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Study of volatile constituents of roots of boswellia serrata and treatment of resistant gram-positive and gram negative bacteria

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Abstract
The roots of Boswellia serrata offer hydro distillation yielded 1.5% of essential oil and experimented against several grams positive and gram negative bacteria. The resource have been commited to the development of anti microbial agent with activity against these organisms. This review will focus on the newer antibacterial aga=ent that have developed for the treatment of resistant gram positive pathogens.

Keywords: boswellia serrata, essential oil, gram positive and gram negative bacteria, bacterial infections, anti-bacterial agents

Introduction
Boswellia serrata is shrub with reddish fruits. The plant belonging to family Burseraceae. The roots of plants are adjuvavtand roots are aggrieved vomit purgative cathartic and powerful brain tonic. They are rumored to be useful for treatment of joint pain, palsy etc.
In addition the oil from the roots is stomachic used in lives and disease of the skin. This drug is becoming more popular in the modern world for their application to cure variety of diseases with less toxic effects and better therapeutic effects.
In view of the following medicinal properties of the above plant was selected for the present study of the antibacterial activities.

Experiment
Essential oils have extracted by steam distillation. The soften rootsof plant was distilled. The aqueous steam distille has saturated with salt and extracted with light petroleum.
The combined oil and solvent extract had dried. The solvent has removed by evaporation under reduced pressure to give the essential oil.
Essential oil is the mixture of monotorpene, ditorpenes had sesquite repenes.
Gum portion of the drug consist of pentose and hexose sugar with the some oxiding and digestive enzymes. Resin portion mainly composed of pentacyclic triterpene acid of of which Boswellic acid is mainly segment

Microorganism
Detached separate of gram positive (Bacillus subtitles, streptococcus areas) and gram negative (Ecoli, Klebsiella, Pneumonia and Pseudomonas aeruginosa) actual bacterial strains were used in the study which are obtained from AG College Indore. The stock culture maintained at division of Animal Biotechnology, DAVV University. All microorganisms were maintained at 3ºC on nutrient agar slants.

Preparation of Bacterial Suspension
The murky of each of the following bacterial suspension was prepared to match the 90.5 Mc Farland standard (1.8×10^{10} CFU\ml)
Measure the murky with aid of a spectrophotometer at an optical density 0.06-0.14 and murgid suspension at 730 nm as per Bauer-Kirby method (1996)

Anti-Bacterial Effects
Essential oil have tested against pathogenic bacteria for their antimicrobial effect using well diffusion gathering method
The medium used throughout the experiment was Indian made nutrient agar. The highest antimicrobial activity was observed on E-coli with zone of inhibition as 22.86 ± 0.96 and lowest effect was an Earogenes with zone of inhibitition of 12.58 ± 1.5mm. Whereas standard showed highest activity against Eaerogenes (35.27 ± 1) and lowest activity against. Pneumonial (22.06 ± 0.72).
The organism were tested staphylo cocci and streptococci, Entercocci, corybacteria, clostridia, Ecoli, Pseudomonas, Salmonella, anaerobic bacteria etc.
Minimum inhibitory concentration is defined as the lowest concentration that will inhibit the growth of the test organism over a definite period related to organism growth rate mostly 16-20 hours

Table 1: Minimum Inhibitory Concentrations (MIC)

S. No.	Test Organism	G+\G-	I	II	III	IV
1	Bacillus subtilis	G+	++	+	+	*
2	Staphyloccus aureus	G+	+	+	*	-
3	Streptococcus Pneumoniae	G+	+	+	+	*
4	Escherichia coli	G-	+	*	-	-
5	Klebsiella pneumoniae	G-	++	+	-	-
6	Pseudomonas aeruginosa	G-	++	+	+	+
7	Enterobacter aerogenes	G-	++	++	-	*

I = 25mg/ml; II =50 mg/ml; III =75 mg/ml; IV =100 mg /ml,*=MIC, - = No growth, + = Moderate growth, ++ =Dense growth, G+ = Gram Positive bacteria, G- = Gram Negative bacteria,

Table-2: Gram positive and gram negative bacterial activity of essential oil of Boswellia serrata roots.

