

# Optimal Storage of Healing Honey



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## Introduction

Manuka honey comes from the Manuka tree which is primarily found in New Zealand and Australia. There are four chemicals to consider when assessing the medicinal properties of Manuka Honey: Leptosperin, Methylglyoxal, DHA, and HMF. The high concentrations of these compounds contribute to the antimicrobial and healing effects of Manuka Honey in wound management. Ontario honey also has wound healing capability. Glucose oxidase is an enzyme found in honey which undergoes a chemical reaction to produce hydrogen peroxide. Under the guidance of Dr. Cheryl Ketola, and Dr. Michael Jennings, the purpose of this project is to investigate how storage temperature and storage container affect the peroxide levels of Ontario healing honey. Further, the hope is to identify the optimal temperature and storage conditions to maintain enzymatic activity suitable for medicinal grade honey. This work was funded by the Centre for Research and Innovation at Fanshawe College, and supported by the OBA and Backyard Bees.

## Methodology

1. Sample collection from Beekeepers.
2. Peroxide Assays to determine the initial peroxide content in each sample.
3. Peroxide Activity in honey over time.
  - As a function of temperature
  - As a function of Storage Vessel

### Temperature

- ❖ 50 °C
- ❖ 40°C
- ❖ 30°C
- ❖ 20°C

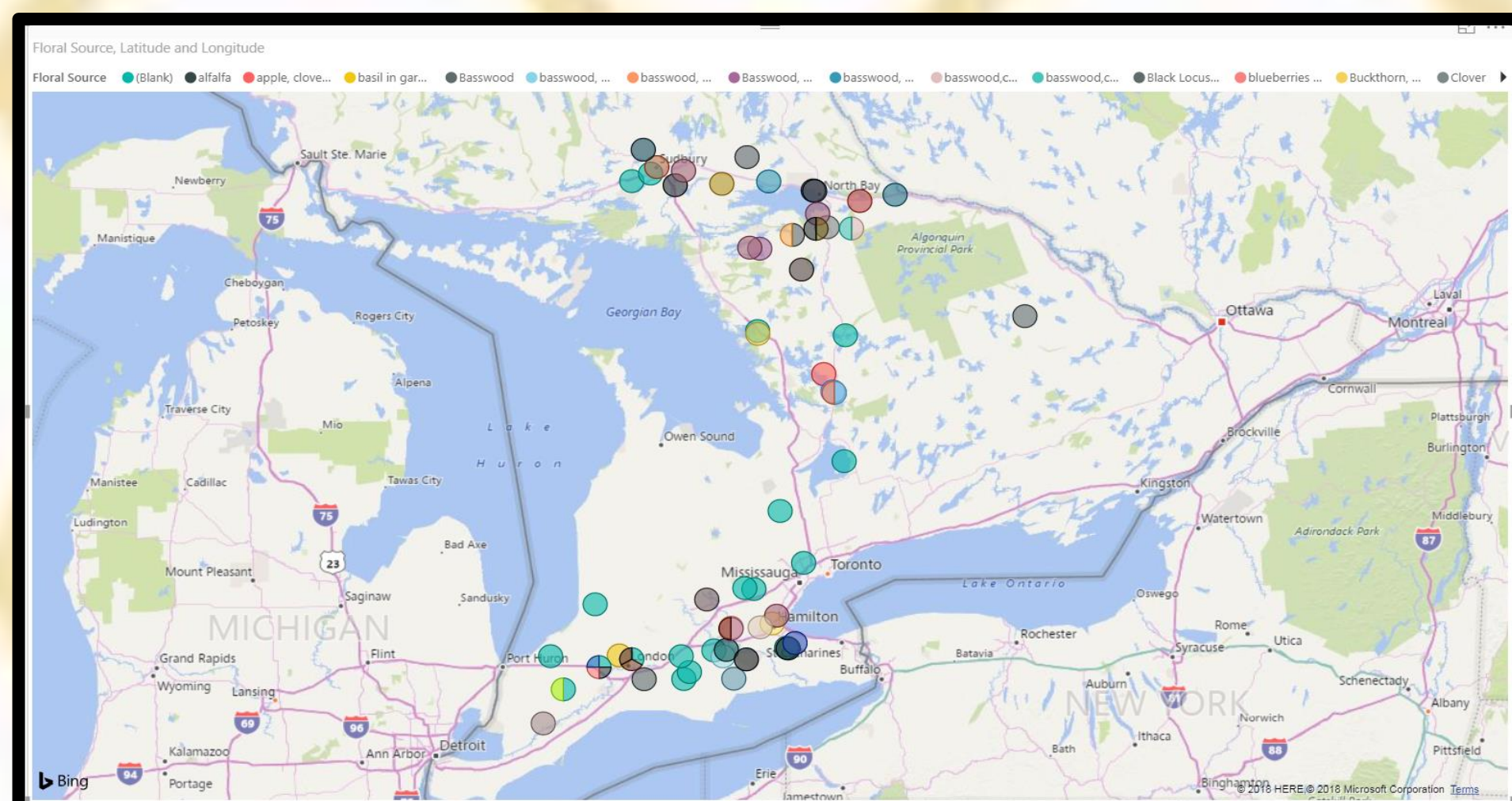
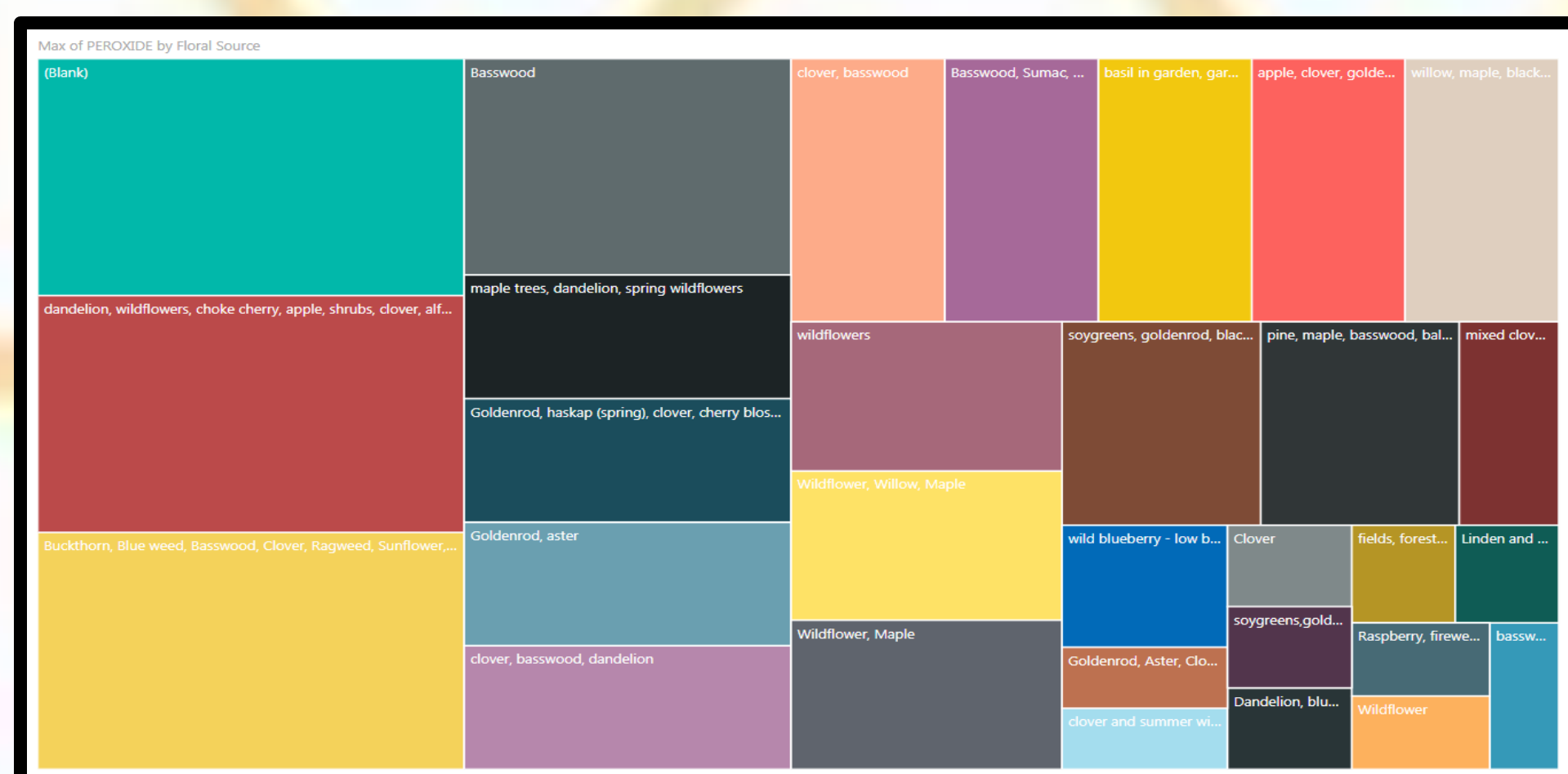
### Storage Vessel

