BIBLIOGRAPHY

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ABSTRACT

The study was conducted to determine the antimicrobial property of pine tree charcoal using Kirby Bauer Technique against *Escherechia coli, Enterococcus aerugenes, Pseudomonas aeruginosa, Salmonella typhi,* and *Streptococcus faecalis.* Pine tree charcoal (T1), and activated charcoal (T0) is used as treatment against the said organisms. All treatments showed negative results.

Results showed that pine tree charcoal has no antimicrobial activity against *Escherechia coli, Enterococcus aerugenes, Pseudomonas aeruginosa, Salmonella typhi,* and *Streptococcus faecalis.*

RESULT AND DISCUSSION

Using Kirby Bauer Technique the antimicrobial activity of of pine tree charcoal was tested against *Enterococcus aerogenes, Escherichia coli, Pseudomonas aeruginosa, Streptococcus faecalis,* and *Salmonella typhi.* The following tables show the results of the conduced experiment.

Table no.1a Mean Zone of Inhibition of pine tree charcoal against *Escherechia coli,* n=15

Treatment	Mean Zone of Inhibition
0	0
1	0

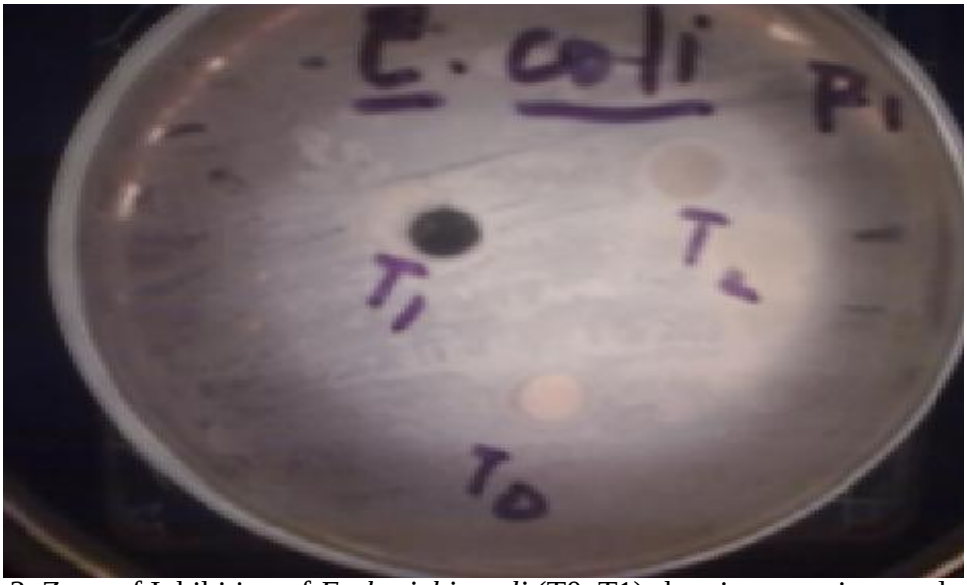

Plate No. 3. Zone of Inhibition of *Escherichia coli* (T0, T1) showing negative result.

Table no.1b Mean Zone of Inhibition of pine tree charcoal against *Enterococcus aerogenes,* n=15

Treatment	Mean Zone of Inhibition(mm)
0	0
1	0.4

Plate No. 4. Zone of Inhibition of *Enterococcus aerogenes* (T0, T1) showing negative result.

Table no.1c Mean Zone of Inhibition of pine tree charcoal against *Pseudomonas aeruginosa,* n=15

Treatment	Mean Zone of Inhibition(mm)
0	0
1	0.4

Plate No.5 Zone of Inhibition of *Pseudomonas aeruginosa* (T0, T1) showing negative results.

Table no.1d Mean Zone of Inhibition of pine tree charcoal against *Salmonella typhi*, n =15.

Treatment	Mean Zone of Inhibition(mm)
0	0
1	0.2

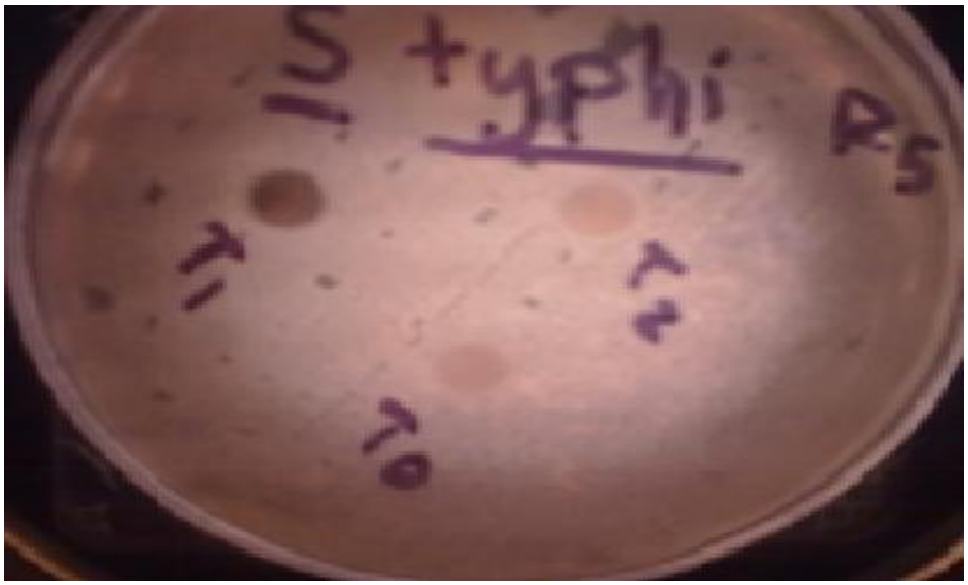

Plate No 6. Zone of Inhibition of *Salmonella typhi* (T 0, T 1) showing negative result.

