The present review gives the use of natural product/isolated compound as antibacterial agents as microbes are the main cause for number of life threatening complication/diseases. Modern techniques like in silico method can identify the target compounds which has selective affinity for particular microorganism and can be effective in treatment of even resistant strains. Not much work is done in this direction, this review can be used as lead for finding the selective target for finding a better antimicrobial for society at an affordable price.

**Key words:** Antifungal; Antimicrobial; Gram positive and gram negative microorganism; Isolated phytoconstituents; Medicinal plants.

### 1. INTRODUCTION

The term antimicrobial, derived from three Greek words anti (against), mikros (little) and bios (life) and refers to the agents that act against micro-organisms. It is a similar term derived from the Greek word anti (against) and biotikos (concerning life). “Antibiotic” means substances produced or synthesized by microorganisms which acts against another microorganism. Thus, antibiotics do not include antimicrobial substances that are purely synthetic (quinolones and sulfonamides), or semisynthetic (amoxicillin and methicillin), or those which derived from plants (alkaloids and quercetin) or animals (lysozyme). In contrast, “antimicrobials” include all substances that act against all kinds of microorganisms –as antibacterial (acts...
against bacteria), antiviral (acts against viruses) antifungal (against fungi) and antiprotozoal (against protozoa).

An antibiotic is a low molecular weight substance which produced by microorganism that inhibits or kills other microorganisms at a low concentration. Antimicrobial is any substance from natural, semisynthetic or synthetic origin that inhibits the growth or kills microorganisms but causes little or no damage to the host cell. Not all antimicrobial agents are antibiotics but all antibiotics are antimicrobial agents.

Bacterial infections caused can be prevented and treated through anti-bacterial agents including antibiotics. When bacteria are exposed to an antibiotic, they cause either inhibition of the growth or remain resistant or unaffected.

Infections caused by bacteria, viruses, fungi and parasites are major causes of mortality, morbidity, disability, and socio-economic disruption of millions of people. The symptoms of bacterial infection are fever, chills, headache, nausea and vomiting, if untreated it can lead to life threatening complications such as sepsis, kidney and liver failure, toxic shock and even death.

However in the developing countries, infectious diseases still remain a major cause of global disease burden with high mortality and morbidity. On other side, there have been threats of new diseases during the past three decades due to the evolution and adaptation of micro-organisms and the re-occurrence of old diseases due to the development of resistance towards antimicrobials. The present trend for treating bacterial infections is antibiotic therapy. But use of antibiotics is associated with mild to severe toxicities and failure of treatment due to the development of resistance to antibiotics.

Before the introduction of modern medicines, disease treatment was entirely managed by herbal remedies. As per WHO, it is estimated that about 80% of the world population in developing and under developed countries still rely mainly on medicinal plants. Medicinal plants are the only affordable and accessible source of primary health care for them, especially in the absence of access to modern medical facilities. There is a need discovery of herbal medicines for their antibacterial properties in this millennium. Use of herbal medicines to treat bacterial infections is consider to be safe due to less toxicity, effective since development of resistance is rare and convenient due to their easy availability. Newer techniques can be used like in silico model/docking studies can be done to check whether the isolated natural products can be the lead molecule against the drug resistance microbes.

It is estimated that, 50% of Western drugs shows either the plant phytoconstituents or synthetic derivatives of phytoconstituents. Commercially proven drugs used in modern practices were initially used in various traditional or folk healing practices in the crude form that suggested potentially useful pharmacological activity. The main benefits of plant derived medicines are that they are relatively safer than synthetic agents, offering profound therapeutic benefits and more affordable treatment.

Plants consisting of active compounds are important as beneficial medicinal effects, typically result from the combinations of secondary metabolite such as tannins, alkaloids, phenolic compounds and steroids, which are synthesized and deposited in specific parts of the plant. These constituents are more complex and specific and are found in certain taxa such as family, genus and species. The medicinal properties of plants are unique to a particular plant species or group, consistent with the concept that the combination of secondary metabolites in a particular plant is taxonomically distinct.

Plants have become a source of potential antimicrobial substances. Laboratories of the world have found literally thousands of phyto-constituents which have inhibitory effects on all types of microbes in vitro. Most of these compounds should be subjected to preclinical and clinical studies to determine their effectiveness in whole-organism systems, including in particular toxicity studies as well as an examination of their effects on beneficial normal microorganisms. It would be advantageous to standardize methods of extraction and in vitro evaluation so that the search could be more systematic and interpretation of results would be facilitated. Also, alternative mechanisms of infection prevention and treatment should be included in initial activity screenings.

Disruption of adhesion and in silico docking techniques are examples and currently, the anti-microbial activity not commonly screened using these mechanisms. Attention in this direction is needed in era of chemotherapeutic treatment of infection by using plant-based principles.

