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Traditional Medicine

Critical Appraisal of the Action of Honey on Skin Infection, a Case Study of Honeys from Four Different Locations in Nigeria

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Abstract **Original Research Article**

Honey has been used as traditional medicine in many countries and in the world at large before modern medicine was introduced. These substance is not only a waste product produced by honeybees but also a therapeutic agent used as an ant inflammatory, ant fungal, bacterial and ant microbial agent too. This context assess the healing potency of honey on different skin and wound infections such as dermatitis, boils, eczema, burns etc. Many of these complications are eliminated due to the chemical constituents found in honey but these constituents differ more greatly in their distribution across places in Nigeria such places are north, west and eastern parts of Nigeria. These distributions affect the healing potency of many honey collected from these areas. In this context, the sample differ in their potencies and also in their chemical constituents. These areas of collection include Abuja, Nsukka and Ibadan respectively. The honeys obtained are applied on surface wounds and on skin inflammations infected by *S. aureus* to see whether they differ in their potency or not. Statistical analysis such as Chi-square test (χ^2) was applied in order to compare the association between different honeys on skin infected with *Staphylococcus aureus*. In other aspect of life, honey is used in many candy products and sometimes in substitute for sugars due to its property of flavonoids compounds.

Keywords: honeybees, traditional medicine, Skin Infection, *Staphylococcus aureus*.

INTRODUCTION

Honey has been reported to have an inhibitory effect to around 60 species of bacteria including aerobes and anaerobes, gram-positives and gram-negatives [1]. Pathogens that are found to be sensitive to anti-infective properties of honey are manifold [2]. Various results are in favor of its activity against *Bacillus anthracis, Corynebacterium diptheriae, Haemophilus influenzae, Klebsiella pneumonia, Listeria monocytogenes, Mycobacterium tuberculosis, Pasteurella multicoda, Yersinia enterocolitica, Proteus species, Pseudomonas aeruginosa, Acinetobacter spp, Salmonella diarrhea, Sal. typhi, Serratia marcescens, Shigella dysentery, Staphylococcus aureus, Streptococcus faecalis, Strep. mutans, Strep. pneumoniae, Strep. pyogenes and Vibrio cholerae* [3]. Previously, a small number of case studies examining the antimicrobial activity of honey against *methicillin-resistant Staph. aureus (MRSA)* organisms demonstrated that natural honey had an antimicrobial activity against the *community-associated MRSA* organisms in *in vitro* condition [4]. The MIC (minimum inhibitory concentration) of honey was found to range from 1.8% to 10.8% (v/v), i.e. the honey had sufficient antibacterial potency to still be able to stop bacterial growth if diluted at least nine times, and up to 56 times for *Staphylococcus aureus*, the most common wound pathogen [5]. It has been indicated that diluted honey treated urinary tract infections because certain bacteria causing urinary tract infections, e.g. *E. coli*, *Proteus* species and *Streptococcus faecalis*, were found to be sensitive to the antibacterial activity of honey [6]. The antibacterial action is due to its acidity, hydrogen peroxide content, osmotic effects, nutritional and antioxidant content,

stimulation of immunity, and unidentified compounds [7]. Different kinds of honey like Gelam, Med honey, Tualang and Manuka, have been tested and found to have similar properties.

METHODS

Each honey gotten were tested on skin infection to indicate and assess their potencies. Many, skin complication and inflammation are caused by a bacterium *Staphylococcus aureus* which is identify by coagulase test, catalyst's test and gram staining [8]. Samples on skin inflammation are taken from a patient with skin infection removing white substance on the affected area and cultured using different Medias such as BA (blood agar) and CA (chocolate agar). The samples are inoculated on the blood agar and are incubated for about 24 hours using aerobic incubator while samples inoculated with CA (chocolate agar) are incubated anaerobically using anaerobic incubator for about 24 hours [9]. After 24 hours of incubation, the samples taken tend to form bacteria colonies on blood agar while other do not form colonies on chocolate agar [10]. These bacteria identification is shown with many analytical test and procedure to confirm whether it is *Staphylococcus* species or another species of bacteria [11].

