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Research Article

Pharmacological Effect Of Modified Mineral Clays Using Cotton Seed Oil And Glycyrrhiza Glabra

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ABSTRACT

The use of eco-friendly mineral clay to heal bacteriological infections has been marked, since the first recorded history, and specific clay minerals may prove valuable in the treatment of bacterial diseases, including infections for which there are no active antibiotics, such as multi-drug resistant toxicities. The aim of this study is to identify new inhibitory agents in an era when bacterial antibiotic resistance continues to challenge human health and the availability of new antimicrobial compounds is limited. Cotton seed oil and *Avaramsenna* were chosen for the modification if clay minerals.Our results indicated that mineral clay could provide an alternative treatment against numerous human bacterial infections.Understanding the antibacterial mechanism of natural clays can lead to their safe use or design of new antimicrobial products.

KEYWORDS: antimicrobial, diseases, heal, mineral clay, liquorice, cotton seed oil, *Glycyrrhizaglabra* and understanding.

1. INTRODUCTION

Clay minerals are naturally abundant alumina-silicates that often occur as deposits in many parts of the world (Awokunmi and Asaolu, 2017). They are found in nature either as large or small deposit covering of the earth surface. They form a major part of soils in which plants grow and they are the primary raw materials in various industrial products such as adsorbents, cosmetics, pharmaceuticals, paints, veterinary medicine and biocides (Carretero, 2002; Zhant *et al.*, 2007; Parolo *et al.*, 2011; Adekeye *et al.*, 2019). Both raw and modified clay minerals as well as materials synthesized from minerals such as kaolinite and steatite have long been used in many parts of the world to treat several human diseases and ailments including those of the digestive tract (Ferrell, 2008).

The diversity of clay mineral applications can be attributed to their chemical, geotechnical, and biological characteristics. Clay minerals consist of various elements including the transition metals (Adekeye *et al.*, 2019). These elements may either be beneficial or toxic to microorganisms. Some elements may serve as sources of minerals for various biological functioning while others may be toxic to the organisms (Prescott *et al.*, 1999; Li, 2002; Morrison *et al.*, 2014).Chemical nature of clay minerals greatly influences the type of microorganism that can inhabit the minerals phyllo sphere and environment.

Aim of the present study was designed to evaluate the antimicrobial potential of modified Kaolinite, Bentonite, Pyrophyllite and Local clay using *Glycyrrhizaglabra* and cotton seed oil against *Pseudomonas aeruginosa, Staphlococcusaureus*and *Aspergillusflaves.*

2. MATERIALS AND METHODS

2.1 MATERIALS

Kaolin, bentonite, pyrophyllite clays were obtained from Indian clays limited, Thiruvananthapuram and the Local clay were collected from our area.

Pseudomonas aeruginosa (gram-negative), *Staphlococcusaureus* (gram-positive), *Aspergillusflaves,* were grown in the Kirby-Bauer Method (Scudder Diagnostic Centre).

2.2 METHODS

A) ANTIMICROBIAL ACTIVITIES

Pseudomonas aeruginosa (gram-negative), *Staphlococcusaureus* (gram-positive), *Aspergillusflaves*, were used in this study the Kirby-Bauer method.

B) THE KIRBY-BAUER METHOD (1966)

The medium is prepared and sterilised as directed by the manufacturer. Defibrinated blood may be necessary for tests on fastidious organisms, in which case the medium should be allowed to cool to 50^{o} C before 7% of blood is added. Human blood is not recommended as it may contain antimicrobial substances; the medium should be poured into Petri dishes on a flat horizontal surface to a depth of 4 mm (25ml in an 85 mm circular dish, 60ml in a 135 mm circular dish). Poured plates are stored +4^{o} C and used within one week of preparation.

Before inoculation plates should be dried with lids ajar so that there are no droplets of moisture on the agar surface. The time to achieve this depends on the drying conditions. The pH of the medium should be checked at the time of preparation and should be 7.2 to 7.4 (Bauer *et al.*, 1966).

3. RESULTS AND DISSCUSSIONS

3.1. Pharmacological screening assay of modified clay minerals using medicinal plants

All the antimicrobial agents showed comparatively very good inhibition against the fungi and bacteria. The inhibition zone of Nystatin (control) against *Asperigillusflavus* was medium than that of the other antifungal agents (Kaur *et al.*, 2012).