In silico docking techniques, the compounds which are complementarily at the molecular level of a ligand and a protein target is studied. Docking studies can identify the structural features that are important for binding and for in silico screening efforts in which suitable binding partners can be identified. In silico method can become an important tool in drug discovery taking the lead from the herbal medicinal plants which have already shown as a potential source of drugs as an alternate source. Phytoconstituents which have shown/ isolated / the extract which have shown good activity against microbes can be good source as antiinfectives. Structural activity relation[SAR] for the isolated compounds can be studied by in silico molecular docking studies and best molecule with potential can be made available to the society at a affordable price with effective treatment free from side effects.

The present work aim is to give a review of isolated compound from the plants which has shown activity against microbes viz., bacteria and fungi in alphabetic order. Not much work is done in this direction of studying in silico docking of microbes, this review can be used as lead for finding the selective target for finding a better antimicrobial after SAR and docking studies.
1.1 Ageratum conyzoides

Antibacterial activity of an isolated compound (AC-1) from the leaves of Ageratum conyzoides Linn was evaluated against four Gram-negative bacteria like Escherichia coli, Shigella dysenteriae, Pseudomonas aeruginosa and Salmonella typhi as well as four Gram +ve bacteria viz. Staphylococcus aureus, Streptococcus pyogenes, Bacillus subtilis and Bacillus megaterium using Disc diffusion method. Result showed that compound AC-1 had large zone of inhibition in disc diffusion against the said bacteria. Antibacterial activity was more in Gram - positive bacteria than Gram - negative bacteria. Highest activity was noted against Staphylococcus aureus and lowest was found for Salmonella typhi. The MIC (minimum inhibitory concentration) values of AC-1 against the bacteria ranged from 8 – 32 µg/ml. Results, thus, suggests that the compound (AC-1) isolated from the leaves of Ageratum conyzoides Linn. had good anti bacterial activity against the tested bacteria.

1.2 Ambrosia maritima

Five pseudoguaianolide sesquiterpenes (neoambrosin, damsicin acid, damsin, ambrosin, and hymenin) isolated from the aerial parts of Ambrosia maritima were investigated for their antimicrobial activity against two plant pathogenic bacteria, Agro bacterium tumefaciens and Erwinia carotovora. The tested compounds exhibited variable degree of antibacterial activity against both tested bacteria as minimum inhibitory concentrations (MIC) ranged 90–520 mg/l. Neoambrosin showed the highest antibacterial activity among the tested sesquiterpenes with MIC values of 150 and 90 mg/l against A. tumefaciens and E. carotovora, respectively.

On the contrary, hymenin was the least effective compound with MIC values of 520 and 310 mg/l against A. tumefaciens and E. carotovora, respectively. Neoambrosin, damsicin acid, and damsin caused significant reduction in sulfhydryl group content with the former being the most effective. The tested sesquiterpenes significantly inhibited polygalacturonase and pectin-lyase activities of A. tumefaciens and E. carotovora except for hymenin which caused a significant activation of E. carotovora enzymes.

1.3 Berberis heterophylla

The in-vitro antifungal activity of aqueous extracts of Ber beris heterophylla were evaluated as well as the antifungal activity of berberine isolated from Ber beris heterophylla. In Addition acute toxicity on fish and toxicity of berberine to embryo-larval stages of Bufo arenarum were tested. Berberine has shown a moderate but significant antifungal activity against dermatophytes fungi. Thus, the in vivo or in vitro antifungal activity of this compound, combined with their lower toxic effect in comparison with the reference compounds, indicate that the potential of this alkaloid as a novel class of antifungal agents.

1.4 Baccharis dracunculifolia

The antimicrobial activities of B. dracunculifolia and some of its isolated compounds were evaluated. The results have shown that the leaves extract of B. dracunculifolia (BdE) presents antifungal and antibacterial activities, especially against Candida krusei and Cryptococcus neoformans, for which the BdE showed IC50 values of 65 μg/ml and 40 μg/ml respectively.

Also, a phytochemical evaluation of the BdE was performed with the isolation of ursolic acid (1), 2a-hydroxy-ursolic acid (2), isosakuranetin (3), aromadendrin-4’-methyl ether (4), baccharin (5), viscidone (6), hautriwaic acid lactone (7), and the clerodane diterpene (8). Among these isolated compounds, 1 and 2 showed significant antibacterial property against Methicillin-Resistant Staphylococcus aureus (MRSA) with IC50 values of 5 μg/ml and 3 μg/ml respectively. Compound 3 was active against C. neoformans with an IC50 value of 15 μg/ml and a MIC value of 40 μg/ml, while compounds 4 to 8 were inactive against all tested microorganisms.

