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EVALUATION ON ANTIMICROBIAL ACTIVITIES OF SELECTED INDIAN MEDICINAL PLANTS

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ABSTRACT:
The four plants were selected for this research namely *Cassia auriculata, Glycyrrhiza glabra, Piper longum and Syzygium aromaticum* based on ethno botanical information, literature, references and therapeutic significance. These weremostly reported for anti-diabetic, anti- cancer, anti-inflammatory activities and for several other therapeutic indications. Though several researchers also reported antimicrobial activities for these plants, most of these plants have not been fully studied for their antimicrobial potential and exploited as antimicrobials, especially as drug potentiators, or resistance modifying agents, or synergistic agents. In this article, antimicrobial activities of selected Indian medicinal plants has been evaluated.

KEYWORDS: Antimicrobial, Indian, Medicinal, Plants.

INTRODUCTION:

One of the main therapeutic challenges faced by antibiotic therapy is the emergence of multidrug resistance, particularly in bacteria. [1] To combat the diseases caused by these microorganisms, researchers have been compelled to discover and develop new medications. [2] However, the past few years have witnessed a decrease in the development of new antibiotics due to the time-consuming, expensive, and labor-intensive nature of isolating the new antimicrobial agents with unique modes of action from microbes. [3] Furthermore, the limited shelf life of newly introduced antibiotics stems from their frequent updates every two to three years. [4] Many of the antibacterial agents that are now in use have negative side effects that include toxicity, immunosuppression, hypersensitivity, and tissue residue that pose a risk to public health. [5] Moreover, the more recent broad spectrum antibiotics are more expensive, making them inaccessible to the impoverished. [6] These drawbacks make it difficult to use the antibacterial drugs that are now on the market therapeutically, which makes it necessary to look for alternate treatments for illnesses caused by different bacteria. [7,8] As the world shifts towards non-toxic and environmentally friendly products, we should prioritize the creation of pharmaceuticals from traditional medicinal plants for the treatment of many human and animal diseases. [9, 10]

EXPERIMENTAL METHODOLOGY:

The experimental methodology based on the following protocol:

- Selection of Plants
- Identification of Plant Parts
- Plant Extracts Preparation

- Yield Percentage of Solvent Extracts
- Test Organism:

The following microorganisms was used for antimicrobial activity of the plant extracts.

Gram-positive strains (ATCC):

- *Bacillus subtilis*
- *Staphylococcus aureus*
- *Micrococcus luteus*

Gram-negative strains (ATCC):

- *Escherichia coli*
- *Pseudomonas aeruginosa*
- *Salmonella typhi*

- Culture Media Composition of Different Media:

The culture media used for anti-microbial susceptibility testing of the bacterial & fungal strains in the present study were as follows:

- Nutrient Broth
- Nutrient Agar
- Potato Dextrose Broth
- Potato Dextrose Agar

- Preparation of Inoculum Growth Media
- Preparation of Turbidity standard
- Preparation of dried filter paper discs
- Preparation of dried filter paper discs
- Antibiotic Discs
- Antibiotic Susceptibility Test
- Evaluation of Anti-Bacterial Activity of Plant Extracts
- Minimum Inhibitory Concentration
- Minimum Bactericidal Concentrations

RESULTS:

Cassia auriculata

In vitro antibacterial potential (activity) of four therapeutic plants (medicinal plants) leaves extracts selected randomly have been assessed by the method of agar well diffusion assay (AWDA).

Table 1: Antibacterial activity of *Cassia auriculata* plant extracts

Zone of Inhibition (mm)						
Extracts	**B. s.**	**S. a.**	**M. l.**	**E.c**	**P.a**	**S.t.**
Methanol	20	12	18	17	13	16
Ethanol	17	12	16	15	11	14
Aqueous	12	09	13	16	08	12
reptomycin	23	22	23	25	16	20
DMSO	00	00	00	00	00	00

Streptomycin (+ ve control) DMSO (- ve control)