- ❖ Clear glass jar
- ❖ Green glass jar
- ❖ Amber glass jar



## Floral Sources

Floral sources used in gathering nectar and pollen can affect the peroxide level and antimicrobial effects in honey. The major floral sources contributing to high peroxide levels have been correlated by abundance, and relative GPS location in Ontario Honey. This work was paid for by an Engage Grant partnered with the OBA.

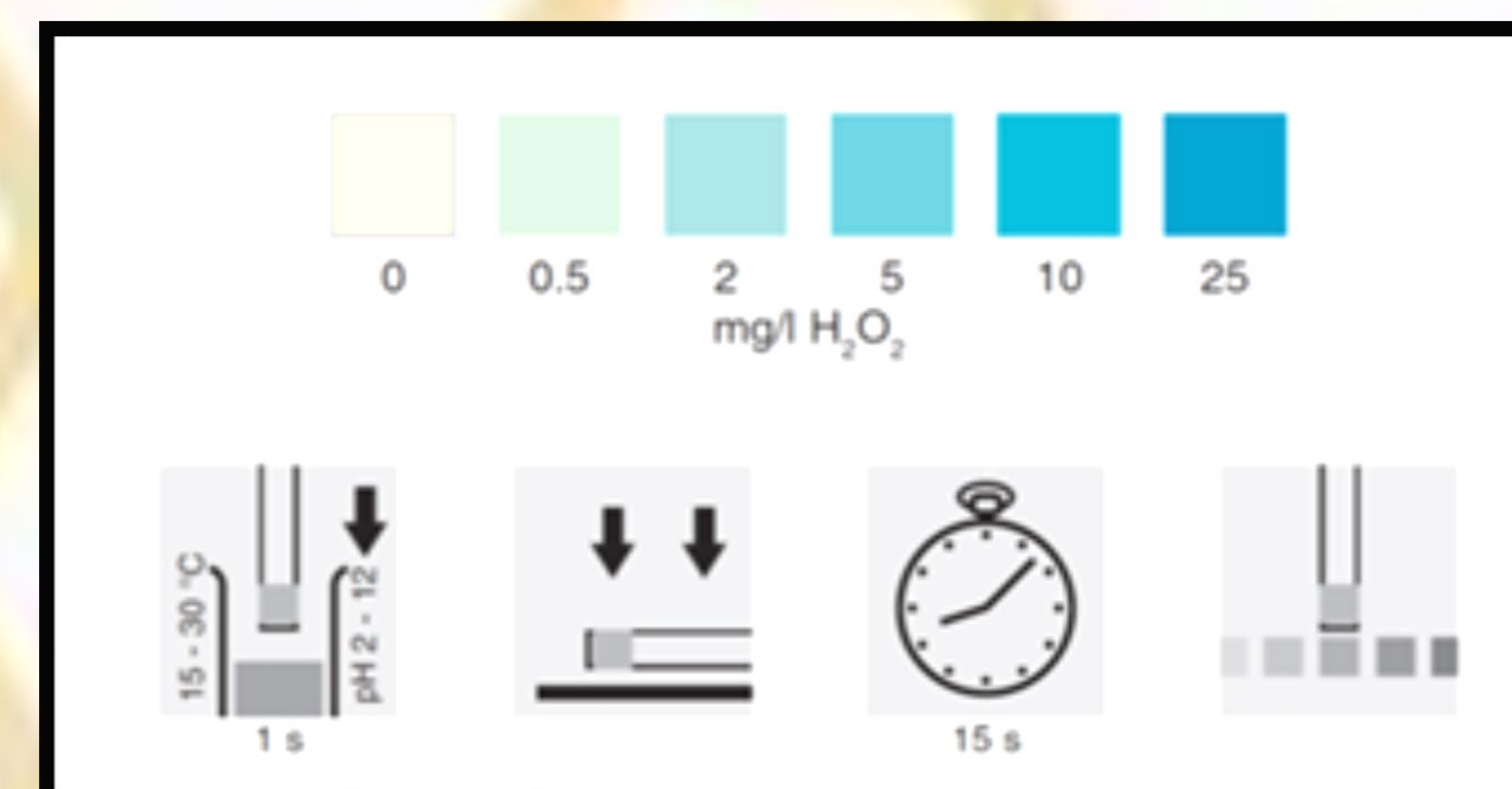
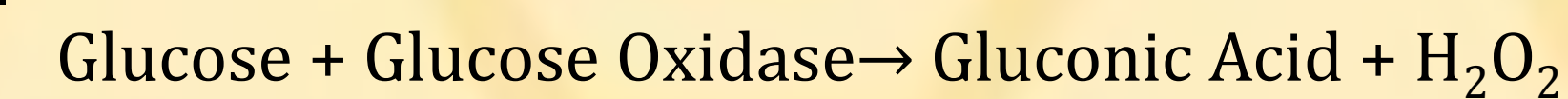