Table 3.1: Antimicrobial effect of modified clay using cotton seed oil

S. No.	Micro Organisms used	*Pseudomonas aeruginosa*	*Staphlococcusaureus*	*Aspergilusflavus*
1	KS	19 mm	17 mm	12 mm
2	LS	21 mm	19 mm	11 mm
3	BS	18 mm	14 mm	13 mm
4	PS	19 mm	10 mm	14 mm

5	Control	16 mm	17 mm	15 mm

Figure 3.1: Antimicrobial activities of modified clay minerals using cotton seed oil

The figure 3.1 shows the antibacterial activity of modified clay using cotton seed oil in a sterile environment and performed against two bacterial strains and one fungal strains of clinical interest. The kaolinite modified clay using cotton seed oil showed slightly good inhibition rate against all the bacteria and fungi (*Pseudomonas aeruginosa* 19 mm, *Staphylococcus* 17 mm and *Aspergillusflaves*12 mm). The modified local clay using cotton seed oil showed slightly good inhibition rate against all the bacteria and fungi (*Pseudomonas aeruginosa* 21 mm, *Staphylococcus* 19 mm and *Aspergillusflaves*11 mm).

The modified bentonite clay using cotton seed oil showed slightly good inhibition rate against all the bacteria and fungi (*Pseudomonas aeruginosa* 18 mm, *Staphylococcus* 14 mm and *Aspergillusflaves*13 mm).The modified pyrophyllite clay using cotton seed oil showed slightly good inhibition rate against all the bacteria and fungi (*Pseudomonas aeruginosa* 19 mm, *Staphylococcus* 10 mm and *Aspergillusflaves*14 mm).

The images in figure 3.1 show the absence of bacteria, demonstrating that there was no risk of bacterial contamination in any of the modified clay minerals using oils studied that may compromise the system, making them biologically safe and without antimicrobial activity. All the three antimicrobial agents showed highest inhibition rate against the bacteria and fungi. This proves that the modified clay minerals using oils have good antimicrobial activity against the pathogens.

3.2. Pharmacological screening assay of modified clay minerals using *Glycyrrhizaglabra*

The results of the antimicrobial activity test indicate that the modified clay sample using medicinal plants suppresses the growth of the bacterial population but after 24 hours there is inevitably an increase in the bacterial population.

Table 3.2 : Antimicrobial effect of modified clay using *Glycyrrhizaglabra*

S. No.	Sample	*P.aeruginosa*	*S. aureus*	*S. marceans*	*B. cereus*	*C. albicans*
1	P (1)	15 mm	14 mm	12 mm	13 mm	11 mm
2	S (2)	14 mm	16 mm	12 mm	16 mm	10 mm
3	V (3)	15 mm	15 mm	12 mm	14 mm	10 mm
4	Y (4)	13 mm	14 mm	13 mm	15 mm	09 mm
5	Control	19 mm	18 mm	16 mm	14 mm	20 mm

Figure 3.2: Antibacterial activities of modified clay minerals using *Glycyrrhiza glabra*

The figure 3.2.shows the antibacterial activity of modified clay using medicinal plants in a sterile environment and performed against four bacterial strains and two fungal strains of clinical interest. The kaolinite modified clay using *Glycyrrhizaglabra* showed slightly good inhibition rate against all the bacteria and fungi (*Pseudomonas aeruginosa* 15 mm, *S. aureus* 14 mm, *S. marceans* 12 mm, *Bacilus cereus* 13 mm and *Candida albicans* 11 mm).

The modified local clay using *Glycyrrhizaglabra* showed slightly good inhibition rate against all the bacteria and fungi (*Pseudomonas aeruginosa* 14 mm, *S. aureus* 16 mm, *S. marceans* 12 mm, *Bacilus cereus* 16 mm and *Candida albicans* 10 mm).

The modified bentonite clay *Glycyrrhizaglabra* showed slightly good inhibition rate against all the bacteria and fungi (*Pseudomonas aeruginosa* 15 mm, *S. aureus* 15 mm, *S. marceans* 12 mm, *Bacilus cereus* 14 mm and *Candida albicans* 10 mm). The modified pyrophyllite clay using *Glycyrrhizaglabra* showed slightly good inhibition rate against all the bacteria and fungi (*Pseudomonas aeruginosa* 13 mm, *S. aureus* 14 mm, *S. marceans* 13 mm, *Bacilus cereus* 15 mm and *Candida albicans* 09 mm).

The images in show the absence of bacteria, demonstrating that there was no risk of bacterial contamination in any of the modified clays using medicinal plants studied that may compromise the system, making them biologically safe and without antimicrobial activity. All the three antimicrobial agents showed highest inhibition rate against the bacteria and fungi. This proves that the modified clay minerals using medicinal plants have good antimicrobial activity against the pathogens.

4.CONCLUSION

Our results indicated that modified mineral clay using oil and medicinal plants could provide an alternative treatment against numerous human bacterial infections. The growing interest in the microbial interactions with clay minerals is related to the enormous significance of this vast and ubiquitous phenomenon, which has greatly influenced the shaping of the evolution of the biosphere, and has important environmental and biotechnological implications.

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