1.5 Boscia albitrunca

The extracts of Boscia albitrunca and martynoside were evaluated for antimicrobial activities using the micro dilution technique. All the extracts and compound were active against the tested Gram +ve, Gram –ve bacteria and fungi. Minimum inhibitory concentration (MIC) values for extracts ranged from 390.0 to 6250 g/ml and martynoside isolated from the butanol fraction was the most active with the lowest MIC values of 7.81 and 31.2 g/ml against B. subtilis and K. pneumoniae respectively. The activity demonstrated by the extracts and martynoside obtained from B. albitrunca against tested bacteria and fungi suggests that they could be helpful in the management of eye infections.

1.6 Bougainvillea glabra

Antibacterial property of Oleananonic acid acetate isolated from Bougainvillea glabra leaves were evaluated against Streptococcus mitis and Lactobacillus spp., by examining the zone of inhibition by well diffusion method at a concentration of 25 g/25 l. The terpenoid has shown significant antibacterial activity. The isolation method adopted is simple, cost effective and efficient.

1.7 Butea monosperma

Crude extract of flowers [CVP-1] and roots [CVP-2] of Butea monosperma were subjected for antibacterial activity against gram-negative and gram-positive bacteria like Bacillus megatarium, Bacillus subtilis, Escherichia coli and Pseudomonas aeruginosa using standard protocols with MIC in range of 7.5 to 25 g/ml. The antifungal activity was also carried out against strains of Alternaria, Fusarium and Aspergillus flavus in the range of 10 g/ml to 300 g/ml. The fraction CVP-1 was found to be active against the bacterial strain Escherichia coli MTCC–442 with 3.5 g/mL concentration. Similarly, fraction CVP-2 was found excellent active against the bacterial strain Bacillus subtilis MTCC–441 with 6.4 g/ml concentration. The fraction
CVP-1 was found excellent active against Alternaria MTCC—149 with 10 g/ml concentration and fraction CVP-2 was found excellent active against Alternaria MTCC—149 with 50 g/ml concentration. Four compounds were isolated viz., 3,4,5 trihydroxy Benzoic acid-2-(3,4-dihydroxyphenyl)-3,5,7-trihydroxy- 4H-chromen-4-one (quercetin), (E)-3-(4 hydroxy-3-(3,4,5-trihydroxy methyl) tetrahydro-2H pyran-2-yloxy)phenyl)-1-(2-hydroxy-4-(3,4,5-trihydroxy-6(hydroxyl methyl) tetrahydro-2H-pyran-2-yloxy) phenyl) prop-2-en-1-one and 2-(4-hydroxy-3-(4,5,6-trihydroxy) tetrahydro-2H-pyran-2-yloxy)phenyl)-7-(4,5,6 trihydroxy 3-(hydroxymethyl)tetrahydro-2H-pyran-2-yloxy) chroman-4-one from the plant and antimicrobial activity could be attributed this compounds.

**1.8 Calophyllum brasiliense**

Crude methanol extracts (CME) of Calophyllum brasiliense and two fractions, denoted non-polar (soluble in chloroform) and polar (insoluble in chloroform), were prepared from different parts of the plant (roots, stems, leaves, flowers and fruits) and evaluated. Isolated compounds from methanol extract of Calophyllum brasiliense viz., brasiliensic acid (1), gallic acid (2), epicatechin (3), protocatechic acid (4), friedelin (5) and 1,5-dihydroxyxanthone (6) were evaluated for antimicrobial activity against Bacillus cereus(ATTCC 14579), Enterobacter cloacae (ATCC35030), Escherichia coli (ATCC 11775), Proteus mirabilis (ATCC 14273), Pseudomonas aeruginosa (ATCC 35032), Salmonella typhimurium (ATCC14028), Staphylococcus aureus (ATCC 6538P), Staphylococcus saprophyticus (ATCC 35552) and Streptococcus agalactiae (ATCC 13813), Candida albicans (ATCC 10231) and Candida tropicalis (ATCC 7349). The results of the present indicated that all the parts of the plant exhibited antimicrobial activity against Gram-positive bacteria, which are selectively inhibited by components of C. brasiliense. No activity was found against Gram-negative bacteria and yeasts tested. Among the isolated compounds, substance 4 showed antimicrobial property against all the tested microorganisms, where as compound 6 has shown antimicrobial activity only against Gram-positive bacteria.