## Peroxide Assay In Honey

### Glucose Oxidase

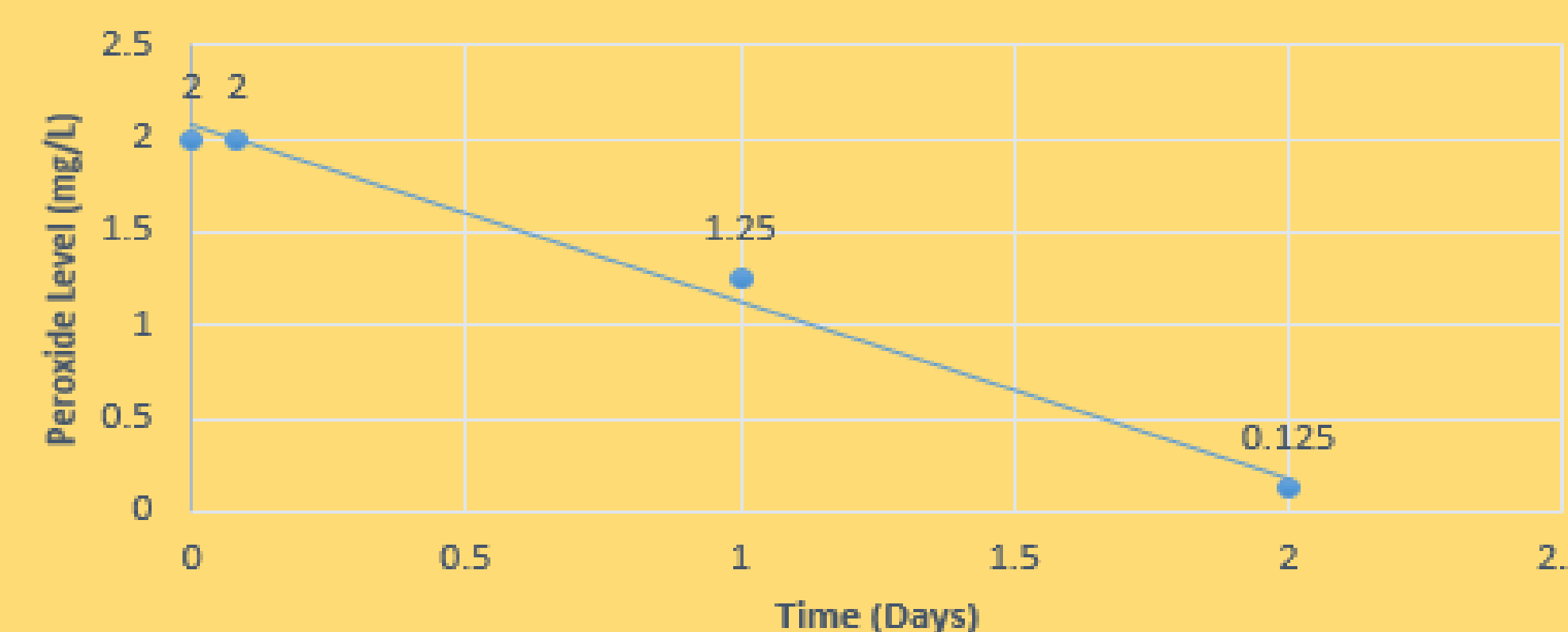
GOx is an enzyme found in honey that oxidizes glucose into gluconolactone and on to gluconic acid. This reaction is initiated by diluting the honey with water and  $O_2$  is converted to  $H_2O_2$  (hydrogen peroxide) a known antimicrobial agent. This allows honey to be applied as an antimicrobial barrier to promote wound healing.

