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Antibacterial Coating for Medical Metal Bed by Using Extracted Mulberry Leaf

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Abstract: ***The use of extracted natural mulberry leaf plant obtained from natural resources (Farm) has the potential for kill bacteria. Medical metal bed needs covering antibacterial textile especially for patient who suffer from sensitive skin. Problem: The spread of some diseases in hospitals, especially skin diseases, which causes unsafely and uncomforted for patients, in addition to some patients who sit long on the bed. All these require anti-bacterial covering of metal medical bed. Aims: This study is aimed to investigate the effect of extracted mulberry leaf solution on cotton covering medical metal bed where prevent bacteria grown. Experiment: This research studied: First: mulberry leaf and made extracted solution from it after drying and grinding. Second: metal medical bed and it requirements for safety. Third: two kinds of bacteria which have direct effect on humans. Therefore it studied cotton textile which covering metal medical bed and their safety requirement. Results showed that extracted natural mulberry leaf solution give textile covering for metal medical bed the protection and antibacterial properties.***

Keywords: medical - metal bed - extracted - mulberry leaf - antibacterial

1. Introduction

The worldwide spread of produces antibacterial product to keep environment healthy.(1) Infection diseases on skin are accounting for high proportion of health problems in the hospitals. An international movement arose demanding a special care & protection for patients, where they need lying on these beds. Some requirements for patients are safety antibacterial covering where prevention the prevalence of allergic diseases.(2)

The best material for covering is cotton fabrics, which can be treated with the solution extracted from mulberry leaf. Mulberry leaf was used in medicine, dyeing and pharmacology……and so on.(3) (4) Mulberry leaves have beneficial effects on some diseases because of plant polyphenols which have their antioxidant and anti-inflammatory properties.(5)(6)

Antimicrobial activity of leaf extract of Morus indica was found to be the best against bacterial and fungal cultures, and also proved that the factors which are found in the form of secondary metabolites were responsible for antimicrobial activity.(3) Staph epidermidis is a kind of harmful bacteria which causes staph infections. These infections can turn deadly if the bacteria invade deeper into human body, entering his bloodstream, joints, bones, lungs or heart. A growing number of otherwise healthy people are developing life-threatening staph infections.(7)

Escherichia coli (E. coli) are a bacterium which can cause illness in humans, including diarrhea, abdominal pain, fever, and sometimes vomiting. Some of these bacteria produce a toxin known as Shiga. It is one of the most powerful toxins, and it can cause an intestinal infection. Some 265,000 Shiga toxin-producing E. coli (STEC) infections occur each year in the United States (U.S.). Around 36 percent of these are probably caused by E. coli O157:H7. When a food borne outbreak occurs, it usually involves a shiga toxin-producing E. coli. Some other types of E. coli infection can lead to urinary tract infections, respiratory illness, pneumonia, and other illnesses like meningitis.(1).

Metal medical beds are the source of society importance especially in hospital. These beds have special features as comfort, well-being of the patient and for the convenience of health care workers. And also include adjustable height for the entire bed, the head, and the feet, adjustable side rails, and electronic buttons to operate both the bed and other nearby electronic devices.(8),(9)

2. Materials and Chemicals

2.1 Fabrics

Table 1: Specification 0f cotton samples, Produces in this research

Fabrics	Fabric weight	Count number of warp yarn	Count number of weft yarn	Tissue structure
scoured 100% cotton fabrics	130 gm/m^2	50/1 denier	50/1 denier	1/1

So the research aims to determine the demands of comfortable design of metal chair for elderly.

2.2 Natural mulberry leaf

Natural mulberry leaf from plants sources present in private Farm, Egypt during the month of July were used in this work.

English name	Mulberry
Principle color	green
Origin	leaf
The source	Private farm
Botanical name	Morus rubra

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3. Technical Procedures

3.1Preparation of Sample

The collection of Healthy mulberry leaves plants was done from the private farm and washed thoroughly with tap water followed by distilled water, then wiped and dried under shade followed by drying at (60°C) till constant weight was attained. Completely dried leaf samples were ground using an electric blender to obtain a fine powder.

3.2 Extraction using soaking process

100 g of plant powder was extracted by:-
900 ml water
1000 g

900 ml water was added to 100 gm/Kg plant powder, and soaked for different durations (18, 24, 30 and 36 hours), then the samples were padded in an aqueous solution. Each one left for 30 minutes at room temperature, then drying at 60°C for 10 minutes followed by the usual washing process.

3.3 Extraction using boiling process

100 g/kg of plant powder was extracted by:-
900 ml water
1000 g

900 ml water was added to 100 gm/Kg plant powder, and soaked for different durations (30, 20 and 10 minutes), then the samples were padded in an aqueous solution. Each one left for 30 minutes at room temperature, then dried at 60°C for 10 minutes followed by the usual washing process.