Gram-Positive			Gram-negative		
Bacteria	**Commonly found in**	**Common treatment**	**Bacteria**	**Commonly found in**	**Common treatment**
Staphylococci & streptococci	Skin and wound infections	**Vancomycin, Teicoplanin, Gentamicin (staphylococci only).** **Resistant to:** Cephalosporins, metronidazole **(except clostridia)**	**The Coliform bacteria;** *E. Coli, Klebsiella, enterobacter, salmonella*	The Gut! UTI, also can cause ventilator assisted pneumonia, wound infection, biliary tract infection, septicaemia	Cephalosporins, gentamicin, ciprofloxacin, tazocin, imipenem, trimethoprim **Resistant to:** amoxicillin,
Staph, Enterococci, corynebacteria	Line related infection		Pseudomonas	Moist environments – **chronic leg ulcers.** Catheters, pneumonia, septicaemia, CF/bronchiectasis	Aminoglycosides, cipro, tazocin, imipenem **Resistant to:** Most other AB's
Clostridia	Gangrenous wound infections, **abdominal infections**		**Bacteroids** – anaerobic bacteria	Intra-abdominal infections, soft tissue infection below the waist	Metronidazole, co-amoxiclav, imipenem, Tazocin, clindamycin **Resistant to:** Benzylpenicillin, amoxicillin, cefuroxime, gentamicin, quinolones, macrolides

Antibiotic Spectrum

The range of bacteria or other microorganism that are affected by a certain antibiotic is expressed as its spectrum of action. Antibiotic which kill or inhibit a wide range of gram positive and gram negative bacteria are said to be broad spectrum antibiotics. Those effective mainly against gram positive or gram negative bacteria are narrow spectrum antibiotics. If effective a single organism or disease they are referred toas limited spectrum.

Table 3: Antibiotics spectrum of gram positive and gram negative bacteria

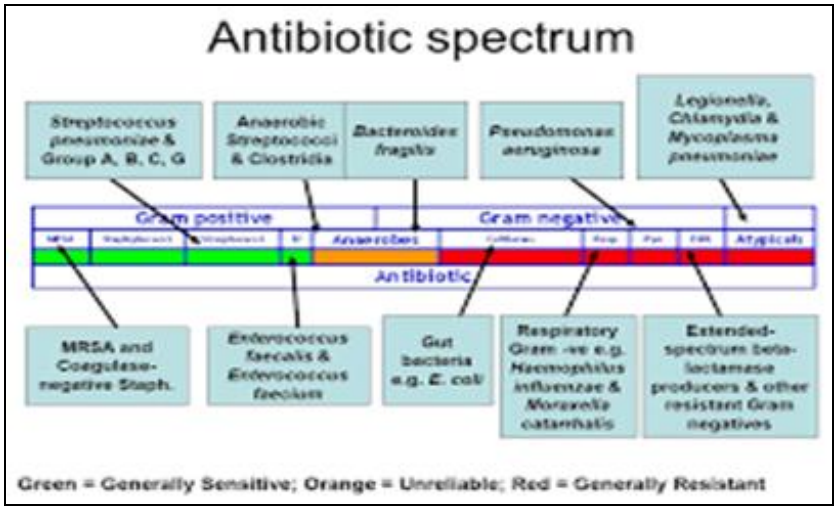
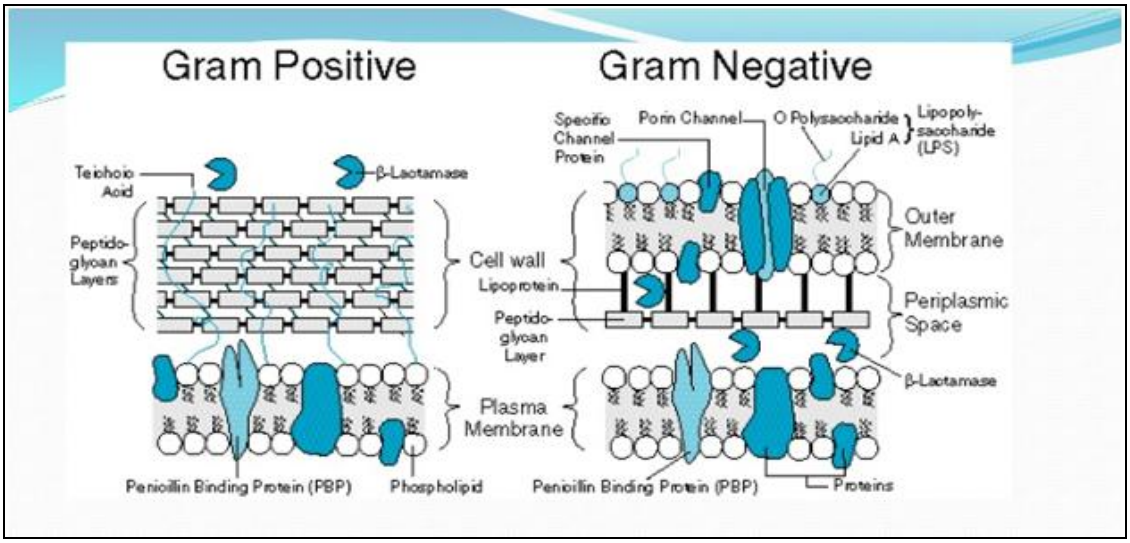