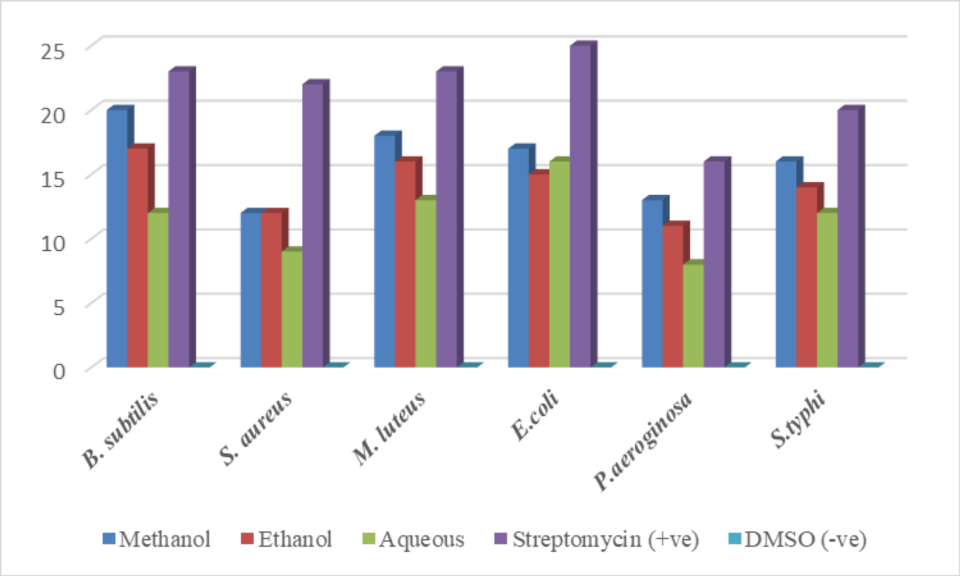

Figure 1:Antibacterial activity of *Cassia auriculata* plant extracts

Glycyrrhiza glabra

Table 2: Antibacterial activity of Glycyrrhiza *glabra* stem bark extracts

						Zone of Inhibition (mm)
Extracts	**B. s.**	**S. a.**	**M. l.**	**E.c**	**P.a**	**S.t.**
Methanol	21	25	18	13	00	00
Ethanol	19	22	16	00	00	00
Aqueous	17	20	14	00	00	00
treptomycin	24	27	22	23	16	17
DMSO	00	00	00	00	00	00

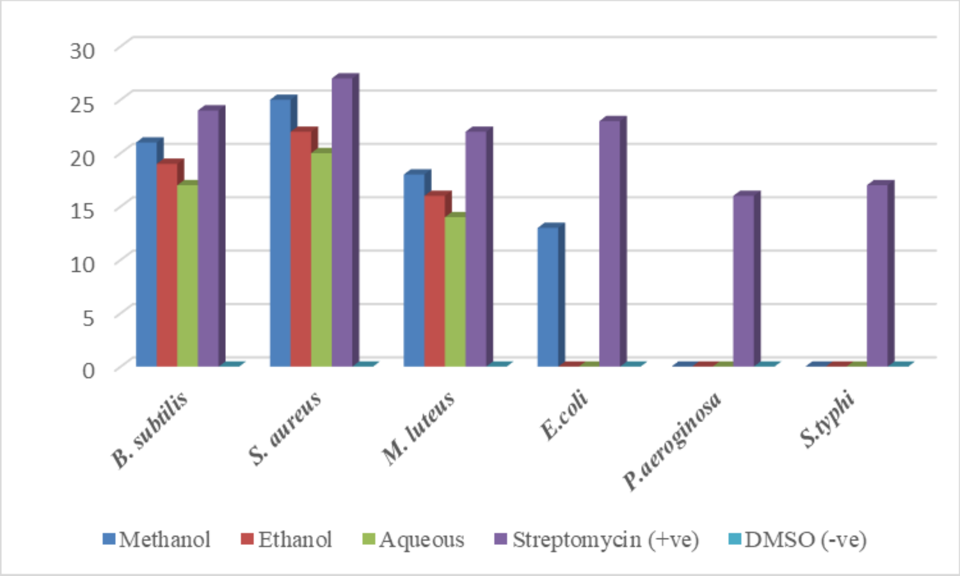

Figure 2:Antibacterial activity of *Glycyrrhiza glabra* stem bark extracts

Piper longum

Table 3: Antibacterial activity of*Piper longum* stem dried root extracts

					Zone of Inhibition (mm)	
Extracts	**B. s.**	**S. a.**	**M.I**	**E.c**	**P.a**	**S.t.**
Methanol	14	12	00	13	00	00
Ethanol	12	10	00	09	00	00
Aqueous	00	00	00	00	00	00
Streptomycin	21	23	20	22	16	17
DMSO	00	00	00	00	00	00