**1.9 Chamaecyparis formosensis**

The chemical composition of the volatile oil of Chamaecyparis formosensis wood has been tested. GCMS data and retention indices for reference samples were used to identify 32 compounds. α Eudesmol (18.06%), β-guaiene (8.0%), (–)-β-cadinene (7.89%), γ-costal (7.03%), α- muurolol (6.49%), 4α-hydroxy-4b methylidihydrocostol (5.52%), s-selinene (4.78%), santolina triene (4.60%), eremophilene (4.32%), humulene (4.11%), myrtanol (4.11%), and t-cadinene (3.25%) were the most abundant components. The wood oil was evaluated against typical wood decay fungi, Laetiporus sulphureus and Trametes versicolor, proved the antifungal activity of the essential oil, as the growth of L. sulphureus and T. versicolor was inhibited at concentrations of 50 and 100 µg/ml respectively. The volatile compounds were isolated and purified from ethyl acetate fractions of C. formosensis were epicubenol, chamaecynone, myrtanol, cis-myrtanol, 12-hydroxyisomentodenol and 4α-hydroxy-4β methylidihydrocostol. Out of the isolated compound, Chamaecynone possessed the strongest antifungal activity, with an antifungal index of 88.2% and 67.3% for L. sulphureus and T. versicolor at a dose of 50 mg/ml respectively.

**1.2.0 Cichorium intybus**

The ethyl acetate extract of chicory root were tested for antibacterial and anti-fungal properties using Gram Positive (Bacillus subtilis, Staphylococcus aureus, Rhizobium leguminosarum) and three Gram negative (Vibrio cholerae, Escherichia coli, Pseudomonas fluoreescens) bacterial species & two fungal (Aspergillus niger and Saccharomyces cerevisiae) species. Fractionation by column chromatography of ethyl acetate extracted root powder contains the compound, inhibiting both Gram positive and Gram negative bacteria and was found to be bacteriostatic rather than bacteriocidal. The effect of chicory root extract has more bacteriostatic effect on Gram Positive bacteria than Gram negative bacteria as MIC value is more in case of Gram negative bacteria than Gram positive bacteria.

**1.2.1 Chromolaena Spp.**

The crude extracts (dichloromethanic and ethanolic) and compoundsisolated (8 flavonoids and 5 steroids stigmasterol 9, β-sitosterol 10, campesterol 11, espinasterol 12, 7-stigmastenol 13) isolated from Chromolaena squalida (leaves and stems) and Chromolaena hirsuta (leaves and flowers) have been investigated against 22 strains of microorganisms including bacteria (Gram- positive and Gram-negative) and yeasts( Escherichia coli - ATCC 10538; E. coli 6.1 (fieldstrain); Pseudomonas aeruginosa - ATCC 27853; P. aeruginosa - Pn (field strain); Micrococcus luteus - ATCC9341; Staphylococcus aureus - ATCC 25923, 6538 and 29213; S. aureus - 7+ penicillinase producer; S. aureus -8-penicillinase non-producer; Staphylococcus epidermidis - 6ep (field strains); Candida albicans - ATCC 1023;Candida albicans-cas and Candida tropicalis - ct (field strains), cultivated for 24 hours at 37 °C in Mueller Hinton broth (Difco)-MHb; Enterococcus faecalis – ATCC 10541; Streptococcus mutans - ATCC 25175; S. mutans (strains Fab3; 87.1; 203.1; 211.1; 213.1) and Streptococcus sobrinus - 87.3 (field strains).

All crude extracts, flavonoids and steroids evaluated have been shown actives, mainly against Gram-positive bacteria. The flavonoids 6, 7 and 8 were the most bioactives. The mixture of steroids (500 µg/ml) showed to be active mainly against Streptococcus mutans and S. sobrinus strains, however with very limited activity. The flavonoids 1 and 2 were active against S. aureus (ATCC 6538 and ATCC 29213), S. sobrinus (87.3) and Enterococcus faecalis (ATCC-10541) strains. From all test-drug only the flavonoid 7 showed activity against the Gram-negative (Escherichia coli, Pseudomonas aeruginosa) bacteria and yeast (Candida

albicans and C. tropicalis. C. hirsuta showed antimicrobial activity, mainly against Gram-positive (Staphylococcus and Streptococcus) bacteria\textsuperscript{12}.

1.2.2 Clerodendrum plomidis

The in vitro antimicrobial activity of the extracts and isolated compounds \{ Phenyl acetic acid, Ethyl- 2- hydroxy - 4- methyl benzoate, 3,6,7-trihydroxy-2-(3-methoxyphenyl)-4H-chromen-4-\} one \{ from roots of Clerodendrum plomidis against Staphylococcus aureus, Streptococcus pyogenes, Escherichia coli, Pseudomonas aeruginosa, Candida albicans, and Aspergillus niger \} were evaluated. Experiment showed that ethanol extract of Clerodendrum plomidis at 106.66 g/ml showed a significant result against Escherichia coli. Chlorofor m extract also shows good antimicrobial activity against Staphylococcus aureus with a zone of inhibition of \{ (14.67mm) \}. Among the isolated compounds, Ethyl- 2- hydroxy - 4- methyl benzoate shows good antimicrobial activity against Staphylococcus pyogenes, and Candida albica\textsuperscript{13}. In the isolated compounds, ethyl- 2-hydroxy - 4- methyl benzoate shows good antimicrobial activity than other two compounds, this may be due to the presence of ester group and phenolic hydroxyl group. All the isolated compounds showed no inhibition against Pseudomonas aeruginosa. Ethyl- 2- hydroxy - 4- methyl benzoate, possess the chemical structure similar to parabens, may exert the similar antimicrobial activity like that of parabens.

