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Anti-microbial Activity of Substituted Flavones against *E-coli and P-acne*

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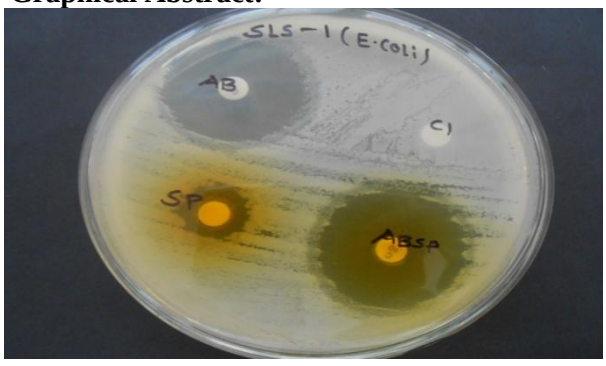
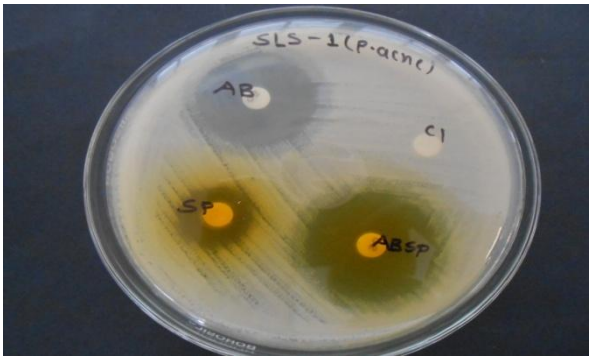
ABSTRACT

During the recent years, the incidence of bacterial and fungal infections has been increasing dramatically due to an increase in the number of Immuno-compromised hosts. The increasing incidence of resistance to a large number of antibacterial agents is becoming another major concern. These observations clearly indicate the need of as well as search for alternative new and more effective antimicrobial agents with a broad spectrum of activity. The substituted flavones have medicinal, biological and pharmacological values. Hence, it was thought interesting to study antimicrobial activity of substituted flavones against pathogenic microorganism and help to find better alternative against drug resistant pathogenic microorganism. All the compounds L_1 , L_2, L_3,L_4,L_5 and L_6 were screened for the anti-microbial activity against bacteria one gram negative E-coli and one gram positive P-acne by using agar disc diffusion method.

Graphical Abstract:



Activity of *E.coli*



Activity of *P-acne*

Keywords: Anti-microbial activity, gram positive bacteria, gram negative bacteria, substituted flavones, disc diffusion method.

INTRODUCTION

An Antimicrobial is any substance of natural, semisynthetic or synthetic origin that kills or inhibits the growth of microorganisms but causes little or no damage to the host. Antimicrobial agents are the substances known to have therapeutic effect against pathogenic microorganisms either as prevention and treatment [1]. Among foremost health problems, infectious diseases account 41 % of global diseases, the main reason of infectious diseases are natural development of bacterial resistance to various antibiotics due to accumulate of different antibiotic residues inside the same strain, multidrug resistance bacteria causes financial and economic implication treatment failure and spread pathogen bacteria from person to person. Although, new generation of antibiotics were produced by pharmacological companies but even drug resistance has increased [2]. Antimicrobial chemotherapy [3] has conferred huge benefits on human health. A variety of microorganisms were elucidated to cause infectious diseases in the latter half of the 19th century. Thereafter, antimicrobial chemotherapy made remarkable advances during the 20th century, resulting in the overly optimistic view that infectious diseases would be conquered in the near future. However, in response to the development of antimicrobial agents, microorganisms that have acquired resistance to drugs through a variety of mechanisms have emerged and continue to plague human beings. The drugs have been developed to achieve better pharmacodynamics including the absorption of oral drugs, concentration in the blood, and distribution to the inflammatory focus. In addition, as antimicrobial chemotherapy has been established and matured, more importance has been attached to the drug safety. Antimicrobial agents that are associated with serious side effects have been replaced by other safer drugs [4]. Literature survey reveals that the heterocycles like pyrazoles, pyrimidines, thiazoles, chalcones, flavones etc. show good antimicrobial activity [5-7]. Some extensive work has been done on numerous heterocyclic compounds for their antimicrobial activities including gram positive and gram negative pathogens [8]. Flavones are important heterocyclic compound extensively used in drugs and dyes. Natural flavones are known to have antiseptic, analgesic, anticancer, anti-inflammatory, antidiabetic, hepato protective activities [9].

E. coli is a gram- negative gamma proteo bacterium commonly found in the lower intestine of warm blooded organisms. *E. coli* bacteria cause severe anemia or kidney failure, urinary tract infections which can lead to death. *P. acnes* is a gram- positive bacterium, live on the skin and contribute to acne may also cause infections after surgery including infections in brain. The microbes may even spur some cells to become cancerous also cause inflammation of tissues [10].