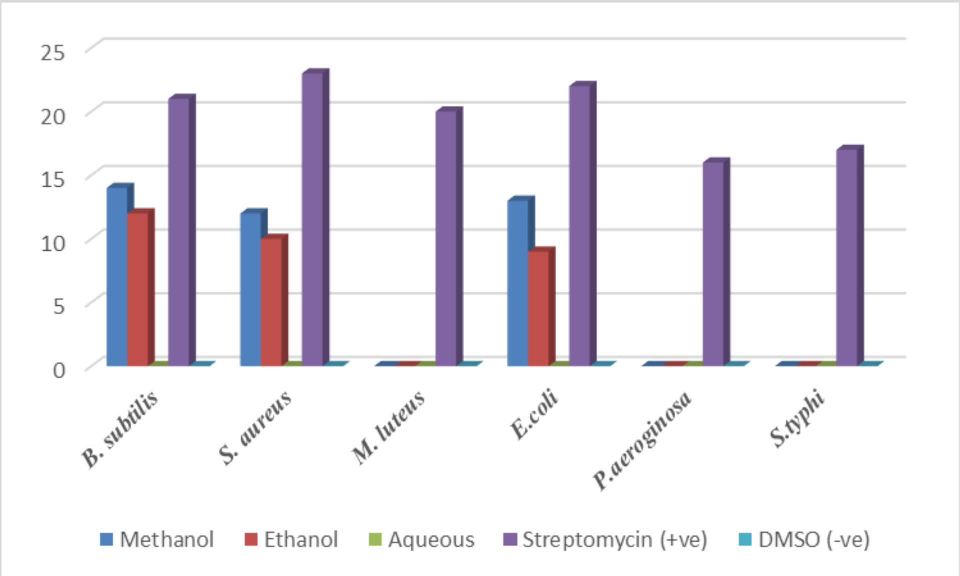

Figure 3:Antibacterial activity of *Piper longum* stem dried root extracts

Syzygium aromaticum

Table 4:Antibacterial activity of *Syzygium aromaticum* dried flower extracts

bition (mm)						
Extracts	**B. s.**	**S.a**	**M. l**	**E.c**	**P.a**	**S.t.**
Methanol	19	21	22	20	13	17
Ethanol	16	17	19	17	18	12
Aqueous	15	14	17	15	08	13
Streptomycin	21	20	23	22	16	19
DMSO	00	00	00	00	00	00

