

Efficacy of Syrian Propolis Against Several Bacterial Strains

Rim M. Harfouch^{1*}, Rawan Fead¹, Lubana Hammoud¹ and Nora Harfouch²

¹Department of Biochemistry and Microbiology, Faculty of Pharmacy, Al Andalus University, Tartous, Syria

²Department of Dermatology, Faculty of Medicine, Tishreen University, Latakia, Syria

ABSTRACT

Propolis is a natural material that can be found in bee honey. It has many medical uses due to its antibacterial activity. In this study we aimed to estimate the antibacterial efficacy of three propolis extracts using three different solvents (Ethanol, Methanol and Ethyl Acetate). We experienced the three extracts on four different strains of bacteria (Klebsiella pneumonia, Ecoli, Pseudomonas aruginosa & Staphylococcus aureus). The results indicated that all the studied propolis extractions do not have any efficacy on Klebsiella neither on Ecoli. The methanolic extract has the greatest effect on Staphylococcus aureus as well as on Pseudomonas aruginosa in contrast of ethanolic and ethyle acetatic extracts which has no efficacy on any of the studied bacterial strains.

*Corresponding author

Rim M. Harfouch, Department of Biochemistry and Microbiology, Faculty of Pharmacy, Al Andalus University, Tartous, Syria. E-mail: rimharfouch@au.edu.sy

Received: November 15, 2020; **Accepted:** December 03, 2020; **Published:** December 21, 2020

Keywords: Propolis, Antibacterial Activity, Solvent, Extract, Inhibition Zone, Mep, Eep, Acep.

Introduction

Propolis is a natural resin material that is rich of effective compounds like flavanones such as Naringenin, pinobanksin, pinostrobin, pinocembrin and sakuranetin [1]. It is widely used for the prevention and treatment of many diseases [2]. The propolis extract is used as an antibacterial, disinfecting, and anti-inflammatory in oral preparations such is toothpastes [3]. Its antibacterial efficacy is due to the presence of the flavor galagin especially on Encountered cocci and Gram positive bacteria [4].

Propolis also contains aromatic acids such as caffeic, cinnamic, comaric and ferulic in addition to esters such as benzyl caffeate, benzyl coumarate and caffeic acid phenethyl ester [5]. The recent in vitro studies has confirmed the antibacterial, antifungal, anti-inflammatory, antiviral and anti-cancer activity of propolis such as its effect on human lung cancer which is still being studied [3].

Its special effect was observed on bacterial species, with significant effect on Gram positive bacteria including the human tubercle bacillus, but only limited activity against Gram negative bacilli and the therapeutic effectiveness is due to a combination of several active substances and not to a single effect of one substance [6,7].

In this study, we aimed to evaluate the antibacterial effect of three different extracts of propolis, which were introduced with three types of solvents (Ethanolic extract, Methanolic extract and the Ethyl acetatic extract on four different bacterial strains: E.coli, Klebsiella, Pseudomonas aeruginosa and Staphylococcus aureus.

Materials and Methods

Preparation of extracts

The propolis sample was obtained from Tartous, Syria in September 2019. To prepare the ethanolic extract, the propolis was crushed into soft powder and there after 5g of the propolis powder was mixed with 20 ml of 95% of ethanol to obtain 25%(w/v) propolis extract.

The same thing was done with the other two extracts but the only difference was the solvents, for example in the second extract we mixed the propolis powder with 20ml of methanol and in the third extract we mixed it with 20ml of ethyl acetate.

Extractions were carried out at room temperature in the dark for 7 days with periodical hand shaking of the extractions. The extractions were centrifuged and the supernatants were termed as an ethanolic extract of propolis (EEP), methanolic extract of propolis (MEP) and ethyl acetatic extract of propolis (ACEP). The concentration of the three extracts was 25%. Then each sample was filtered by a 0.45 micrometer filter and collected into a sterile tube.