3.3 Soaping stage

Finally samples were soaped in a soaping bath containing:-

2g/l	soap (Hostapal CV-ET)
L.R	1:50
Temperature	at 60-70°C
Time	for 15 minutes

3.4 Study of antimicrobial effect (On cotton samples)

Method
A suspension of each organisms is made to concentration of $(10)^8$, equal volume of bacterial suspension, antibacterial substances solution are mixed and left incubated at room temperature over night.

Subculture of mixed solutions by standered calibrated loop (10u) on 2 bacteriological media. Mannitol salt agar for staph epidermidis.

The microbial suspension is applied on each cotton textile samples mixed with previous antimicrobial solutions and left one hour.

Subculture of these tissues on mannitol salt agar & MacConkey agar were done. (Specialized Clinical Lab, license no.1139)

4. Results and Discussion

Table 2: Effect of storage time using soaking method on two kinds of bacteria

Storage time (hours)	18	24	30	36
Effect on staph epidermidis (skin inhabitant) $(10)^8$	Reduce to $(10)^5$	No. bacterial growth (good antibacterial activity)	No. bacterial growth (good antibacterial activity)	Reduce to $(10)^3$
(gut inhabitant) Effect on E. Coli $(10)^8$	Reduce to $(10)^5$	Reduce to $(10)^2$	No. bacterial growth (good antibacterial activity)	Reduce to $(10)^3$

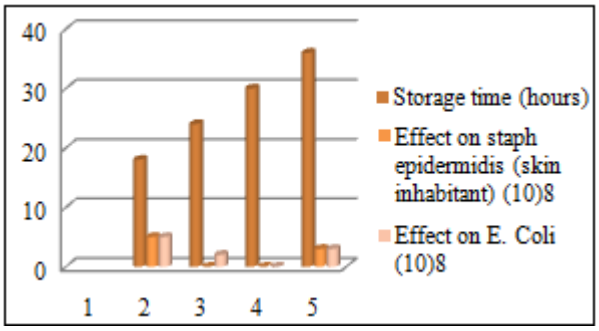


Figure 1: Effect of storage time using soaking method on two kinds of bacteria

Table 3: Effect of boiling time method on two kinds of bacteria

boiling time (minutes)	30	20	10
Effect on staph epidermidis (skin inhabitant) $(10)^8$	No. bacterial growth (good antibacterial activity)	Reduce to $(10)^2$	Reduce to $(10)^5$
Effect on E. Coli (gut inhabitant) $(10)^8$	No. bacterial growth (good antibacterial activity)	Reduce to $(10)^3$	Reduce to $(10)^5$

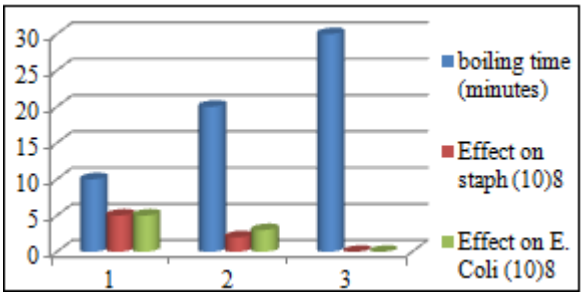


Figure 2: Effect of boiling time method on two kinds of bacteria

Extraction using soaking process
It is shown from table (2) & fig. (1), that by using soaking method for extracted mulberry leaf. The optimum time storage condition between (24 & 30 hrs) to give the best antibacterial effect on staph epidermidis (skin inhabitant = skin odour). But at lower than 24 hrs or greater than 30 hrs is not good for antibacterial effect. This is due to that at lower than 24 hrs, the amount of extracted was not enough to kill all bacteria, or the extraction was not completed. But at greater than 30 hrs, may be related to the start of broken down of substrate in mulberry leaf extracted solution.

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It is shown from table (2) & fig. (2) that by using soaking method for extracted mulberry leaf. The optimum time storage condition at 30 hrs to give the best antibacterial effect on **Effect on E. Coli (gut inhabitant)**. And at lower or greater than 30 hrs is not good for antibacterial effect. This is related to the same reasons of other bacteria. But **E. Coli is stronger than** staph epidermidis

Extraction using boiling process

When using boiling method for extracted mulberry leaf and from table (3) & fig. (2) is shown, that. The optimum boiling time at 30 minutes to give the best antibacterial effect on staph epidermidis (skin inhabitant = skin odour). But at lower than 30 minutes, it did not record good result for antibacterial effect. This is due to that boiling at lower than 30 minutes, the amount of extracted was not enough to kill all bacteria, or the extraction was not completed.

And also it is clear from table (3) & fig. (2) that by using boiling method for extracted mulberry leaf. The optimum boiling time at 30 minutes to give the best antibacterial effect on E. Coli (gut inhabitant). And at lower than 30 minutes is not good for antibacterial effect. This is related to the same reasons of other bacteria.

5. Conclusion

From the results and discussion, it is clear that: the optimum method to extract best antibacterial solution from mulberry leaf plant is boiling method which saves time. And the optimum time of boiling is 30 minutes. The cotton fabrics which treated by this solution are the best for covering medical metal bed.

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