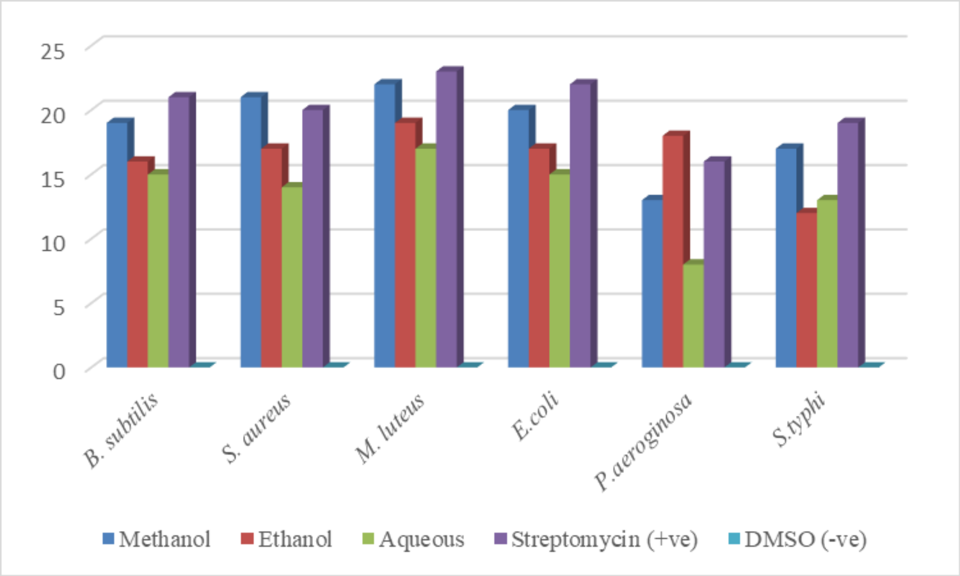

Figure 4: Antibacterial activity of *Syzygium aromaticum*dried flower extracts

Table 5: MIC (mgml^{-1}) of *Cassia auriculata* plant extracts

						MIC (mgml-1)
Extracts	**B. s.**	**S.a**	**M. l**	**E.c**	**P.a**	**S.t.**
Methanol	**25**	**50**	**-**	**50**	**-**	**-**
Ethanol	**50**	**100**	**-**	**50**	**-**	**-**
Aqueous	**-**	**-**	**-**	**-**	**-**	**-**

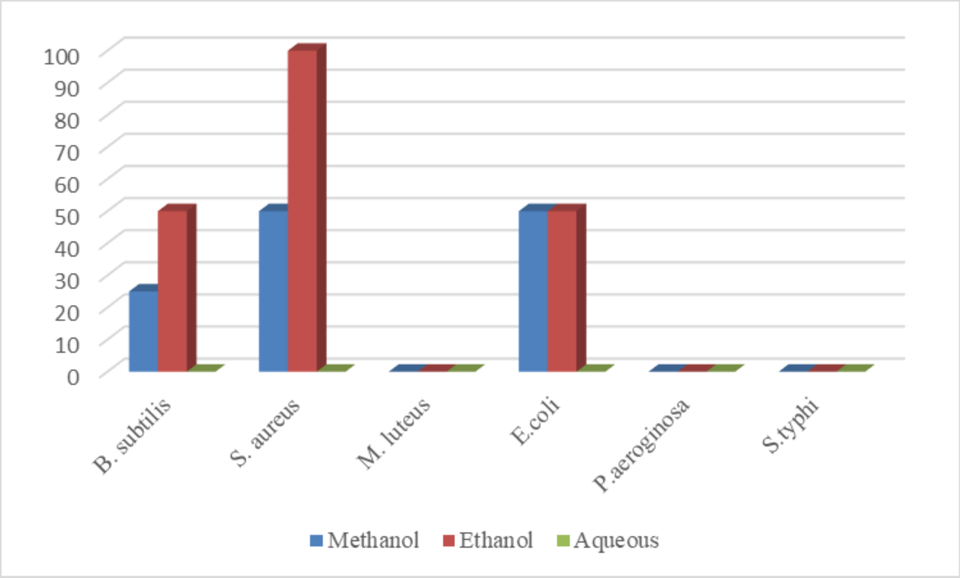

Figure 5:MIC (mgml^{-1}) of *Cassia auriculata* plant extracts

					MIC (mgml-1)	
Extracts	B. s.	S.a	M. l	E.c	P.a	S.t.
Methanol	25	12.5	12.5	12.5	-	-
Ethanol	50	50	12.5	12.5	-	-
Aqueous	100	100	25	-	-	-