Preparation of Mueller-Hinton medium

We suspended 38 grams in 100 ml distilled water, heated until boiling to dissolve the medium and then we sterilized the media by autoclaving at 15 lbs pressure (121°C) for 15 minutes. Suspensions of microorganisms containing 10⁶ cells/ ml were inoculated onto plate surfaces with a sterile cotton swab. Test plates (diameter 10 cm) were prepared with 20 ml of Mueller-Hinton agar (himedia laboratories pvt.ltd), and holes of 6 mm in diameter were punched in the agar plates using cork borer [8]. Each hole was filled with 50 µl of EEP. The diameters of the growth inhibition zones around the holes were measured after incubation for 24 h at 37°C.

Results

When the inhibition zone of propolis extract against both bacterial groups was greater than 6 mm is considered active.

Table 1: Diameters of inhibition zone of propolis extracts on bacterial strains

	EEP	MEP	ACEP
<i>Escherichia coli</i>	-----	11 mm	-----
<i>Pseudomonas aeruginosa</i>	-----	12 mm	-----
<i>Staphylococcus aureus</i>	-----	15 mm	-----
<i>Klebsiella</i>	-----	-----	-----

Discussion

Our results can be very useful in order to estimate the therapeutic value of Syrian propolis as an antibacterial material. The experiment indicated that *Klebsiella* and *E. coli* are the least sensitive bacterial strains against propolis extractions. Although we find high sensitivity of *Staphylococcus aureus* and *Pseudomonas aeruginosa* to MEP.

According to the fact that *P. aeruginosa* has always been considered to be a difficult target for antimicrobial chemotherapy because of its ability to produce β -Lactamase and the low permeability of its outer membrane, Propolis with its efficacy against *P. aeruginosa* which our experiment has proved can be an important material to fight *P. aeruginosa* resistance [9].

Our results is in agreement with Grange et al. who found that dilution of 1: 20 in nutrient agar, the propolis extraction had no effect on *Klebsiella pneumoniae* [7]. Even though that our results shows no efficacy of ethanolic extracts on our studied bacterial strains.

This difference between results may be explained by the influence of the environment on the chemical composition of propolis.

References

1. Wieczynska A, Wezgowiec J, Wieckiewicz W, Czarny A, Kulbacka J, et al. (2017) Antimicrobial activity, cytotoxicity and total phenolic content of different extracts of propolis from the west Pomeranian region in Poland. *Acta Pol Pharm* 74: 715-722.
2. Loreta Kubiliene, Virginija Laugaliene, Alvydas Pavilonis, Audrius Maruska, Daiva Majiene, et al. (2015) Alternative preparation of propolis extracts: comparison of their composition and biological activities. *BMC Complementary and Alternative Medicine* 15:156.
3. Iwona Niedzielska, Zbigniew Puszczewicz, Anna Mertas, Damian Niedzielski, Bartosz Róhanowski, et al. (2016) The Influence of Ethanolic Extract of Brazilian Green Propolis Gel on Hygiene and Oral Microbiota in Patients after Mandible Fractures. *BioMed Research International*.
4. Shaimaa Obead Hasson (2014) Antibacterial Activities of Iraqi Propolis and Its Active Components Extracts on Some Bacterial Isolates (in vitro study), *world journal of pharmacy and pharmaceutical sciences* 3: 858-875.
5. Mc Marcucci (1995) Propolis: chemical composition, biological properties and therapeutic activity. *Apidologie*. Springer Verlag.
6. Rim M Harfouch, Raneem Mohammad, Hala Suliman (2016) Antibacterial activity of Syrian Propolis extract against several strains of bacteria in vitro. *World journal of pharmacy and pharmaceutical sciences*.
7. Grange JM, Davey RW (1990) Antibacterial properties of propolis (bee glue). *Journal of the Royal Society of Medicine* 83.
8. Rim M Harfouch, Manal Darwish, Wisam Al-Asadi, Ali F Mohammad, Nour M Gharib, et al. (2019) Antibacterial Activity of Essential Oils of *Rosmarinus officinalis*, *Salvia officinalis* and *Anthemis nobilis* Widespread in the Syrian Coast. *Research J. Pharm. and Tech* 12: 3410-3412.
9. Mesarosa N, Nordmann P, Plésiat P, Roussel-Delvalle M, Van Eldere J, et al (2007) *Pseudomonas aeruginosa*: resistance and therapeutic options at the turn of the new millennium. *Clin Microbiol Infect* 13: 560-578.

Copyright: ©2020 Rim M. Harfouch, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.