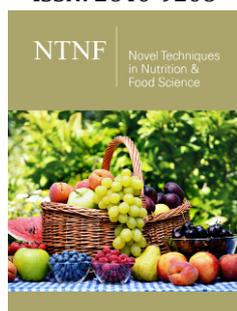


Antimicrobial Activity of *Moringa Oleifera*

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Abstract

Moringa oleifera is a tree native to the Himalayas but has been introduced to various regions of America, it has antimicrobial, nutritional, antioxidant and therapeutic properties. The objective of this study was to evaluate the minimum inhibitory concentration of ethanolic extracts of *Moringa oleifera* leaves on *Staphylococcus epidermidis* and *Enterococcus faecalis*. In the study it was observed that in *S. epidermidis* the inhibition was similar in all concentrations, and for *E. faecalis* inhibition was only observed in the test with the pure extract. Therefore, it is important to evaluate the inhibitory effect of *Moringa oleifera* on other pathogenic strains, as well as the identification of the components that caused the inhibition.

Keywords: Antimicrobial activity; Extracts; *Moringa oleifera*

Introduction

Moringa oleifera is a fast-growing tree that usually reaches 10 to 12m in height, which is native to the Himalayas but has been introduced to various regions of America [1]. A very important characteristic of *Moringa oleifera* is its ability to resist drought and its agronomic potential, being a cultivable tree in arid and semi-arid regions. This is of particular importance because today it is known that climatic conditions are no longer governed by the seasons, as with the passage of time the seasons of the year have radically changed from a hot climate in winter to a drought in summer [2]. The different parts of *M. oleifera* contain more than 40 compounds with antioxidant activity, these extracts inhibit lipid peroxidation. Likewise, the phenolic and flavonoid compounds contained in the leaves have great antioxidant power. The antioxidant activity of moringa leaves varies depending on agroclimatic and seasonal conditions.

On the other hand, the use of *Moringa oleifera* for the control of various infections caused by microorganisms is well known, and in recent years scientific results have been generated that confirm its antimicrobial activity. *In vitro* studies have verified the activity of different parts of the plant on pathogenic microorganisms. Chuang et al. [3], demonstrated the antifungal activity of essential oils of the leaves, and of alcoholic extracts of the seeds and leaves against dermatophytes. The main compound responsible for the antimicrobial activity is benzyl 4-(4'-O-acetyl- α -L-rhamnopyranosiloxy)-benzil isothiocyanate, which has bactericidal action on several pathogenic species, including isolates of resistant *Staphylococcus*, *Streptococcus* and *Legionella* antibiotics. Due to the above, the objective of this study was to evaluate the minimum inhibitory concentration of ethanolic extracts of *Moringa oleifera* leaves on *Staphylococcus epidermidis* and *Enterococcus faecalis*.

Materials and Methods

Plant extraction

Moringa oleifera leaves were collected in the town of Oxkutzcab, during the month of March. They were transferred to the Microbiology laboratory of the Instituto Tecnológico Superior del Sur del Estado de Yucatán. They were washed with purified water, then placed in a drying oven at 45 °C for 25min. They were cut in order to obtain uniform particles to facilitate the extraction process, 15g of leaves were macerated in 60mL of 96% ethanol and stored for a period of fifteen days. At the end of the specific days of storage, the extracts were

filtered, then ethanol was removed in a water bath at a temperature of 65 °C for 3 sessions of 5 hours each.

Antimicrobial activity

The inhibition caused by the extracts on the bacteria *Enterococcus faecalis* (ATCC 29212) and *Staphylococcus epidermidis* (ATCC 12228) was evaluated. The diffusion agar method was used with its modifications, according to Ericsson and Sherris, (1971). Each pathogenic strain was cultured in boxes with 20mL of LB medium (Luria-Bertani), using the exhaustion streak technique, and incubated at 37 °C for 24h. Cells were adjusted at a concentration of 1×10^8 CFU/mL, at an absorbance of 0.1 with a wavelength of 600nm. The antimicrobial activity was evaluated in the strains grown in LB medium, using sterile paper discs (Whatman#1) of 8mm diameter, immersed in the pure extract and with dilutions of 1:10 and 1:100. The cultures were incubated for 24 hours at 37 °C. Penicillin was used as a positive control and ethanol as a negative control. The zones of growth inhibition were expressed in millimeters (mm).

Result

The antimicrobial activity of *Moringa oleifera* leaf extracts was determined on the bacterial strains *Enterococcus faecalis* and *Streptococcus epidermidis*, after 24 hours of incubation the zones of growth inhibition were measured and was observed that the *Moringa oleifera* leaf extracts had an inhibitory effect in the growth of both bacteria (Table 1). In Figure 1 it can be seen that in *S. epidermidis* the inhibition was similar in all concentrations, and for *E. faecalis* inhibition was only observed in the test with the pure extract. In recent years, various authors have studied the antimicrobial effects of moringa leaf extracts. In 2011, in the African country of Kenya, a study was carried out to determine the antimicrobial activity of seed extracts in bacteria such as *S. typhi*, *Vibrio cholerae* and *E. coli*, registering inhibitions of up to 56% [4]. Likewise, the antimicrobial effects of the biocomponents of the moringa seed film and pod have been evaluated, showing inhibition on *Pseudomonas aeruginosa*, *E. coli*, *Staphylococcus aureus* and *Klebsiella pneumoniae* [3,5].

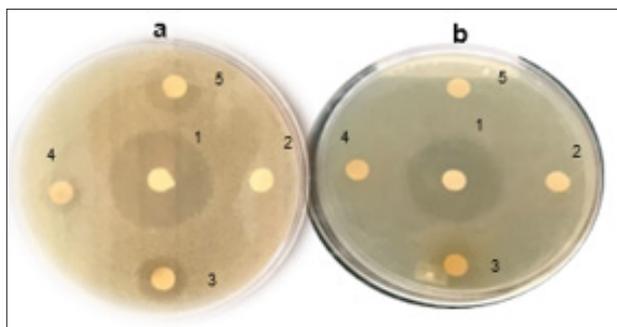


Figure 1: Effect of the inhibition of ethanolic extracts of *Moringa oleifera* leaves on *S. epidermidis* (a) and *E. faecalis* (b). Positive control (1), negative control (2), pure extract (3), 1:10 dilution (4), 1: 100 dilution (5).

Table 1: Inhibitory effect of *Moringa oleifera* extracts.

Micro Organism	Inhibition (mm)		
	Pure Extract	1:10 Dilution	1: 100 Dilution
<i>S. epidermidis</i>	10	7	13
<i>E. faecalis</i>	9	x	x

Conclusion

The ethanolic extracts of the leaves of *Moringa oleifera* inhibited the growth of the bacterial strains *S. epidermidis* and *E. faecalis*, in the first case similar zones of growth inhibition could be observed in all concentrations and for *E. faecalis* antimicrobial activity was only observed in pure concentration. It is important to evaluate the inhibitory effect of *Moringa oleifera* on other pathogenic strains, as well as the identification of the components that caused the inhibition.

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