Table 6: MIC (mgml^{-1}) of *Glycyrrhiza glabra* stem bark extracts

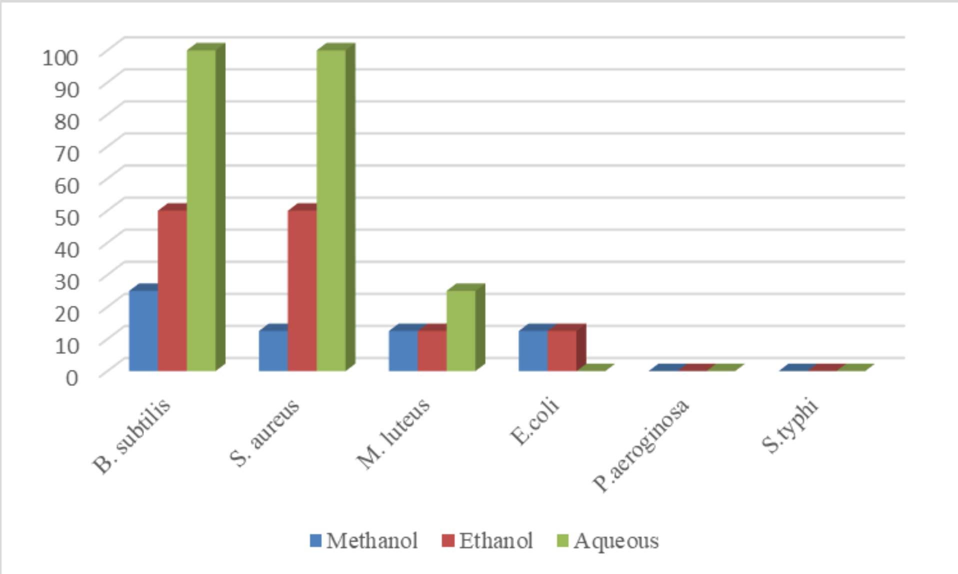

Figure 6: MIC (mgml-1) of *Glycyrrhiza glabra* stem bark extracts

Table 7: MIC (mgml^{-1}) of *Piper longum* root extracts

						MIC (mgml^{-1})
Extracts	B. s.	S.a	M. l	E.c	P.a	S.t.
Methanol	12.5	12.5	25	12.5	50	25
Ethanol	25	25	25	12.5	50	50
Aqueous	25	25	50	12.5	100	100

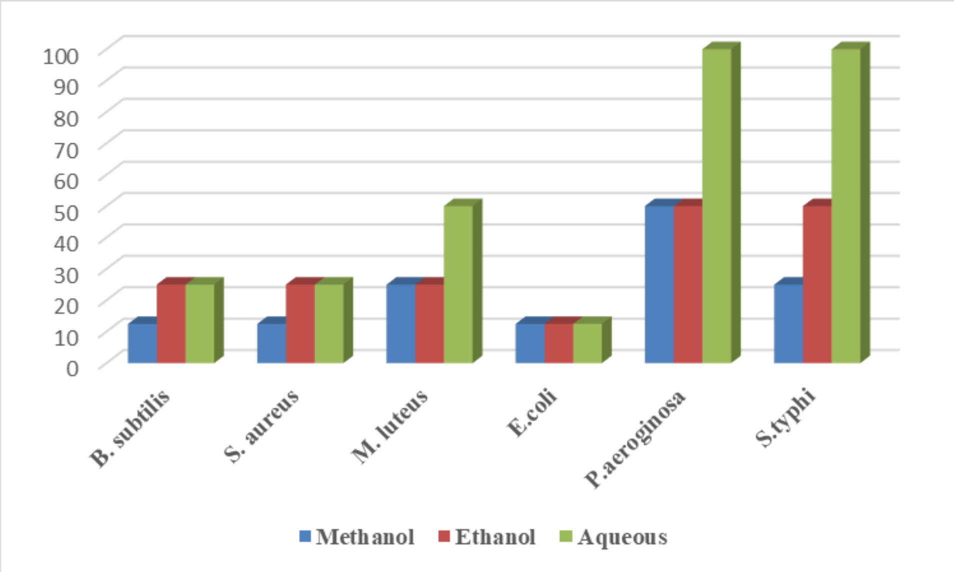

Figure 7: MIC (mgml-1) of *Piper longum* root extracts

Table 8: MIC (mgml-1) of *Syzygium aromaticum* flower extracts

						MIC (mgml-1)
Extracts	**B. s.**	**S.a**	**M. l**	**E.c**	**P.a**	**S.t.**
Methanol	25	25	100	50	50	25
Ethanol	50	100	50	50	100	100
Aqueous	50	50	-	100	-	-

