INHIBITING AND HEALING ACTIVITY OF HONEY AND MOLASSES (DATE SYRUP) IN CONTAMINATED WOUNDS AGAINST PATHOGENIC BACTERIA

Athal Ahmed Abdulredha and Ithar Khamil Abbas
College of Science, University of Baghdad, Iraq.

Abstract
The study includes two parts detection about the inhibiting activity in honey and molasses (date syrup) against pathogenic bacteria (Staphylococcus aureus, Escherichia coli and Pseudomonas aeruginosa) that caused wound contamination. First part was detect the inhibiting ability of natural honey and natural molasses by test the minimum inhibition concentration (MIC) on pathogenic bacteria in cultured plates and the second part by using rats to test their ability to heal the wound which contaminated with pathogenic bacteria (Staphylococcus aureus, Escherichia coli and Pseudomonas aeruginosa) used in the first part this contamination led to inflammation of cuts. The treatment step by natural honey and natural molasses was the last step for examination about the inhibiting activity of these two substances. The Results of honey inhibition activity test against (Staphylococcus aureus, Escherichia coli and Pseudomonas aeruginosa) were detected with (8mm, 7mm and 6mm), respectively. But Molasses inhibition activity results against this bacteria Staphylococcus aureus, Escherichia coli and Pseudomonas aeruginosa were (3mm, 4mm and 5mm), respectively. To conform the results of inhibition activity for both honey and molasses, two antibiotics cefotaxime and meropenem depended already to inhibit the pathogenic bacteria and showed inhibition zone (4mm, 6mm and 3mm) for cefotaxime and (15mm, 13mm and 15mm) for meropenem against Staphylococcus aureus, E. coli and Pseudomonas aeruginosa respectively. Rats divided into four groups, every one group include three individuals each individual infected with (saphylococcus aureus, Escherichia coli and Pseudomonas aeruginosa). First group treated by natural honey, second group treated by natural molasses, third group treated by Cefotaxime and fourth by Meropenem. The period of healing wound with Meropenem which contaminated with the pathogenic bacteria which used in this study, was spent 10 days, but 14 days with Cefotaxime antibiotic treated the wound which contaminated with Escherichia coli and while 16 days with these were contaminated with Staphylococcus aureus. Also, the healing period with honey which spent 12 days against Escherichia coli and Pseudomonas aeruginosa but 11 days against Staphylococcus aureus. About the Molasses treatment results, the treating extend till 14 days against Escherichia coli and Pseudomonas aeruginosa but 16 days for Staphylococcus aureus.

Key words: wounds, honey, molasses.

Introduction
The earlier U.S. Food and Drug Act defined honey as “the nectar and saccharine exudation of plants, gathered, modified and stored in the comb by honey bees (Apis mellifera and A. dorsata); is contains not more than 25% water, not more than 0.25% ash and not more than 8% sucrose. By far, the largest portion of the dry matter in honey consists of the sugars (Tomas et al., 2001). This very concentrated solution of several sugars results in the characteristic physical properties of honey high viscosity, “stickiness,” high density, granulation tendencies, tendency to absorb moisture from the air and immunity from some types of spoilage. Because of its unique character and its considerable difference from other sweeteners honey is an effective broad-spectrum antibacterial agent and have the ability of wound healing. Skin wounds, gastric ulcers and burns are treated by honey (Vonderohe, 1996).

The wound healing properties of honey include stimulation of tissue growth, enhanced epithelialization and minimized scar formation. These effects are ascribed to honey’s acidity, hydrogen peroxide content, osmotic effect, nutritional and antioxidant contents, stimulation of immunity and to unidentified compounds (Gheldof and et
al., 2002). Prostaglandins and nitric oxide play a major role in inflammation, microbial killing and the healing process (Diegelmann and Evans, 2004). Honey was found to lower prostaglandin levels and elevate nitric oxide end products. These properties might help to explain some biological and therapeutic properties of honey, particularly as an antibacterial agent or wound healer (Mundo and et al., 2004).

The major minerals of *Phoenix dactylifera* L. are selenium, copper, potassium and magnesium. It is contained a high percentage of carbohydrate, fat, minerals, protein, vitamins and a high percentage of dietary fiber. There are at least 15 minerals in dates. The percentage of each mineral in dates syrup varies from 0.1 - 916 mg/100 g date depending on the type of mineral. In many varieties potassium can be found at a concentration as high as 0.9% in the flesh. (Al-Shahib and Marshall, 2003).

Other minerals and salts that are found in various proportions include boron, calcium cobalt, copper, fluorine, iron, magnesium, manganese, potassium, phosphorous, sodium zinc, aluminum, cadmium, chloride, lead and sulphur (El-Sohaimy and Hafez, 2010). Dates syrup contain elemental fluorine that is useful in protecting teeth against decay (Gad and et al., 2010). Selenium, another element believed to help prevent cancer and important in immune function, is also found in dates syrup. Date syrup had been assessed for the presence of antioxidant compounds such as anthocyanins, vitamins, carotenoids and phenolic compounds. Antibacterial properties were also exhibited by date palm extract, which could inhibit the growth of Gram positive and Gram negative bacteria (Hasnaoui and et al., 2010; Tan and et al., 2011).