The tests carried out were as follows;

- **Coagulase test**

These test were conducted using plasma from blood composition to identify the bacterium *S. aureus*. The cultured sample was isolated from its colony with the plasma on the slide the cultured sample was placed on the slide to see whether the plasma will agglutinate [12].

- **Catalyst test**

These tests were carried out by using hydrogen peroxide for the identification of *S. aureus.* To conduct the test, the culture was isolated from its colony and a pipette was used to take some volume of hydrogen peroxide (H_2O_2) on a slide from the universal container. The cultured sample was taken from its colony and put on the slide having hydrogen peroxide. After application, resulting samples with either show effervescence or not [13].

- **Gram Staining**

This was another method used in identifying gram positive and gram negative bacterium. It was a method used alongside with other chemicals such as crystal violet, liquor iodine, acetone and safranin red.

Staining Procedures

- The sample is taken from the colony of the bacteria and mounted on the slide using some drops of normal saline (NS) and fixed on the slide with heat [14].
- Then after fixing it on the slide, the sample is been stained by applying first crystal violet for about 2 minutes, then liquor iodine for about 1 minutes, then wash the sample with acetone to remove the excess stain for about 2 minutes then after safranin red is applied for just a minute.
- After the staining is done, the sample is bolt dried for about 1 minutes and oil is applied on the slide in order for the organisms to be viewed under the microscope.

RESULTS

A total of 3 different honey varieties were used in order to assess their potency and to eliminate certain microbes like bacteria from the skin. Chi square (χ^2) test was used to analyze the association of different honey with species of bacteria and also sensitivity of these bacteria species with different honey varieties.

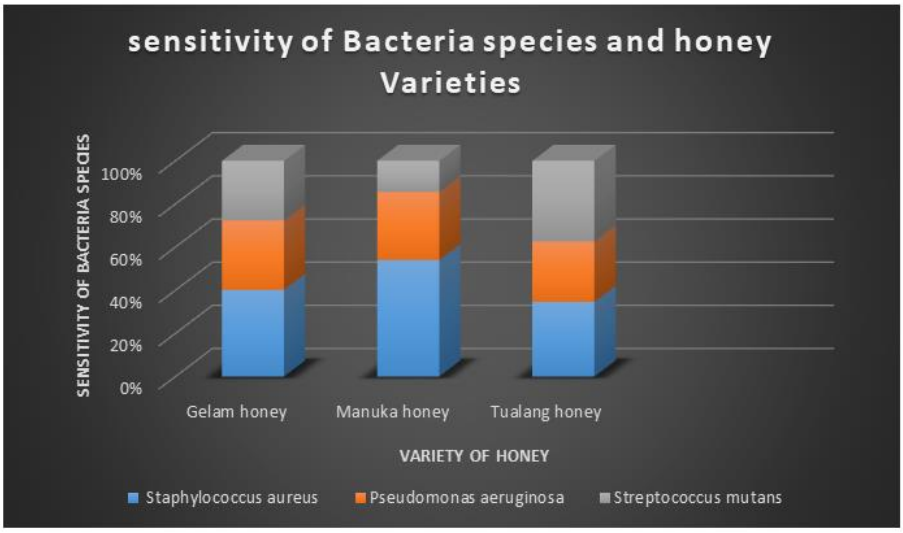

Table 1: A chart showing the sensitivity of bacteria species with varieties of honey

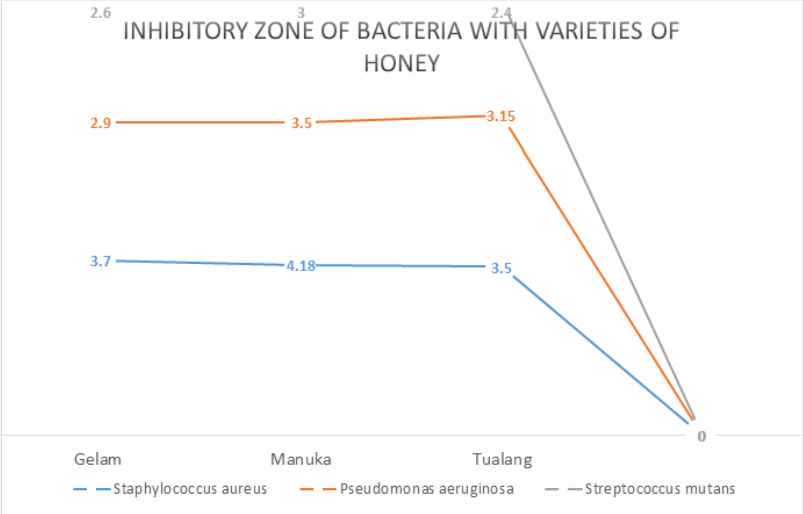

Table 2: Shows the inhibitory zones of different bacteria with varieties of honey

