

# Antibiotic and Organoleptic Properties of Honey from *Apis dorsata* (Giant Honeybee) and *Trigona laeviceps* (Stingless Bee)

Chanpen Chanchao, Ph.D.

chanpen@sc.chula.ac.th

Chanpen Chanchao, Nareerat Wongchum, and Phansaang Wannakun  
*Department of Biology, Faculty of Science,  
Chulalongkorn University,  
Bangkok 10330 Thailand*

Honeybees are highly eusocial insects which are very useful in pollination. Their products such as honey, wax, royal jelly, propolis, venom are very economic (Wongsiri *et al.*, 2000). Honey has widely consumed as food (Crane, 1975). It is modified from nectar of plants by the function of  $\alpha$  – glucosidase (Bogdanov, 1997). Honey is composed of fructose and glucose (79%), H<sub>2</sub>O (20%), acids such as gluconic acid (0.5%), and minerals such as calcium, magnesium, potassium, phosphorus together with vitamins such as riboflavin, niacin (0.5%). Considering the component of honey, fructose and glucose allows the honey to be highly saturated and provides the sweet taste. In contrast, gluconic acid provides the sour taste. The property of honey depends on nectar from plants as food sources. They are different in term of the taste, smell, color (from light yellow to darkish brown) (Wongsiri *et al.*, 2000). Since honey is widely consumed, there is a shortage in honey at present. This brings to the promotion in apiary. Not only honey is nutritional, but it also inhibits the growth of pathogens. It was recorded in the papyrus that Egyptians used honey in ancient medicine. Honey was used to prevent the bacterial infection in surgery and in any wounds (Mizrahi and Lensky, 1997). The antimicrobial activity of honey may be due to low moisture content. High osmotic pressure can desorb H<sub>2</sub>O out of the pathogen cells (hypotonic condition). Then, that leads to either the death or the growth inhibition of pathogens which are bacteria, fungi, yeast (Kucuk *et al.*, 2007; Noori, 2005). Nowadays, although antibiotics are widely used in prevention of microbial infection, there are still problems of antibiotic resistance. Using honey for growth inhibition of microorganisms seems to be an alternative way.

Not only the property of honey depends on the plant nectar, but it also depends on the species of honeybee. In Thailand, the diversity of honeybee is high. There are 4 native *Apis* species which are *Apis dorsata*, *A. cerana*, *A. florea*, and *A. andreniformis* and 1 imported *Apis* species which is *A. mellifera*. In this research, we are interested in *A. dorsata* since its honey is the most popular in consuming. The body size and the bee hive of *A. dorsata* or giant honeybee is the largest. The diameter of the bee hive is about 0.5 – 1 meter. It likes nesting its nest on a branch of tall trees or at the corner of the house roof or high buildings. *A. dorsata* is well known to be the most aggressive. It is widely distributed throughout Thailand and almost any countries in Southeast Asia such as China (in the South), Burma, Sri Lanka, and India (in the West). Furthermore, *Trigona laeviceps* or stingless bees were also studied. Its honey is not popular to consume due to its sour and bitter taste. The color and smell of its honey is not attractive so other properties would be good in term of indicating the advantage of this honey type.

**Methods:** pH was measured. Proline and percentage of inverted sugar were assayed due to Sidney (1984). Total protein was estimated by Bradford assay. Major protein bands were observed by SDS PAGE. Partial amino acid sequences were obtained by MALDI TOF MS. For antimicrobial activity, agar – well diffusion method was used. Neat honey and diluted honey at 25%, 50%, and 75% were used. Inhibition zone was recorded and analyzed by one

way ANOVA.

**Results:** Honey is acidic, 3.37 (*Tl*) and 3.8 (*Ad*). The proline content is 17.23  $\mu\text{g/ml}$  (*Tl*) and 16.1  $\mu\text{g/ml}$  (*Ad*). The percentage of inverted sugar is 15.19% (*Tl*) and 13.16% (*Ad*). In addition, total protein is 28.2  $\mu\text{g/ml}$  (*Tl*) and 16.0  $\mu\text{g}/\mu\text{l}$  (*Ad*). After SDS PAGE, different protein patterns of both honey types were revealed. By MALDI TOF MS, different types of protein are presented. About antimicrobial activity, neat honey provides the best activity. *Staphylococcus aureus* (gram positive bacteria) shows the most response to both types of honey at any dilutions.

**Conclusions:** Honey from both types contains other nutrients than sugar but in different amount. In addition, both types of honey also indicate antimicrobial activities. Different dilutions of honey present different antimicrobial activity. Also, it depends on types of microorganisms.