1.2.3 Combretum woodii

Acetone extracts of C. woodii leaf powder was separated by solvent-solvent partition into six fractions. The highest total activity was in the chloroform fraction. The compound was isolated by bioassay-guided fractionation using silica gel open column chromatography as the stilbene 2',3',4-trihydroxy-3,5,4' trimethoxybenzyl (combretastatin B5). Causative agents of nosocomial infections were used which were Staphylococcus aureus (ATCC 29213), Pseudomonas aeruginosa (ATCC 25922), Escherichia coli (ATCC 27853) and Enterococcus faecalis (ATCC21212). It has shown significant anti-bacterial activity against S. aureus with an MIC of 16 mg/l but with lower activity towards P. aeruginosa (125 mg/l), E. faecalis (125 mg/l) and slight activity against E. coli. Its concentration in the leaves was in the order of 5-10 mg/g which makes the use of extracts for clinical purposes a viable possibility particularly in poor communities\textsuperscript{14}.

1.2.4 Curcuma longa

The three isolated compounds from Curcuma longa viz, curcuminoids \{ curcumin, bisdemethoxycurcumin and demethoxycurcumin \} were screened for antibacterial activity against medically important bacteria viz. B. subtilis, K. pneumonia, E. coli, Enterobacter aerogenes, Pseudomonas aeruginosa, S. aureus and P. Mirabilis by Agar diffusion method. Two fungi were selected viz. Aspergillus niger and Candida albicans for antifungal activity of three isolated curcuminoids by Agar well diffusion method. Out of three curcuminoids, curcumin has shown better antibacterial as well as antifungal properties as compared to bisdemethoxycurcumin and demethoxy curcumin. Curcumin has shown very good significant activity against B. subtilis, E. coli, S. aureus and P. mirabilis, whereas it exhibited moderate activity against K. pneumonia, Enterobacter aerogenes and Pseudomonas aeruginosa. Bisdemethoxycurcumin exhibited good activity against B. subtilis and S. aureus whereas it showed moderate activity against E. coli, P. mirabilis, K. pneumonia, Enterobacter aerogenes and Pseudomonas aeruginosa. Demethoxycurcumin has shown some degree of activity against B. subtilis, S. aureus, E. coli, P. mirabilis, K. pneumonia and Enterobacter aerogenes. It was inactive against Pseudomonas aeruginosa. Curcumin showed very good activity against both fungi, viz., A. niger and Calbican. Bisdemethoxycurcumin has shown moderate activity against A. niger and Calbican. Demethoxycurcumin exhibited some degree of activity against Calbican and no activity against A. niger\textsuperscript{15}.

1.2.5 Ficus lyrata

The aqueous and ethanol extracts of F. lyrata and two pure compounds i.e. Ursolic acid (FL-1) and Acacetin-7-O-neohesperidoside (FL-2) isolated from F. lyrata were tested against several standard bacterial strains by the Kirby Bauer method for determining the MIC. F. lyrata showed potent antibacterial activity against Pseudomonas aeruginosa, Staphylococcus aureus, Shigella dysenteriae, Shigella boydii, Citrobacter freundii, Proteus vulgaris, Proteus mirabilis and Klebsiella. The aqueous extract was more potent than alcoholic extract. The isolated compounds were more potent and showed better activity when compared to the crude extract. The minimum inhibitory concentration (MIC) of aqueous extract of F. lyrata and the isolated compounds were found to be significantly low for all the tested bacterial strains. The study suggests that the extracts obtained from the leaves of F. lyrata possess excellent antibacterial activity which could possibly be attributed to the two compounds i.e. FL-1 and FL-2\textsuperscript{17}.