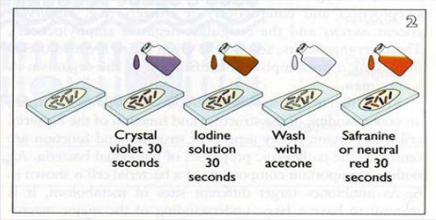
Table 4: Comparison of the structure and composition of gram-positive and gram-negative call walls

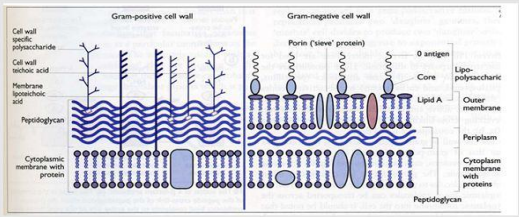


Further categorization is based on their target specificity: narrow-spectrum antibiotics target particular types of bacteria, such as Gram-negative or Gram-positive bacteria, while broad-spectrum antibiotics affect a wide range of bacteria.

Gram-staining: A test, resulting in the classification of bacteria, developed in the last century by Hans Christian Gram, a Danish microbiologist:

- **Gram positive bacteria will retain the original blue stain**
- **Gram negative bacteria will lose the blue stain upon intermediate acetone treatment and will stain red**





Gram staining differentiates bacteria by the chemical and physical properties of their cell walls by detecting peptidoglycan, which is present in a thick layer in gram-positive bacteria. In a Gram stain test, gram-positive bacteria retain the crystal violet dye, while a counterstain (commonly safranin or fuchsin) added after the crystal violet gives all gram-negative bacteria a red or pink coloring.

The Gram staining is a valuable diagnostic tool in both clinical and research settings, not all bacteria can be definitively classified by this technique.

Result and Discussion

The entire above organism studied are human pathogens from the results it is clear that essential oils are effective and remarkable antimicrobial activity performed on aqueous fraction of 30,50,70 and 100 mg\mL of Boswellia serrata, traditionally important medicinal plant provide to be bacteria statics agent. The current work will provide new reference data for the drug development and possesses the ability inhibit pathogenic bacteria.

Conclusion

Root gum of Boswellia serrata has been used in traditional and modern natural medicine for the treatment of variety of illnesses with very minimum side effects. The anti-inflammatory, anti-arthritic, anti-microbial and analgesic effects of this gum resin can reduce inflammation and pain in the body and relieve the related symptoms of many diseases.

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