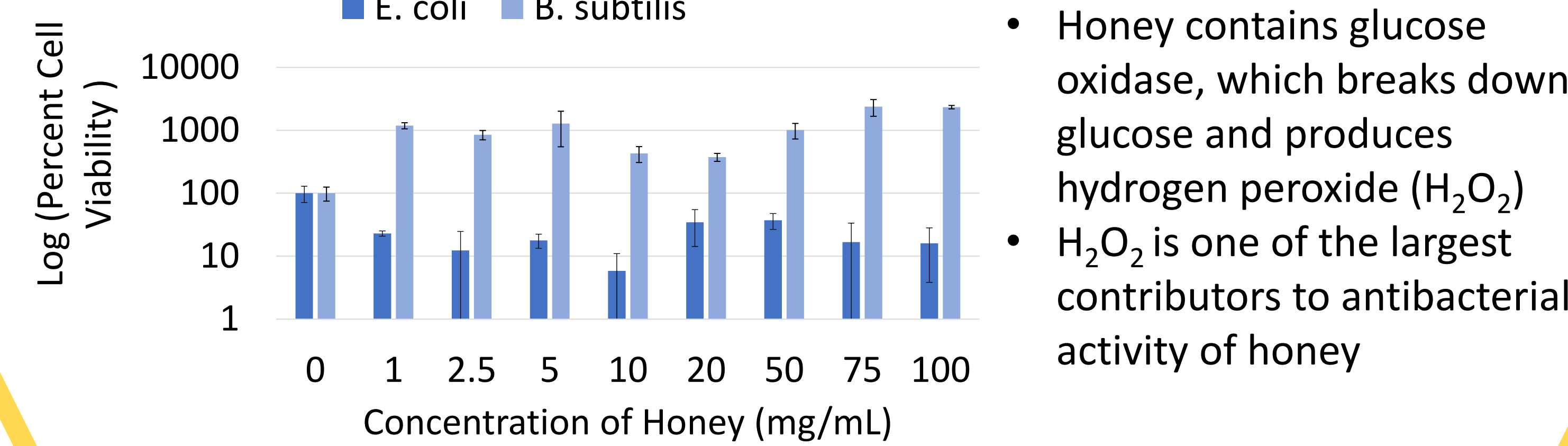
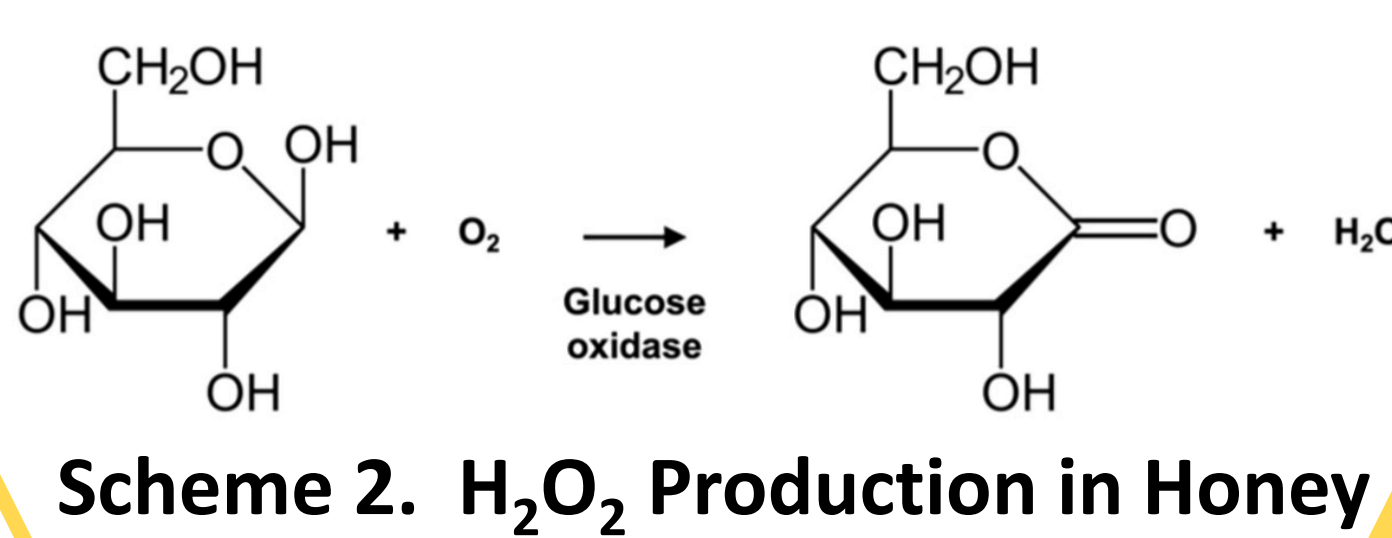