1.2.6 Flavonoids

Flavonoids are ubiquitous in photo-synthesising cells and are commonly found in vegetables, nuts, fruit, seeds, stems, flowers, tea, wine, honey and propolis. For centuries, preparations consisting of flavonoid compounds have been used to treat various human diseases. Now a days this class of natural products is becoming the subject of research as anti-infectives, and several groups have isolated and identified the structures of flavonoids possessing antimicrobial (antifungal, antiviral and antibacterial) activity. Several groups of flavonoids have demonstrated synergistic properties between active flavonoids as well as between flavonoids and existing chemotherapeutic agents. In addition, several research groups have sought to elucidate the mechanisms of action for antibacterial activity of selected flavonoids. For example, the activity of quercetin
has been at least partially attributed to DNA gyrase inhibition. Also it has been proposed that sophoraflavone G and (−)-epigallocatechin gallate diminishes cytoplasmic membrane function, and that lichochochalcones A and C inhibit energy metabolism. Other flavonoids for which mechanisms of action for antimicrobial properties have been investigated include apigenin, rutin, robinetin, myricetin, galangin, 2,4,2-trihydroxy-5-methylchalcone and lonchocarpol A. These compounds represent novel leads for future studies may allow the development of a pharmacologically acceptable antimicrobial agent or class of agents.\textsuperscript{18}

1.2.7 Kigelia africana

Crude extracts of stem bark and fruits of Kigelia africana were prepared with distilled water, ethanol or ethyl acetate. In the microtitre plate bioassay, fruits and stem bark extracts have shown similar antibacterial activity against Gram-negative and Gram-positive bacteria. A mixture of three fatty acids [palmitic acid was the major compound and non-anonic acid and 8-heptadecenoic acid, the minor compounds] showing antibacterial effects were isolated from the ethyl extract of the fruits using bioassay-guided fractionation. The results confirm antibacterial activity of K. africana fruits and stem bark, and support the traditional use of the plant in therapy of bacterial infections.\textsuperscript{19}

1.2.8 Mangifera indica

Five flavonoids, viz. (−)-epicatechin-3-O-β-glucopyranoside (1), 5-hydroxy-3-(4-hydroxyphenyl)pyran-3,2,4-glucopyranoside (4) and (−)-epicatechin (2), 3,4-dihydro-2H-chromene-3,5,7-triol (5) were isolated from the leaves of mango (Mangifera indica L.). The antibacterial properties of different concentrations of the flavonoids (100, 300, 500, 700, 900 and 1000 ppm) were tested against four bacterial species, namely Azospirillum lipoferum, Bacillus spp., Escherichia coli and Lactobacillus spp. The five flavonoids significantly inhibited the growth of all the five tested species of bacterial. However, differences in the antibacterial properties of the flavonoids were evident. Compound 1 has shown the lowest antibacterial property, resulting in a 7–75% reduction in the growth of the different bacterial species. Compound 5 has shown the maximum antibacterial activity and the different concentrations inhibited the bacterial growth by 45–99.9%. A. lipoferum and Bacillus spp. has shown the highest susceptibility to this compound. Compounds 2–4 also exhibited pronounced antibacterial activity. Different concentrations of the flavonoid compounds reduced bacterial growth by 52–96%. The results of the present study concluded that compound 5 is the most effective of the tested flavonoids against A. lipoferum and Bacillus spp.\textsuperscript{20}

Potential antimicrobial compounds from Mangifera indica L. seed kernel were isolated by the bioassay guided fractionation process and characterized by NMR and LC-MS as gallic acid, gallic acid ethyl ester, hydroxyl xanthone-C-glucoside and Quercetin 3 sulphate. The extracts and isolated fractions were evaluated for their antimicrobial property against Bacillus subtilis, Staphylococcus aureus, Escherichia coli, Pseudomonas aeruginosa, and the fungal strains Aspergillus niger and Candida albicans. The minimum inhibitory concentration (MIC) of ethyl acetate extract ranged between 4.0 and 5.0 μg/ml, Bacillus subtilis (MIC 4.5 μg/ml), S. aureus (MIC 0.4 μg/ml), Escherichia coli (MIC 4.5 g/ml) and Pseudomonas aeruginosa (MIC 5.0 g/ml) and Candida albicans (MIC 4.5 g/ml)\textsuperscript{21}.

1.2.9 Monanotaxis littoralis

The study evaluated the antifungal activity of a mixture of two closely related flavonoids namely 3, 7, 5'-trihydroxyanthocyanidines and 3, 5-dihydroxy-7-methoxyanthocyanidines isolated from Monanotaxis littoralis (Annonaceae) against mycotoxigenic fungi from three genera (Aspergillus, Fusarium and Penicillium) isolated from maize samples. The highest activity of the flavonoids was against Aspergillus ochraceus with inhibition zone of 20.17 mm and MIC of 1 μg/ml. The activity of the flavonoids against the mycotoxigenic fungi had Minimum Inhibitory Concentration (MIC) values ranging from 1 μg/ml to 4 μg/ml. These results show that the two flavonoids from M. littoralis have antifungal activities against fungi that are the producers of poisonous mycotoxins found in foods. These compounds are potential antimicrobials that can be used in food preservation systems to inhibit the growth of moulds and retard subsequent mycotoxin production.\textsuperscript{22}

1.3.0 Nycanthes arboritris

The antimicrobial activity of stem bark extracts of Nycanthes arboritris were evaluated by cup plate method against Staphylococcus aureus, Micrococcus luteus, Bacillus subtilis, Escherichia coli, Pseudomonas aeruginosa, Candida albicans and Aspergillus niger. The chloroform extract was found to have both antifungal and antibacterial properties whereas the petroleum ether and ethanol extracts has shown only antibacterial property.