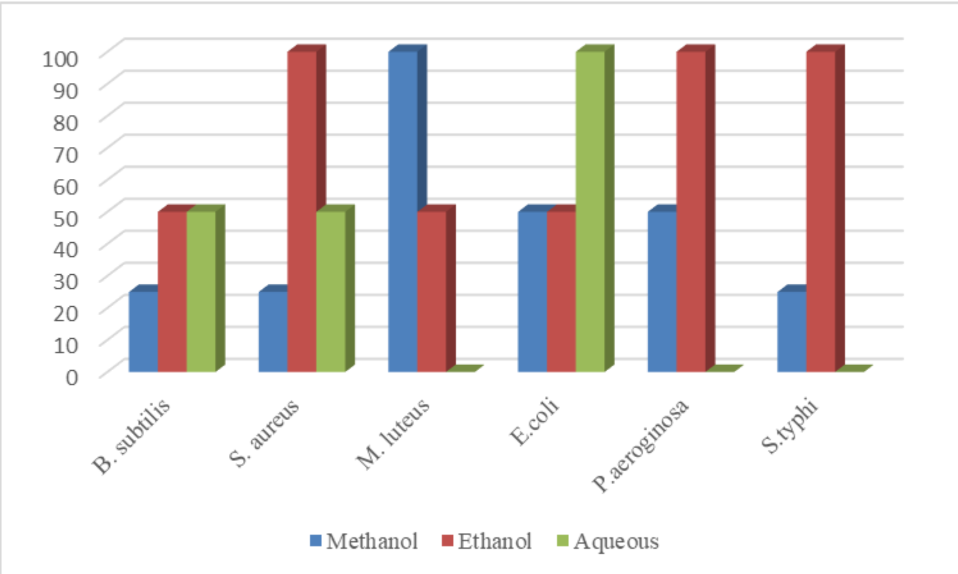

Figure 8: MIC (mgml-1) of *Syzygium aromaticum*flower extracts

Table 9: MBC (mgml-1) of *Cassia auriculata* plant extracts

						MBC (mgml-1)
Extracts	**B. s.**	**S.a**	**M. l**	**E.c**	**P.a**	**S.t.**
Methanol	50	-	100	50	-	-
Ethanol	100	-	100	100	-	-
Aqueous	-	-	-	-	-	-

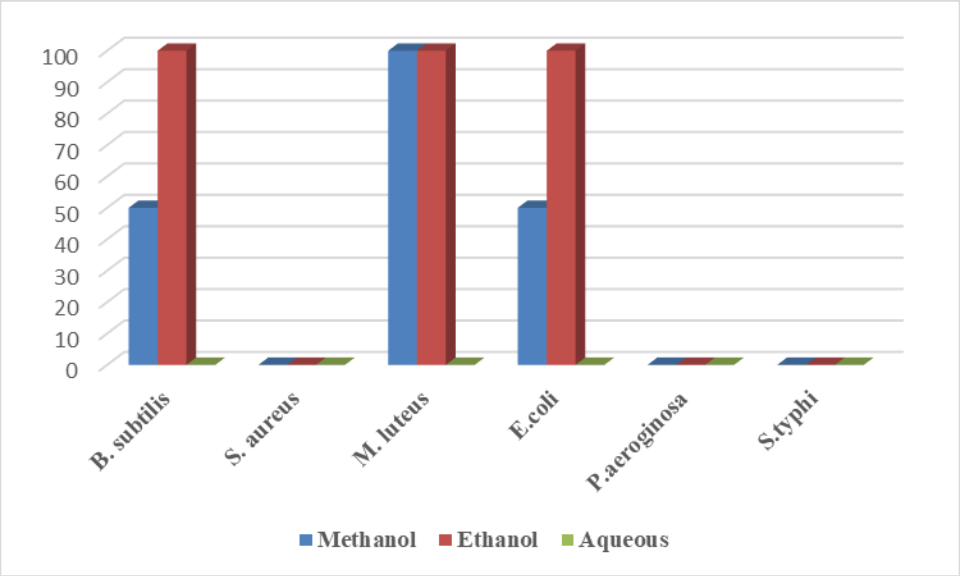

Figure 9: MBC (mgml^{-1}) of *Cassia auriculata* plant extracts

Table 10: MBC (mgml^{-1}) of *Glycyrrhiza glabra* stem bark extracts

						MBC (mgml-^{1})
Extracts	**B. s.**	**S.a**	**M. l**	**E.c**	**P.a**	**S.t.**
Methanol	**25**	**25**	**12.5**	**25**	**50**	**25**
Ethanol	**50**	**25**	**25**	**25**	**100**	**50**
Aqueous	**50**	**50**	**25**	**50**	**25**	**50**