### Reaction:

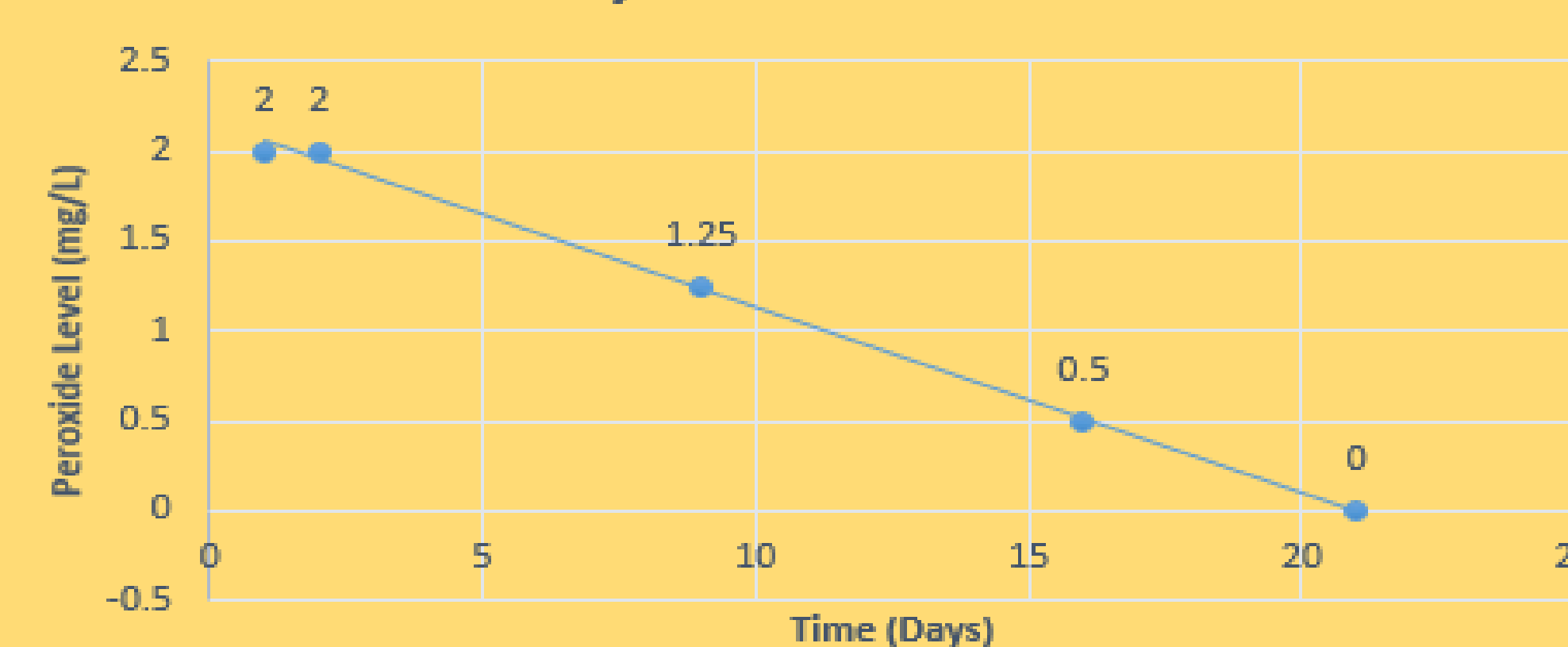


## Preliminary Temperature Testing

### Peroxide Concentration in Honey at 50°C Over Time



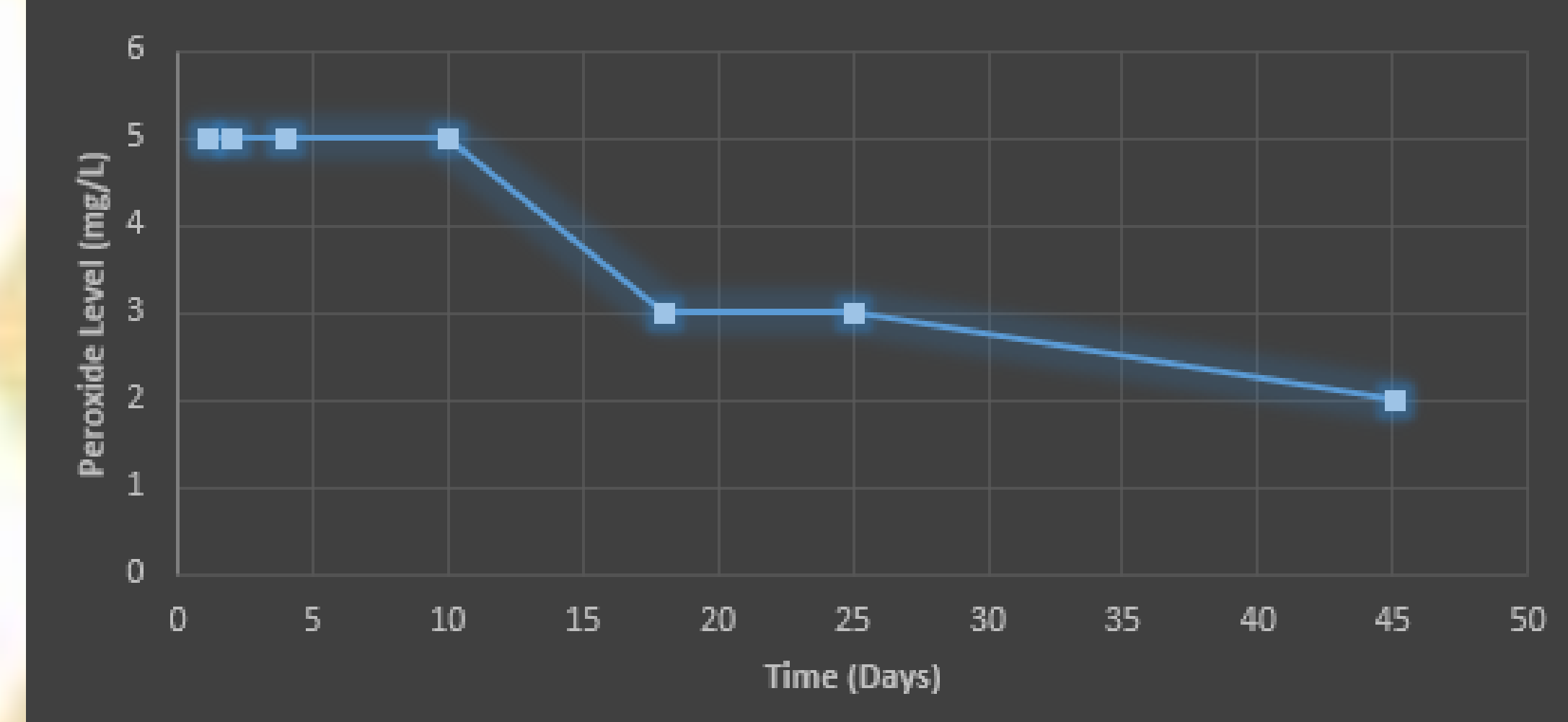
### Peroxide Concentration in Honey at 40°C Over Time



- ❖ Honey with an initial peroxide level of 2 mg/L was tested over two days at 50°C. The peroxide level dropped to almost 0 mg/L.
- ❖ The same honey with an initial peroxide level of 2 mg/L was tested at 40°C over 21 days. The peroxide level dropped from 2 mg/L to 0 mg/L.
- ❖ This verified that peroxide concentrations in honey decreased over time and more rapidly at higher temperature.
- ❖ Thus higher storage temperatures will reduce the efficacy of the healing honey.

