



# Antimicrobial Activity of the Aqueous Extract of Acacia (*Acacia Nilotica*) in Inhibiting the Growth of Some Pathogenic Bacterial Strains

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The study was conducted in the laboratory of the Department of Biology at the College of Science and Arts in Baljurashi- Baha Region-Kingdom of Saudi Arabia. The aim of the research was studying the effectiveness of the aqueous extract of the Acacia plant *Acacia Nilotica* on the growth of some of pathogenic bacteria strains and comparing it with Myrrha essential oil (*Commiphora Myrrha*). The result indicated that the aqueous extract of the Acacia plant (*Acacia Nilotica*) has a potent antimicrobial activity against all tested organisms except *Pseudomonas spp.* which showed resistance against it. The inhibitory level among all tested organisms (*Stenotrophomonas spp.*, *Achromobacter spp.*, *Shewella spp.*, *Pseudoxanthomonas spp.*, *Pseudomonas spp.*, *Bacillus spp.* were 14 , 28, 16, 20, 0 and 12 mm respectively. The highest antibacterial effect was against *Achromobacter spp.* where the inhibition zone (28mm) and the lowest antimicrobial effect was against *Bacillus spp.* where the inhibition zone (12mm). By the other hand Myrrha (*Commiphora Myrrha*) essential oil was very weak or did not cause any inhibition in the tested strains. More studies are needed to determine the antimicrobial activity of aqueous extract of the Acacia plant on other organisms which cause food spoilage, poisoning and food borne diseases.

**KEYWORDS:** Aqueous Extract, *Acacia Nilotica*, *Commiphora Myrrha*, Pathogenic Bacterial Strains

## INTRODUCTION

Medicinal plants have been discovered and used in traditional medicine practices from ancient times before modern medicine existed.<sup>1</sup> Herbal medicines are classified as any products originating from plants and used to preserve or recover health, as described by the National Institutes of Health.<sup>2</sup> Medicinal plants are widely used as folk medicine because they are readily available and cheaper than modern medicines.<sup>3</sup> Plant synthesize hundreds of chemical compounds for various functions such as protection against bacteria, fungi, and insect. Some herbs are rich in volatile oil or essential oils which have been extensively investigated for their activity against a number of microorganism.<sup>4</sup>

*Acacia Nilotica* is a thorny tree with yellow flowers. it grows in the dry areas of Africa, Australia, the Arabian Peninsula and India, this plant has a long history in ancient civilizations, especially among the ancient Egyptians, Sudanese and the indigenous tribes in Australia. *Commiphora Myrrha*, is the tree used in the production of myrrh, a resin made from dried tree sap. The tree is native to the Arabian peninsula, Oman, Yemen and in Africa (Djibouti, Ethiopia, Somalia, Northeast Kenya) It is called 'Myrrh' in Arabic, meaning bitter.<sup>5</sup> Due to the medical properties of these plant they have been used to treat many medical

conditions, such as respiratory infections sore throats, and wounds.<sup>6</sup>

Bacteria classified into various categories based on their features and characteristics. *Stenotrophomonas* is a genus of Gram-negative bacteria. The most common species of the genus is *Stenotrophomonas maltophilia*, and is the only known pathogenic species. *Stenotrophomonas maltophilia* is a rare but serious bacterium that can infect the bloodstream, joints, and skin . It is difficult to treat and is often resistant to antibiotics.<sup>7</sup> *Achromobacter* is a genus of bacteria, is a Genus Gram-negative bacteria. They have been identified as opportunistic human pathogens in people with certain immunosuppressive conditions such as cystic fibrosis, cancer and kidney failure.<sup>8</sup> *Bacillus*, genus of gram-positive bacteria widely found in soil and water. Some types of *Bacillus* bacteria are harmful to humans, plants, or other organisms. Example, *B. cereus* it causes spoilage in canned foods and food poisoning of short duration.<sup>9</sup>

## AIM

The research aimed to prepare extract of the Acacia tree by using the aqueous extraction method then study the effect of the extract on the growth of bacteria



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strains and compare it by Myrrh oil manufactories by now company.

## MATERIALS AND METHOD

**1. Extraction method:** Fresh *Acacia* plant was obtained from Wad Medani-Sudan- local market and prepared by washed and dried in a well-ventilated, dark place, then grounded. The aqueous extract of the *Acacia* plant was prepared according to methods described by Swanston et al.<sup>10</sup> 5 grams of plant material were soaked in 100 ml of distilled water for two hours on a vertical shaker, then leaving it for 24 hours in a dark place, then filtering the liquid in two stages, the first through a muslin sieve and the second through a filter paper. The resulting concentration is 100%.