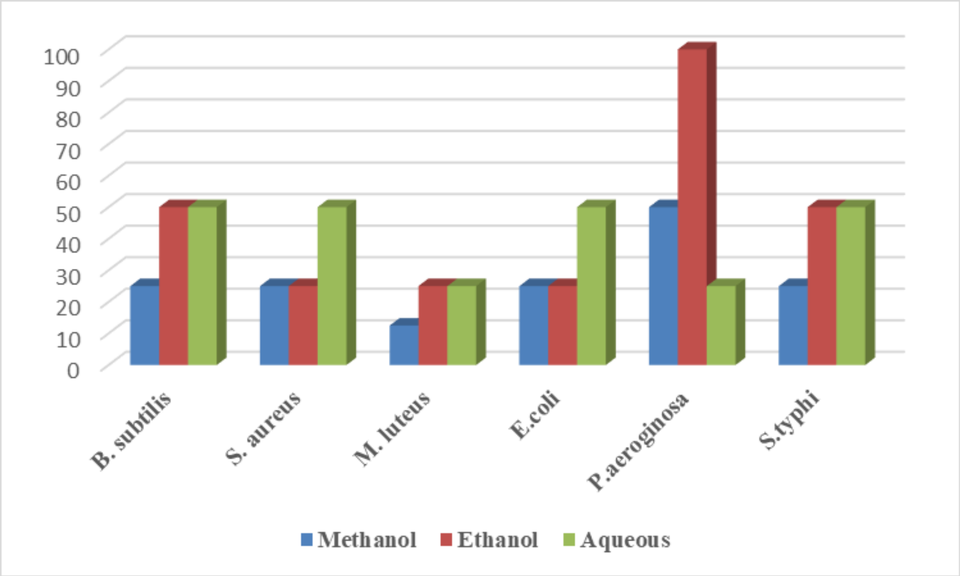

Figure 10: MBC (mgml^{-1}) of *Glycyrrhiza glabra* stem bark extracts

Table 11: MBC ($mgml^{-1}$) of *Piper longum* root extracts

						MBC (mgml-^{1})
Extracts	**B. s.**	**S.a**	**M. l**	**E.c**	**P.a**	**S.t.**
Methanol	25	50	50	100	50	100
Ethanol	50	100	100	50	50	100
Aqueous	100	-	-	-	-	-

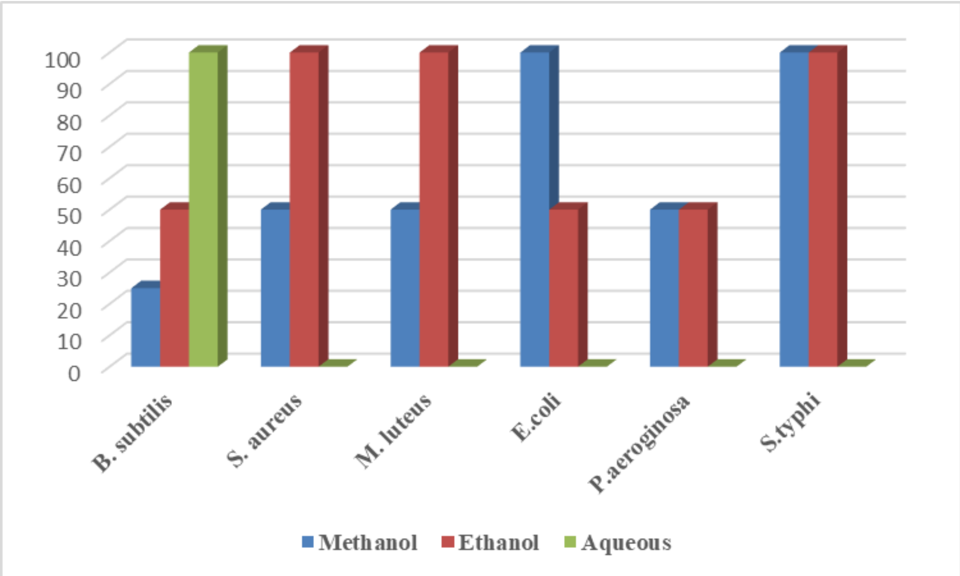

Figure 11: MBC ($mgml^{-1}$) of *Piper longum* root extracts

Table 12: MBC ($mgml^{-1}$) of *Syzygium aromaticum* flower extracts

						MBC ($mgml^{-1}$)
Extracts	**B. s.**	**S.a**	**M. l**	**E.c**	**P.a**	**S.t.**
Methanol	25	50	50	25	50	50
Ethanol	50	50	100	50	100	100
Aqueous	50	100	100	50	100	100