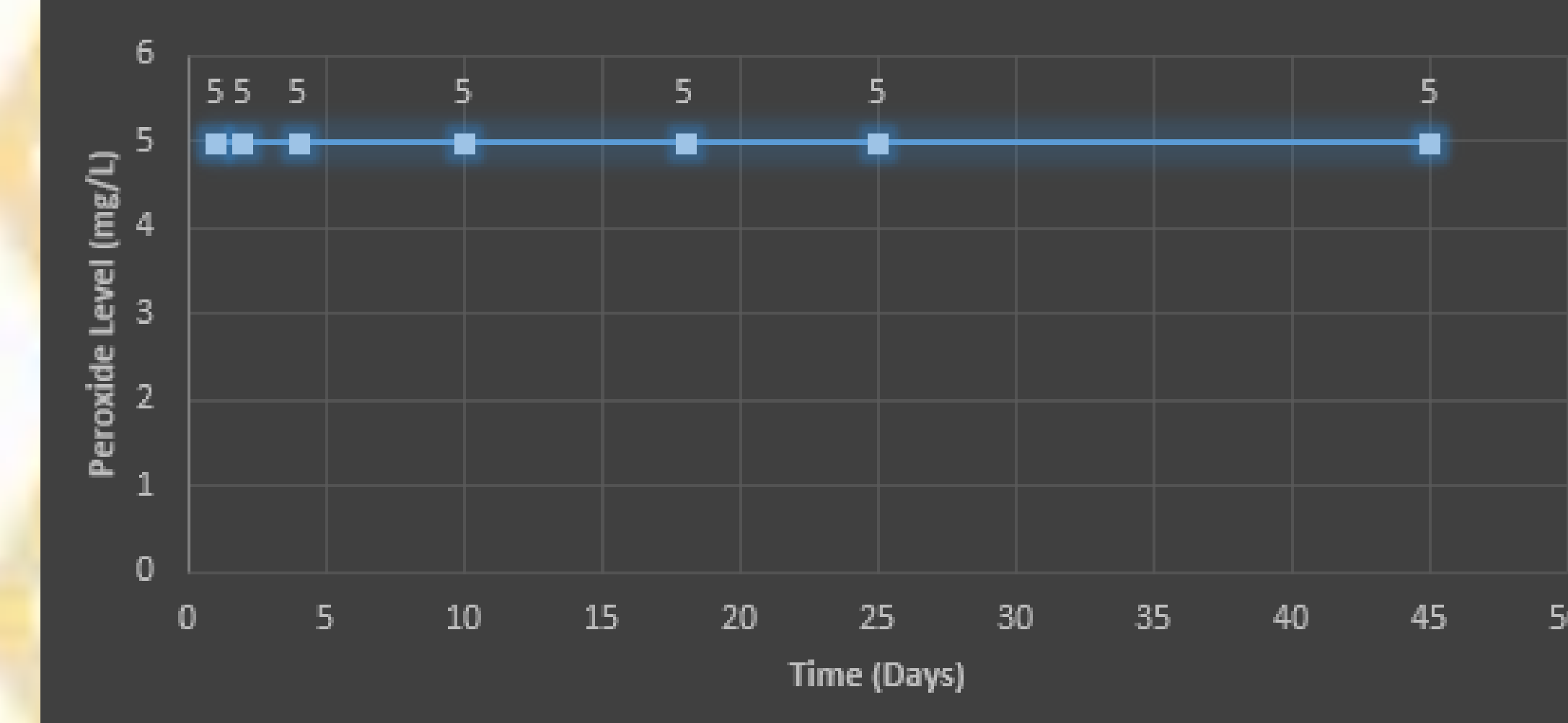
## Temperature & Storage Testing

### Change in Peroxide Concentration of Honey Stored at 30°C in the Dark



- ❖ Honey with an initial peroxide level of 5 mg/L was tested over 45 days at 30°C in the dark.
- ❖ The level was steady for 10 days decreasing to 3 mg/L by day 18.
- ❖ Again, steady until day 25 and decreasing to 2 mg/L by day 45.
- ❖ Even at 30°C the peroxide level decreases given enough time.

### Consistent Peroxide Concentration in Honey Stored at 20°C in the Dark



- ❖ Honey with an initial peroxide level of 5 mg/L was tested over 45 days at 20°C in a dark place.
- ❖ The peroxide level was consistently 5 mg/L throughout the experiment.

### Change in Peroxide Concentration of Honey Stored at 20°C in Direct Sunlight



- ❖ Honey with an initial peroxide level of 5 mg/L was tested over 45 days at 20°C in direct sunlight.
- ❖ This section of the experiment accounted for how light levels effect the peroxide level in the honey over time.

- ❖ Amber Jars: The peroxide level has been consistent throughout this experiment.
- ❖ Green Jars: Peroxide levels dropped to 2 mg/L by day 2. On day 25, the level dropped to 0.5.
- ❖ Clear Jars: The peroxide levels dropped to 2 mg/L by day 2, 0.5 mg/L by day 18, and 0 mg/L by day 45.