Figure 6. Antibacterial Activity of Honey Sample 1 Against *E. coli* and *B. subtilis*



Scheme 2. H₂O₂ Production in Honey

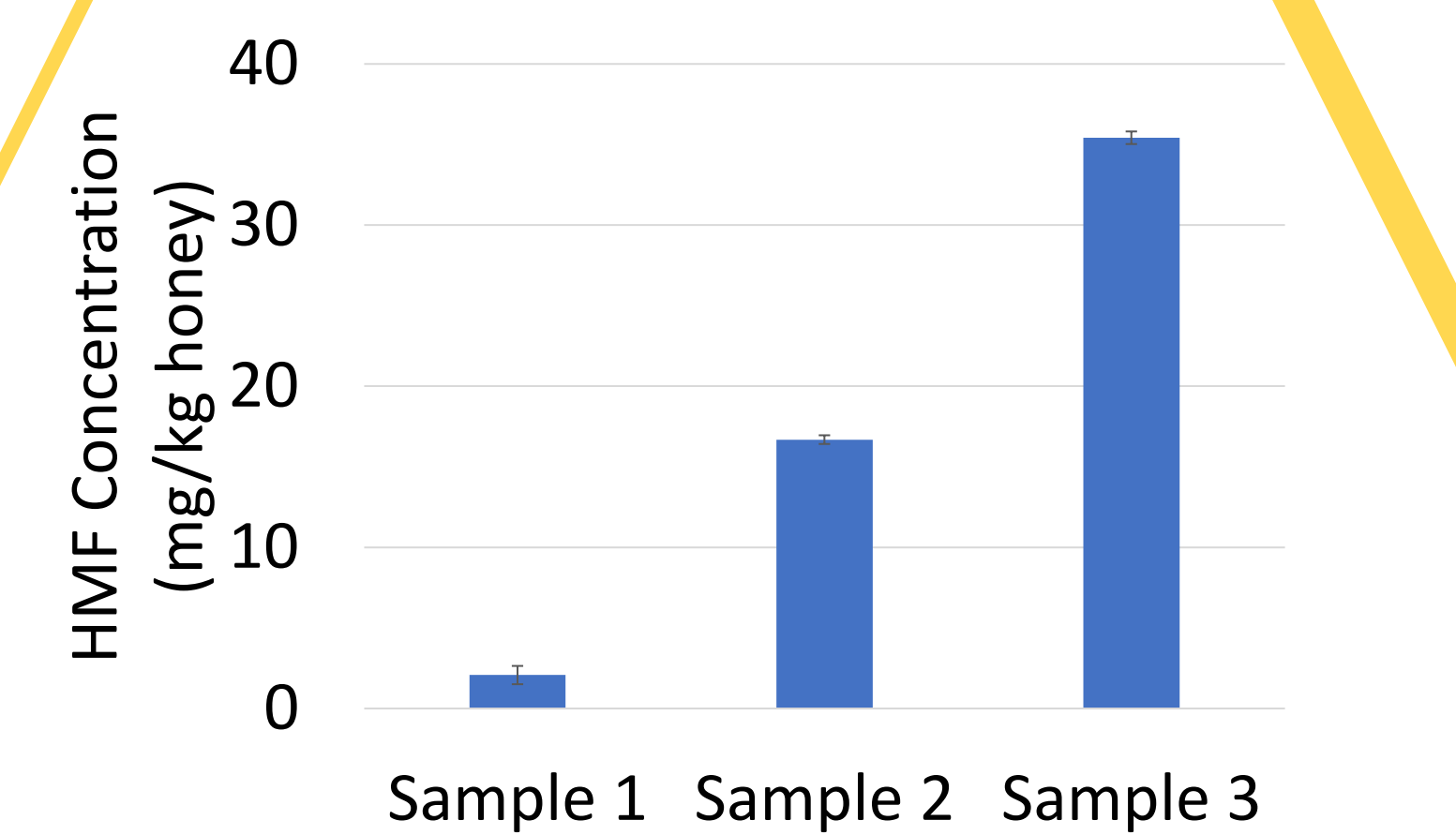
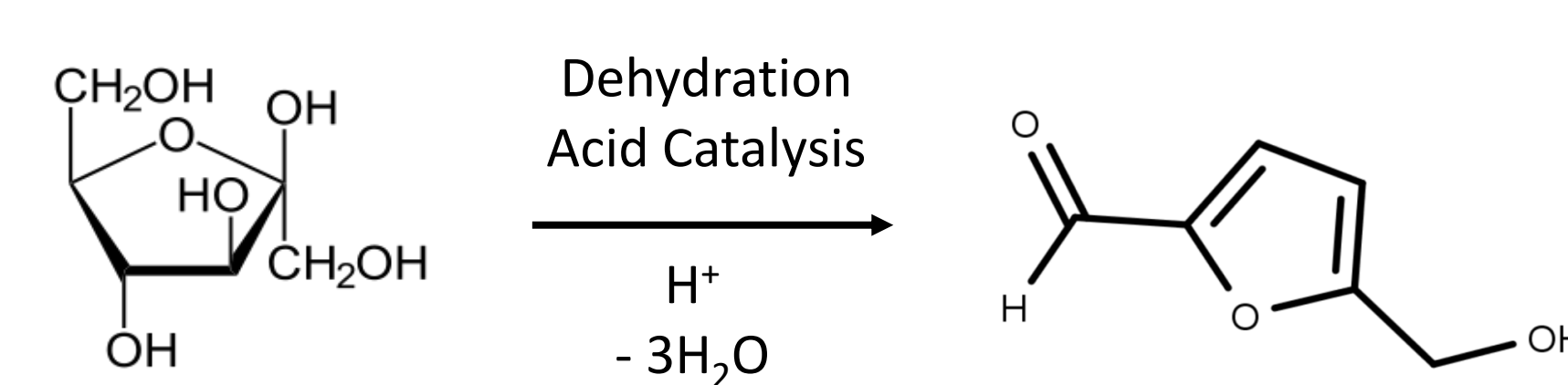