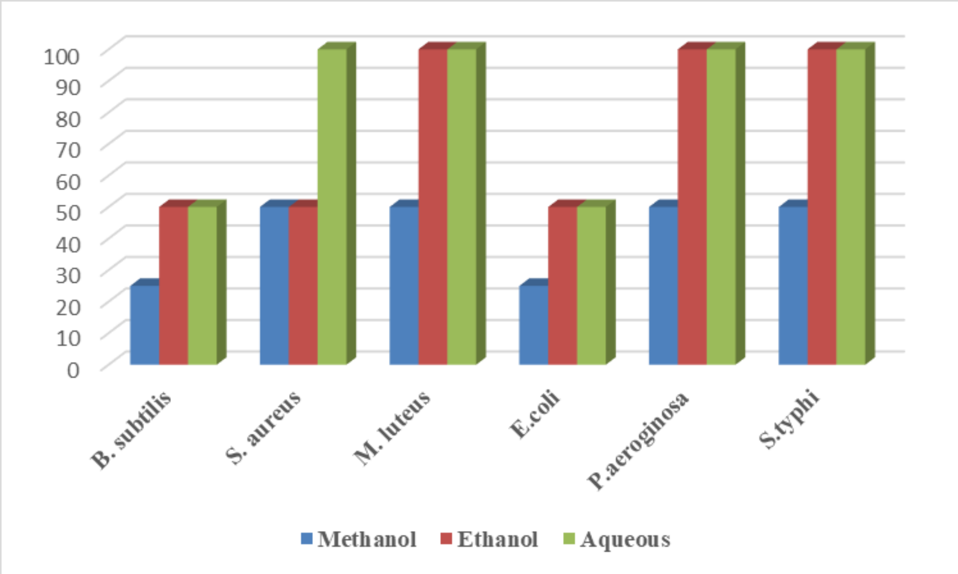

Figure 12: MBC (mgml^{-1}) of *Syzygium aromaticum* flower extracts

CONCLUSION:

From the above results, it was found that the four medicinal plants namely *Cassia auriculata, Glycyrrhiza glabra, Piper longum and Syzygium aromaticum* have potent antibacterial as well as antimicrobial activities.

REFERENCES:

1. Karahan, F. et al. (2016) Antimicrobial and antioxidant activities of medicinal plant *Glycyrrhiza glabra var. glandulifera* from different habitats.*Biotechnology & Biotechnological Equipment*, 30(4), 797-804.
2. Syed, S.R., Shekshavali, T., Ahamed, S.S. (2018). A Review on *Cassia auriculata*. *Res. J. Pharmacology and Pharmacodynamics*, 10(3), 141-145.
3. Batiha, G.E.S. et al. (2020). *Syzygium aromaticum* L. (Myrtaceae): Traditional Uses, Bioactive Chemical Constituents, Pharmacological and Toxicological Activities.*Biomolecules*, 10(2), 202.
4. Seema Yadav et al. (2020). Syzygium Aromaticum (Clove): A Review on Various Phytochemicals and Pharmacological Activities in Medicinal Plant.*World Journal of Pharmaceutical Research*, 9 (11), 349.363.
5. Meena, V. et al. (2019). Cassia auriculata: A healing herb for all remedy.*Journal of Pharmacognosy and Phytochemistry*, 8(3), 4093-4097.
6. Ashalatha, M & Sannappanawar, R.B. (2015). A Review Article on Pippali (*Piper longum* Linn), *International Ayurvedic Medical Journal*, 3(9), 2841-2849.
7. Pandey, D.K. (2018). Piper longum: A concise review on Botany, Phytochemistry and Pharmacology.*Journal of Emerging Technologies and Innovative Research*, 5(12), 711-717.
8. Pastorino, G. et al. (2018). Liquorice (Glycyrrhiza glabra): A phytochemical and pharmacological review.*Phytother Res*, 32(12), 2323–2339.
9. Chauhan, N., Uniyal, P., Chauhan, R., Singh, C., Kumar, D. (2019). In Vitro Antibacterial Effects of Piper longum Fruit Extracts on Human Pathogens and Phytochemical Analysis.*International Journal of Research and Analytical Reviews*, 6 (1), 282-288.
10. Saritha, P.&Devi, U. A. (2017). Medicinal Properties of Telangana State Flower Tangedu (Cassia Auriculata Linn).*World Journal of Pharmaceutical Research*, 6(8), 1597-1605.