Table 3: Prevalence of skin infection associated with *Staphylococcus aureus* among selected hospital in Nigeria

Hospitals	**Numbers positive**	**Number Examined**	**Prevalence** (%)
National Hospital	4	49	8.16
Garki	2	62	3.22
Modern	3	19	15.79
St Mary's	1	43	2.32
Total	**10**	**173**	**5.78**

X^2=4.83, DF=3, P=0.05

Table 4: Shows the various acidic components that inhibit bacterial growth in skin tissues (in percentages)

Acidic components	**Species of bacteria**	**Inhibitory rate (%)**
Phenolic acid	*Staphylococcus aureus*	9.61±9.86
Cinnamic acid	*Streptococcus mutans*	7.61±7.76
Gallic acids	*Klebsiella pneumoniae*	7.45±7.58
Benzonic acid	*Escherichia coli*	6.65±6.87
Caffeic acid	*Bacillus subtilis*	4.91±4.71
Syringic acid	*Pseudomonas aeruginosa*	2.45±2.98
Citric acid	*Enterobacter cloacae*	3.15±3.76
Ferulic acid	*Enterococcus faecium*	5.67±5.87
Ascorbic acid	*Salmonella enterica*	4.88±4.34
Chlorogenic acid	*Staphylococcus epidermis*	2.34±2.73
Coumaric acid	*Shigella species*	3.45±3.87

Table 5: The varieties of honey used in the prevalence of skin infection associated with *Staphylococcus aureus* among selected hospital in Nigeria

	Gelam				**Manuka**				**Tualang**			
	N.H.A	**M.D**	**St.Mary**	**Garki**	**N.H.A**	**M.D**	**St Mary**	**Garki**	**N.H.A**	**M.D**	**St Mary**	**Garki**
No of cases	53	22	44	64	56	28	47	68	51	18	50	52
Skin infected With *S. aureus* (%)	32.1	45.5	47.7	40.6	44.6	50	42.6	44.1	52.9	50	77.4	51.9
No. Examined No of Positive Cases	17	10	21	26	25	14	20	30	27	9	24	27

DISCUSSIONS

In modern times, honey potency in medical field has been enormous in dealing with many wound and skin complications caused by microbes. Due to its acidic nature, many microorganisms are not seen wandering in its mixture but aids in elimination of certain microbes. Healing properties are in many areas even in traditional medicine for gastric ulcer and also in relieving pain. Manuka honey in recent times constitutes mostly of high acidic content, Jarrah honey

is used in ant fungal inflammation of skin and so on. The potency is also due to chemical nutrient such as vitamins, amino acids etc. Evidence confirming the use of honey in all areas of clinical practice is needed. Studies revealed that the medicinal effect of honey may be due to of its antibacterial, anti-inflammatory, apoptotic, and antioxidant properties. This review should provide practitioner with remarkable evidence supporting the use of honey in the medical field. Although some studies have tested the efficacy of honey in relation to medical purposes, more studies are needed to cover all medicinal aspects of honey.

CONCLUSION

In summary, the remarkable action of honey in recent times is in the production of antibodies and also induction of cytokines which speed up the healing process of adverse skin complication in the macrophage or cellular structures. Unlike, other healing agent, honey gives a respiratory outburst to cell by producing glucose oxidase which give rise to osmotic outflow and bioactive compounds that gives it antibacterial properties. As honeys from diverse floral origins have been shown to have antimicrobial activity against a range of skin relevant microbes, research should continue to investigate the efficacy of honey in the treatment of other types of skin disorders where microbes have been implicated in the pathophysiology of the disease. There are countless varieties of honeys being produced worldwide, and some may have superior antimicrobial activities that are yet to be discovered.

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