Table no.1e Mean Zone of Inhibition of pine tree charcoal against *Streptococcus faecalis*, n=15.

Treatment	Mean Zone of Inhibition
0	0
1	0

Plate no. 7. Zone of Inhibition of *Streptococcus faecalis* (T0, T1) showing negative result.

Results show that that all treatments in table no.1a have no zone of inhibition against *Escherichia coli*. Table no.1b shows that there is 0.4mm zone of inhibition against *Enterococcus aerogenes* in treatment one but according to the interpretation based on the description of Lirio et al., as cited by Aurelio, 2002 the result was negative. Table no.1c shows that there is no anti microbial property of pine tree charcoal against

Pseudomonas aeruginosa. Treatment one has 0.4mm zone of inhibition but still the degree of antimicrobial activity is negative according to the description of Lirio et al., 1998 as cited by Aurelio, 2002. In table no.1d results showed that treatment one has 0.2mm zone of inhibition against *Salmonella typhi* which is negative according to the description of Lirio et al., 1998 as cited by Aurelio, 2002. Table no.1e shows no mean zone of inhibition against *Streptococcus faecalis*.

The result showed that there is no antimicrobial property of pine tree charcoal against *Escherechia coli, E. aerogenes, Pseudomonas aeruginosa, Salmonella typhi, and Streptococcus faecalis.*

There are several factors that may contribute to the possibility of having the negative results on the experiment; the ability of the organism to develop resistance, the function of the charcoal as medicine and the proper performance of the test.

Most organisms are resistant to antibiotic because of their innate characteristics like *Pseudomonas aeruginosa, and Escherichia coli*. *Pseudomonas aeruginosa* is resistant to antibiotic because of their characteristics. It is intrinsically resistant to antimicrobial agents due to low permeability of its cell wall. It has the genetic capacity to express a wide repertoire of resistance mechanisms. It can become resistant through mutation in chromosomal genes which regulate resistance genes. It can acquire additional resistance genes from other organisms via plasmids, transposons and bacteriophages as mentioned by Lambert, 2002.

Charcoal is used as medicine because of its amazing ability to attract other substances to its surface and hold them there. This is called adsorption. Charcoal can adsorb

thousands of times its own weight in gases, heavy metals, poisons, and other chemicals, thus making them ineffective or harmless as cited by Anonymous, 2008.

Charcoal has physiological action when used as treatment against diarrhoea it will absorb digestive contents and secretions not allowing any toxins to be absorbed by the body. Because charcoal is not "digested," it stays inside the GI tract and eliminates the toxin when the there is a bowel movement (Cunha, 2013). Therefore, pine tree charcoal as used as treatment against diarrhea, has no antimicrobial property against agents which causes diarrhea but it function as an adsorbent. These results dispels the traditional beliefs of some people that regard charcoal as antimicrobial agent as treatment against diarrhea.

Further, the interpretation of the results is greatly affected by the performance of the test. The age of the turbidity of the bacterial inoculums, the way inoculums are spread on the plate, the preparation of the Mueller Hinton Agar (source, depth, pH, cat ion content, supplements), the temperature, and duration of incubation of the plate, the antimicrobial content of the disk and the methods of reading the results are things which may influence the results as cited by Baron *et al*, 1994.

SUMMARY, CONCLUSION AND RECOMMENDATIONS

The charcoal sample which come from the pine tree (*Pinus kesiya*), activated charcoal, were tested against Gram negative *Escherichia coli*, and *Pseudomonas aeruginosa*, *Salmonella typhi*, *Enterococcus aerogenes*, and Gram positive *Streptococcus faecalis*.

The result showed that pine tree charcoal has an inhibition zone when tested against *Enterococcus aerogenes*, *Pseudomonas aeruginosa*, and *Salmonella typhi* but its degree of antimicrobial property is negative. The zone of inhibition must reach at least 6.1mm to 7.3mm to be considered as a weakly positive as based on the description of Lirio et al. as cited by Aurelio, 2002. The result showed that the mean zone of inhibition of pine tree charcoal against *Enterococcus aerogenes*, and *Pseudomonas aeruginosa* is 0.4mm and 0.2mm on *Salmonella typhi, Escherichia coli*, and *Streptococcus faecalis* has zero mean zone of inhibition.

Further all the treatments activated charcoal and pine tree charcoal have no antimicrobial activity against *Enterococcus aerogenes, Escherichia coli, Pseudomonas aeruginosa, Salmonella typhi*, and *Streptococcus faecalis.*

Conclusion

The test sample has no antimicrobial property against the test organisms (Gram negative *Escherichia coli*, and *Pseudomonas aeruginosa, Salmonella typhi, Enterococcus aerogenes*, and Gram positive *Streptococcus faecalis*).

Recommendation

According to the data gathered other laboratory methods or technique will be used to further study the test sample. It is further recommended that other bacteria will be used to test the anti-microbial activity of the pine tree charcoal.

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