The antibacterial potential of β sitosterol isolated from the ethanolic extract of leaves of Nycanthes arboritris were evaluated on gram +ve (Staphylococcus aureus) and gram –ve (Escherichia Coli and Pseudomonas aeruginosa) bacteria. Isolated compound, β sitosterol shown higher zone of inhibition against Pseudomonas aeruginosa as compared with the other tested bacteria.\textsuperscript{23}

1.3.1 Psidium guajava

Ten new aliphatic compounds pentapentacont-17, 31-diol (1), 11-hydroxy-tricont-35-pentatriacontanoate (2), 34 octaheaxacontol (3), heptatriacont-8-ol (4), 14,15-dimethyl (cyclopropyl)-9-octodecayl-3-(4-hydroxyphenyl) propanoate (5), hexaecosan-16-ol (6), pentatetracosan-10, 25-diol (7), untricontan-11, 19-diol (8), tricosan-17-ene-5-ol (9), and nonacosan-23-ene-3-ol (10) were isolated from the ethanol extract of the leaves of P. guajava. The
The antifungal compounds isolated from benzene: acetone fraction of P. guajava gave moderate activity against Staphylococcus aureus. All of the compounds showed noticeable activity against Salmonella typhimurium, Pseudomonas aeruginosa and Bacillus subtilis. All compounds showed very poor activity against Shigella spp and Klebsiella pneumoniae.

All compounds isolated from leaves of guava (Psidium guajava L.), which were morin-3-O-α-L-lyxopyranoside, morin-3-O-α-L-arabopyranoside, guaijavarin and quercetin. The minimum inhibition concentration of morin-3-O-α-L-lyxopyranoside and morin-3-O-α-L-arabopyranoside was 200 μg/ml for each against Salmonella enteritidis and 250 μg/ml and 300 μg/ml against Bacillus cereus, respectively.

1.3.2 Pseudognaphalium luteoalbum

Invasive and weedy species such as Pseudognaphalium luteoalbum may serve as a source of biologically active extracts or compounds with application in crop and ornamental plant protection, among other uses. The acetone crude extract of P. luteoalbum leaves had strong antifungal activity when tested against a selection of pathogenic fungi in vitro. The compounds were identified as: 5,4′-dihydroxy-6-methoxy-7-O-β-glucopyranosideflavone (hispidulin-7-O-glucopyranoside) (1) and stigmasterol-3 O-β-glucopyranoside (2). The crude extract and isolated compounds were moderately to highly active against a selection of phytopathogenic fungal organisms with MIC values ranging from 0.02 to 1.25 mg/mL. No cytotoxicity of the isolated compounds was found against Vero kidney cells at 200 μg/ml.

1.3.3 Rebutia hemispherica

Comparative evaluation of antimicrobial activity of methanolic extract and phenolic fraction of a liverwort, Rebutia hemispherica were carried out by Agar well diffusion technique. Four Gram positive (S. aureus, clinical isolate; E. faecalis, clinical isolate; B. subtilis, MTCC 121; B. cereus, MTCC 430) and three Gram negative (E. coli, MTCC 1673; P. aeruginosa, MTCC 1934; K. sp., clinical isolate). Fungal species included A. niger, MTCC 1344 and P. notatum, MTCC 1898. The Gram +ve bacteria were more sensitive than the Gram -ve ones, while the fungal species were less sensitive. R. hemispherica extract exhibited best results against Staphylococcus aureus, although it was active against all tested microbes. The antimicrobial activity increased with the increase in the concentration of the extract except in Klebsiella sp. S. aureus, E. faecalis and Bacillus cereus were inhibited more by the crude methanol extract of R. hemispherica than the phenolic compounds isolated from the extract. A. niger was inhibited equally by the crude methanol extract as well as the phenolic compounds. B. subtilis, E. coli, P. aeruginosa, K. sp. and P. notatum were inhibited more by phenolic compounds than the crude methanol extract of R. hemispherica.

1.3.4 Solanum spirale

The hexane and chloroform extracts of Solanum spirale inhibited antibacterial activity against E. coli and S. aureus with the MIC values were in the range between 375-1500 g/ml. All isolated compounds [trans-cinnamic acid, lupeol and protocatechuic acid] showed equal antibacterial activity against E. coli with the MIC of 250 g/ml and trans-cinnamic acid showed better antibacterial activity against S. aureus with the MIC of 250 g/ml than lupeol and protocatechuic acid.