Figure 4. HMF Content of Honey Samples



Scheme 1. Formation of HMF from Fructose in Honey

Antioxidant Activity

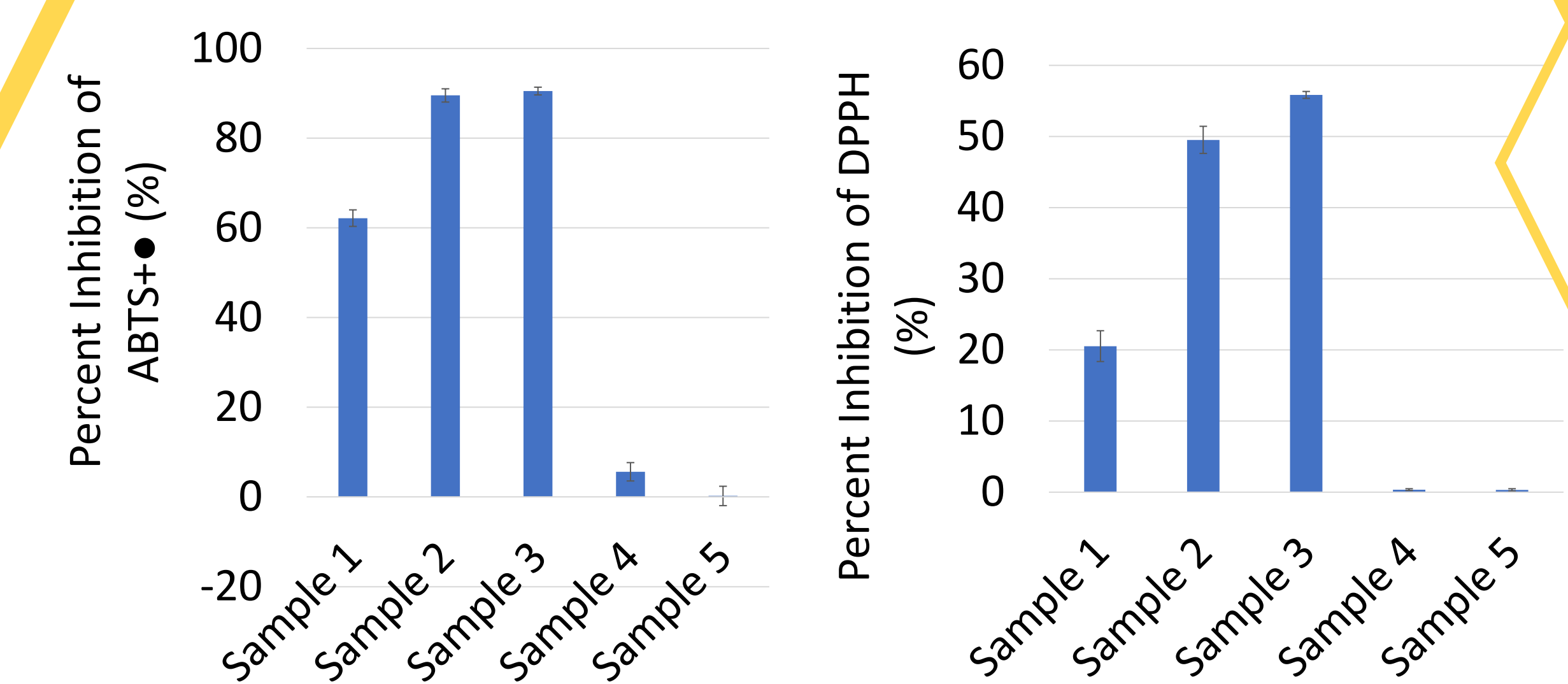


Figure 8. Free Radical Scavenging of ABTS Radicals for Honey Samples

Figure 9. Free Radical Scavenging of DPPH Radicals for Honey Samples

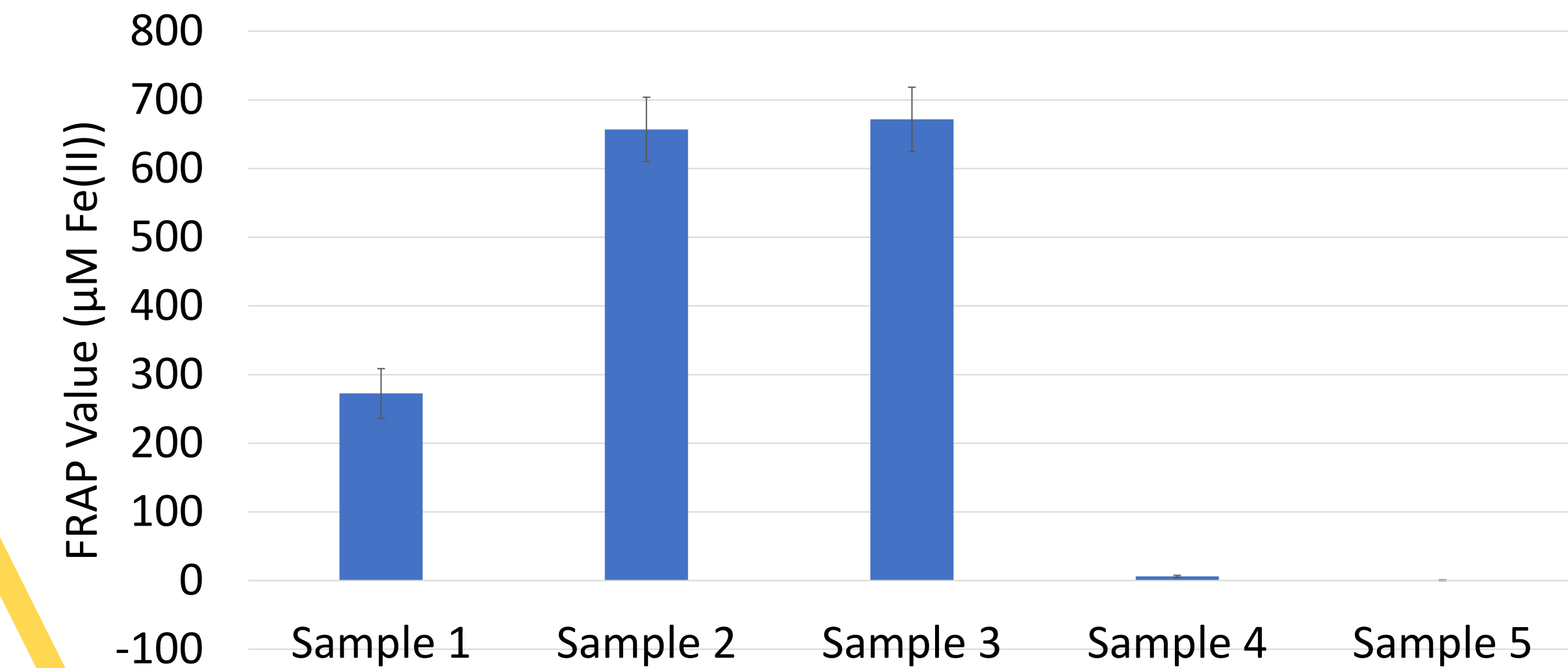


Figure 10. Ferric Reducing Antioxidant Potential of Honey Samples

- Phenolic acids and flavonoids, vitamin C, vitamin E, enzymes (e.g., catalase, peroxidase), etc.

Conclusion and Applications

Improved Health Benefits

- Honey products may demonstrate improved health benefits over natural honey

- Research furthers understanding of honey's benefits
- Application of methods to new avenues

Natural Health Benefits

Good for the Environment
Natural Product

Honey Product Research and the Bioeconomy

Established Methods
Applied and Expanded Upon

Honey Products

- Good for ecosystems and agriculture
- Positive environmental impact

- Honey products that maintain the benefits of natural honey are good for both vendors and consumers

Value for Vendors and Consumers