The Antimicrobial Activity of Sapindus mukorossi

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Abstract
The emergence of bacterial resistance to existing antibiotics makes the need for new antibiotics essential. After years of extensive research on soil microorganisms, we need to look for new sources of antibiotics. There are limited reports of antimicrobials from plants. Soapnut, Sapindus mukorossi, has been used in traditional South Asian culture as a skin cleanser and a laundry detergent. Therefore, we hypothesized that the soapnut seed has antibacterial activity. Soapnut seeds were ground in 95% ethanol or acetone to a final concentration of 430 mg/mL. The extracts were tested against the gram-negative bacteria Salmonella enterica and Escherichia coli and gram-positive Staphylococcus aureus in a disk-diffusion test. The ethanolic extract inhibited Salmonella. The minimum bactericidal concentration against Salmonella is 500 mg/mL; no lethal concentration was found. Bacteriostatic compounds will be isolated by paper chromatography.

Methods & Materials
Preparation of Soapnut Extract
1. Dried Sapindus mukorossi fruits were purchased whole from local markets.
2. The soapnut extract was prepared by first breaking the soapnut with a hammer. The contents were then separated into the pericarp, endocarp, and seed (Figure 1). 3 g soapnut seed was ground in 4 ml of 95% ethanol or acetone to a final concentration of 430 mg/mL.

Screening
1. Antibacterial testing was done by disk-diffusion assays (Figure 2) on nutrient agar against gram-negative Salmonella enterica (ATCC 14028) and Escherichia coli (ATCC 17755), and gram-positive Staphylococcus aureus (ATCC 29213). The minimum inhibitory concentration and the minimum bactericidal concentration were determined by serial dilutions using the ethanolic extract (430 to 500 mg/mL) in nutrient broth in a cell well plate. Each well was inoculated with 50 µL of Sa. enterica. Wells with no growth were subcultured into nutrient broth.

Isolating Active Compounds
1. The ethanolic extract was separated by paper chromatography in isopropanol:ammonium hydroxide.
2. The paper chromatography paper was cut into 1 cm pieces and used in a disk diffusion assay against Sa. enterica (Figure 3).

Determination of a Bacterial Growth Curve
1. Nutrient broth with 340 mg/mL ethanolic soapnut extract was separated by paper chromatography. Antibacterial compounds (at the arrow) were isolated by paper chromatography.

Results
• The ethanolic extract of soapnut seed (340 mg/mL) inhibited the growth of the gram-negative bacteria, Sa. enterica (Figure 2). There was no inhibition of E. coli and Sa. aureus.
• The MIC of the ethanolic extract against Sa. enterica is 500 mg/mL; no lethal concentration was found.
• Antibacterial compounds were found at Rf values of 0.85 and 0.97 (Figure 3).
• The growth rate of Sa. enterica in 340 mg/mL ethanolic soapnut extract was not affected (Figure 4).

Discussion & Conclusion
• In Southern Asia, S. mukorossi has been used as a washing agent and S. saponaria has been used in the American Southwest to treat gastrointestinal ailments.
• Plants that contain saponins are known to have antimicrobial activity.
• Our research shows that an ethanolic extract of soapnut seed inhibits the gram-negative bacterium Sa. enterica.
• The Antimicrobial Activity of Soapnut. The extracts were separated by paper chromatography in isopropanol:ammonium hydroxide.

Figure 1. Soapnut or Chinese soapberry, Sapindus mukorossi, is in the family Sapindaceae. The plant is indigenous to India, China, and Nepal. The soapnut seed consists of a pericarp, endocarp, and seed.

Figure 2. Salmonella enterica was inhibited by the soapnut seed extract (430 mg/mL) in a well diffusion.

Figure 3. Antibacterial compounds (at the arrow) were isolated by paper chromatography.

Figure 4. The growth rate of Sa. enterica in 340 mg/mL ethanolic seed extract was not affected.

Future Studies
• The effects of a higher concentration of the ethanolic seed extract on bacterial growth will be studied.
• The method of action of the ethanolic extract will be determined.

Literature Cited

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