MATERIALS AND METHODS

The antibacterial activities of all the six ligands synthesized were tested to evaluate their efficiencies against animal organisms. All the chemicals and media were purchased from Microbial Type Culture Collection (MTCC), Institute of Microbial Technology, Chandigarh, India. The organisms used were *E. coli* and *P. acnes.*

The following compounds were tested for above microbes.

1) 6-methyl flavones (SLS-1, L_1)
2) 6-methyl-8-nitro- flavones (SLS-2, L_2)
3) 6-methyl-8-bromo flavones (SLS-3, L_3)
4) 6-chloro flavones (SLS-4, L_4)
5) 6-chloro-8-nitro flavones (SLS-5, L_5)
6) 6-chloro-8-bromo flavones (SLS-6, L_6)

Antimicrobial activity of Six Organic compounds viz. L_1, L_2, L_3, L_4, L_5, L_6 were determined by Agar disc diffusion assay [11] according to the Manual of antimicrobial susceptibility testing was used to assay the various antibiotics for bactericidal activity against test strains of *E. coli* and *P. acnes*. The sample about Twenty micro liter on experimental poured on sterile disc as well as antibiotic disc and DMSO used as negative control poured on second sterile disc, then transferred the all Petri plates in incubator at 37^0C for 24 h. After incubation at 37^0C for 24 h, the zones of inhibition were measured. The experiment was done

three times and the mean values were presented. Positive controls were used in experiments antibiotics (Tetracycline -10 mcg) as a standard. All the petri dishes were observed to note readings of zone of inhibition.

RESULTS AND DISCUSSION

The six synthesized compounds were studied for their antimicrobial activities. All the pathogens tested during analysis are human pathogens. For testing the antimicrobial activity, the compounds were dissolved in DMSO. The diameter of inhibition zone (mm) noted, from the noted data it was found that all the compounds are highly and moderately active against bacteria. The comparative study of diameter of zone of inhibition (mm) values images and tables (1-2) of the L_1 to L_6 are given below.

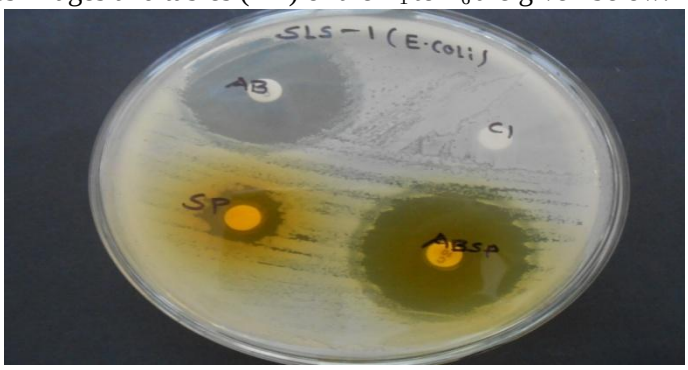


Fig 1. Activity of *E.coli*

Fig 2. Activity of *P-acne*

Table: 1,2 Inhibition zone value in mm against *bacteria*

	***Escherichia coli*- ATCC-14948 (Gram Negative)**			
Sample Code	**AB**	**SP**	**ABSP**	**CL**
SLS-1	29	14	29	00
SLS-2	29	17	29	00
SLS-3	30	16	30	00
SLS-4	29	09	29	00
SLS-5	28	12	28	00
SLS-6	27	13	27	00

***Propionibacterium acnes* -ATCC-1951 (Gram Positive)**			
AB	**SP**	**ABSP**	**CL**
26	15	28	00
26	15	29	00
27	14.5	27	00
25	11	25	00
26	14	26	00
26	00	26	00

*Diameter of inhibition zone (mm), AB- Antibiotic Disc -6mm (Chloramphenicol - 10mcg HIMEDIA), SP-Sample (Used Sterile Disc-6mm HIMEDIA), ABSP- Antibiotic + Sample, CL-Control DMSO (Used Sterile Disc)

From the above images and tables, it is observed that against *E. coli.* bacterium all compounds showing moderate diameter of inhibition zone values. For *P.acnes* L_1 and L_2 show excellent result. Thus, from above data it is cleared that all synthesized compounds show remarkable activity against gram positive, gram negative bacterium. Out of these six compounds L_1,L_5, L_2 found to be highly active. Activities of L_1, L_5, L_2 are good they can be best alternative drugs. L_1, L_5, L_2 show excellent result value, as -CH_3, NO_2 groups present. L_3, L_4 and L_6 are found to be moderately active due to presence of -Cl,-Br group present. The nitro group is more electron withdrawing than chloro group, so that the compounds having such groups in structure have more inhibiting nature against bacteria.

APPLICATIONS

All synthesized drugs can be used as best alternative for the treatment of diseases caused by these two bacteria. Only after the pharmaceutical, biochemical and medicinal significance these drugs used as alternative drugs, if these drugs do not have toxic and other side effects.

CONCLUSIONS

It is seen that L_1, L_5, L_2 highly active against all microbes, and other compounds are moderately active, no one is inactive. It has been observed that presence of nitro group increases the activity is also related with that all these compounds belong to flavonoid family, which always show excellent result against the bacteria. So, above synthesized flavones can act as good alternative to drugs.

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