**2. Testing the effectiveness of the aqueous extract:** The aqueous extracted of *Acacia* plant was tested against standard organism which include *Stenotrophomona spp*, *Achromobacter spp*, *Shewa Nell spp*, *pseudoxanthomas spp*, *Pseudomonas spp*, *Bacillus spp*. The cup-plate agar diffusion method was adopted with some minor modification to assess the antibacterial activity of the prepared extract. Two ml of the standardized bacteria stock suspension contains (10<sup>8</sup> -10<sup>9</sup>) colony forming units per ml (CFU), were thoroughly mixed with 200ml of sterile molten nutrient agar, which was maintained at 45°C. Twenty ml aliquots of the inoculated agar were distributed into sterile Petri dishes. The agar was left to set and each of these plates (10 mm in diameter). Alternate cups were filled with 0.1ml sample of each of the extracts using adjustable pipette, and allowed to diffuse at room temperature for two hours. The plates were then incubated in the upright position at 37°C for 10 hours.<sup>11</sup>

Two replicates were carried out for extract against each of the tested organism. After incubation, the diameter of the resultant growth inhibition zones was measured,

averaged and the mean values were calculated. The result was interpreted in terms of the commonly used terms (sensitive) and (resistance).

## RESULTS AND DISCUSSION

Table 1 shows the antibacterial property of *Acacia* aqueous extract against standard organisms while table 2 shows the antibacterial property of Myrrha essential oil against standard organisms.

The results indicated that *Acacia* extract has apparent antimicrobial activity against tested organisms. While the effect of Commiphora Myrrha essential oil was very weak or did not cause any inhibition in the tested strains. The *Acacia* extract showed potent antibacterial activity against *Stenotrophomona spp*, *Achromobacter spp*, *Shewa Nell spp*, *pseudoxanthomas spp*, *pseudomonas spp*, *bacillus* where the inhibition zones were 14, 28, 16, 20, 0 and 12 mm respectively. This result agreed with Madkour, Mohamed Hussein<sup>9</sup> who evaluated the activity of three plant products of Al-Ashar, *Acacia* and Al-Sanamaki on some bacterial strains (*Escherichia coli*, *Salmonella Typhimurium*, *Staphylococcus aureus subsp. aureus* and *Bacillus cereus*). He stated that *acacia* extract achieve complete inhibition in the case of *Staphylococcus aureus subsp. Staphylococcus aureus*, *Salmonella typhimurium*. This result was also complied with Arun A et al.<sup>13</sup>, who stated that the extract of *Acacia Nilotica* exhibited potent antibacterial activity against all the clinically important bacteria and fungal species with zone of inhibition (22 mm) against *Bacillus* in extract of methanol and chloroform [(75:25), Figure 1 and 2)].

## CONCLUSION

The study pointed out the importance of use *Acacia* and *acacia* extract as an antimicrobial agent. More studies are needed to determine the antimicrobial activity of aqueous extract of the *Acacia* plant on other organisms which cause food spoilage, poisoning and

Bacteria strain	Aqueous extract of ( <i>Acacia Nilotica</i> ) concentration	Inhibition zone	Sensitive-resistance
<i>Stenotrophomona spp.</i>	100%	14 MM	SENSITIVE
<i>Achromobacter spp.</i>	100%	28 MM	SENSITIVE
<i>Shewa Nell spp.</i>	100%	16 MM	SENSITIVE
<i>Pseudoxanthomas spp.</i>	100%	20 MM	SENSITIVE
<i>Pseudomonas spp.</i>	100%	0	RESISTANCE
<i>Bacillus spp.</i>	100%	12MM	SENSITIVE

Table 1. Antibacterial property of *Acacia* aqueous extract against standard organisms

Bacteria strain	Aqueous extract of ( <i>Acacia Nilotica</i> ) concentration	Inhibition zone	Sensitive-resistance
<i>Stenotrophomona spp.</i>	100%	o	RESISTANCE
<i>Achromobacter spp.</i>	100%	o	RESISTANCE
<i>Shewa Nell spp.</i>	100%	o	RESISTANCE
<i>Pseudoxanthomas spp.</i>	100%	o	RESISTANCE
<i>Pseudomonas spp.</i>	100%	o	RESISTANCE
<i>Bacillus spp.</i>	100%	o	RESISTANCE

Table 2. Antibacterial property of Myrrha aqueous extract against standard organisms

food borne diseases.



Figure 1. Inhibition zoon of acacia Aqueous extract *Achromobacter spp.*



Figure 2. Inhibition zoon of acacia Aqueous extract against *Pseudoxanthomas spp.*

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