1.3.5 Tectona grandis

The isolated compound from Tectona grandis was evaluated for anti-mycobacterial activity against S. aureus, K. pneumoniae, S. paratyphi and P. mirabilis and also against Mycobacterium tuberculosis. Cytotoxicity of isolated compounds was evaluated. Two compounds isolated from chloroform extract of leaf has shown significant activity against S. aureus (Compound 1: MIC = 2.5 g/ml, IC50 = 72 g/ml; Compound 2: MIC = 5 g/ml, IC50 = 98 g/ml) and K. pneumoniae (Compound 2: MIC = 6.2 g/ml, IC50 = 113.5 g/ml). These compounds failed to show antimycobacterial activity on testing against M. tuberculosis. On cytotoxicity analysis of both compounds against chick embryo fibroblast (CEF), HEK293, HCT119 and L929 cells, compound 2 showed activity against HEK293 (IC50 = 2 g/ml).

1.3.6 Tragia involucrata

The fresh roots of young matured plants of Tragia involucrata Linn. were selected for phytochemical and antimicrobial examination to justify the folklore and traditional uses of the plant parts in various microbial infections. The antimicrobial activities were noted in the selected isolated compounds from the plants [10, 13-dimethoxy-17-(6-methylheptan-2-yl)-2, 3, 4, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16,17 tetradecahydro-1Hcyclopenta[a]phenantherene] TIR-01, Stigmasterol [TIR-02], Quercetin [TIR-03], Rutin [TIR-04] and 3-(2,4-dimethoxyphenyl)-6,7-dimethoxy-2,3-dihydrodro-men-4 one; TIR-05] in a concentration of 200 g/ml were well comparable with that of the standard drugs in the concentrations of 25 g/ml against some selective strains of bacteria and fungi. S. aureus (MTCC 7443), B. subtilis (MTCC 619), B. brevis (MTCC 4832) and S. epidermidis (MTCC 2639); gram –ve bacteria such as E. coli (MTCC 1687), Shigella dysenteriae (Lab. isolate from stool), Pseudomonas aeruginosa (MTCC 1688) and Vibrio cholera (MTCC 3904) and fungi such as Trichophyton rubrum (MTCC 296) and Malassezia furfur.
2. IN SILICO ANTIMICROBIAL ACTIVITY

2.1 Annona reticulate
The antimicrobial activities of methanolic root extract of Annona reticulate Linn were evaluated using the agar cup method whereas Poison plate method was used to assess sensitivity of fungal strains. The biological potential of major phytoconstituents as antimicrobial agent was screened by new software based tool, PASS. The probable activity (Pa) of neoannonin using PASS was found to be 0.541. The extract was significantly active against all strains of bacteria but the largest zone of inhibition was found against B. cereus. Predominant growth reduction was observed in fungi Tricoderma viride and Candida albicans. The results indicate that the extract show potential as a source of new antimicrobial drug and may impart health benefits by its antioxidant property.

2.2 Sesamum indicum
Pathogenic bacteria constitute an important cause of hospital-acquired infections. However, the misuse of available bactericidal agents has led to the appearance of antibiotic-resistant strains. Thus, efforts to seek new antimicrobials with different action mechanisms would have an enormous impact. Here, a novel antimicrobial protein (SiAMP2) belonging to the 2S albumin family were isolated from Sesamum indicum kernels and evaluated against several bacteria and fungi. Furthermore, in silico analysis was conducted in order to identify conserved residues through other 2S albumin antimicrobial proteins (2S-AMPs). SiAMP2 specifically inhibited Klebsiella sp. Specific regions in the molecule surface where cationic (RR/RRRK) and hydrophobic (MEYWPR) residues are exposed and conserved were proposed as being involved in antimicrobial activity. This study reinforces the hypothesis that plant storage proteins might also play as pathogen protection providing an insight into the mechanism of action for this novel 2S-AMP and evolutionary relations between antimicrobial activity and 2S albumins.

3. CONCLUSION
We have given a review of 38 plants with their isolated compounds against number of bacteria and fungi. Each isolated compound have shown to possess antimicrobial activity with different MIC values. Future plan will be that SAR of the isolated compounds can be done and check which has a better antimicrobial activity. Industry can take the lead and isolated the compound in bulk quantities and prepare formulation. This review gives an idea about their antimicrobial potential of isolated compounds which can be utilized by Industry and coming out with a formulation at a cheaper rate which could be helpful to treating the disease related to microbes at an affordable price.

4. ACKNOWLEDGEMENT
The authors are grateful to Department of Pharmacognosy, The Oxford College of Pharmacy, Bangalore, for providing the facilities.

5. REFERENCES
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**Conflict of Interest: None**

**Source of Funding: Nil**