### Materials and Methods

**Experiment of wounds healing on rats**

Scalpel used to infect laboratory animals to make surface wounds at skin layer. The length of incisions were ranges between (1cm-1.5cm) and with a depth ranges from 1mm to 2mm on the side of the abdominal region in male and female rats that weight (200-250)g at room temperature and with age ranges from 5 to 6 months. After injury of the animals and happen of wounds the next step was infected these wounds by pathogenic bacteria *Staphylococcus aureus, Escherichia coli* and *Pseudomonas aeruginosa*. Then left for 24 hours that make hurts inflammation. (Jessica and Martha, 2010). After the inflammation the healing process be the last step to improve the honey and molasses ability for treating wounds and inhibiting the pathogenic bacteria.

The natural honey, molasses, Cefotaxime and Meropenem antibiotics that used for treatment the contaminated wounds. The incisions was infected by the following bacteria (*Staphylococcus aureus, Pseudomonas* and *E. coli*). The laboratory rats divided according to groups each groups contain three individuals as shown in (Table 4). (Hawk, et al., 2005)

### Minimum Inhibition concentration testing

The appropriate antimicrobial activity, is also found in dates syrup. Date syrup had been assessed for the presence of antioxidant compounds such as anthocyanins, vitamins, carotenoids and phenolic compounds. Antibacterial properties were also exhibited by date palm extract, which could inhibit the growth of Gram positive and Gram negative bacteria (Hasnaoui and et al., 2010; Tan and et al., 2011).
impregnated disks or the antibacterial substances (honey and molasses) placed on the surface of the agar. Then the dispenser put over the agar plate and firmly press the plunger once to dispense the disks or substance onto the surface of the plate. (Wayne, 2006). The dispenser off the plate left and using forceps sterilized by either cleaning them with an alcohol pad or flaming them with isopropyl alcohol, touch each disk on the plate to ensure complete contact with the agar surface. (Jorgenesen, 2007). The disk should not move it has contacted the agar surface even if the disk is not in the proper location, because some of the antibacterial begins to diffuse immediately upon contact with the agar then incubated the plate for a full 24 hours before reading (Winn, 2006).

### Results and Discussion

The results of Minimum Inhibition concentration against (*Escherichia coli* *Staphylococcus aureus* and *Pseudomonas aeruginosa*) were (7mm, 8mm and 6mm), respectively for natural honey table 1. But (6mm, 4mm and 3mm) for Cefotaxime antibiotic respectively and (13mm, 15mm and 15mm) respectively for Meropenem antibiotic table 2.

LSD results of honey of the pathogenic bacteria (*Escherichia coli* , *Staphylococcus aureus* and *Pseudomonas aeruginosa*) were (2.19, 2.66 and 2.08) respectively, In compare with the two types of antibiotics (Cefotaxime and Meropenem) that used to treat contaminated wounds by pathogenic bacteria (*Escherichia coli, Staphylococcus aureus* and *Pseudomonas aeruginosa*), results of LSD were (2.061, 1.0736 and 1.328).

The results of Minimum Inhibition concentration against (*Escherichia coli* *Staphylococcus aureus and in Pseudomonas aeruginosa*) were (4mm, 3mm and 5mm) respectively for natural Molasses, table 3. But (6mm, 4mm and 3mm) for Cefotaxime antibiotic respectively and (13mm, 15mm and 15 mm) respectively for Meropenem antibiotic plates 3 (10-12)

LSD results of natural Molasses of the pathogenic bacteria. In compare with the two types of antibiotics Cefotaxime and Meropenem that used to treat contaminated wounds by pathogenic bacteria (*Escherichia coli, Staphylococcus aureus and Pseudomonas aeruginosa*), in (Table 3). There is significance differences P<0.05 among the studied parameters. LSD of *Escherichia coli* is 2.59 for the four substances (honey, molasses, cefotaxime and meropenem) and 3.06 the result related to *Staphylococcus aureus* also its 3.14 of *Pseudomonas aeruginosa*. So it gives indicate there is significance difference. P<0.05.

### Conclusion

From the current results the following can be concluded:

1. Raw honey has inhibiting activity against pathogenic bacteria (*Staphylococcus aureus, Pseudomonas aeruginosa* and *Escherichia coli*).
2. Natural molasses (date syrup) has inhibiting ability against pathogenic bacteria. (*Staphylococcus aureus, Pseudomonas aeruginosa* and *Escherichia coli*).
3. Processed honey and molasses have no inhibiting activity against pathogenic bacteria. (*Staphylococcus aureus, Pseudomonas aeruginosa* and *Escherichia coli*).
4. Raw honey have inhibiting activity better than Cefotaxime antibiotic and molasses against pathogenic bacteria (*Staphylococcus aureus, Pseudomonas aeruginosa* and *Escherichia coli*).

### References


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<th>Type</th>
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* (P<0.05).


