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Synthesis and Biological Evaluation of New Substituted Imidazole and Pyrazoles Having Anti-Microbial Activity

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ABSTRACT

The nitrogen carry imidazole and pyrazole heterocycles are constantly begin as essential bioactive compounds. The presence of N-heterocycles is an important because it boost the synthetic responses and result of changes on biological efficacy. This will be a demand for brand new medicament development be in charge of the continuously propagation of unfavourable microbial infections. The new substituted imidazole and pyrazoles have been researched for anti-microbial activity, because in a various microbial infections aforementioned base has demonstrate satisfaction during time to time. We call attention to the biological activity of imidazole and pyrazoles in the latest review.

Keywords: Antimicrobial activity, Imidazole , Pyrazole

INTRODUCTION

Antimicrobial activity

In daily routine, the human body may contaminated by various micro-organism, some of that may cause illness by invading the host's body through respiratory tract or urogenital tract or breaks the skin surface or by gastrointestinal tract. The antimicrobial agents are drugs that treat microbial infections by kill the microbes are known as microcidal or by inhibit the microbial growth by various methods called as microbiostatic. The antimicrobial medicines can be grouped according to types of micro-organism. The imidazole and pyrazole are five membered rings that contain two nitrogen atoms. They are an important leading groups of azole family over recent years. The various substitutions on pyrazole nucleus generate medicinal properties and also prohibitors of protein, glycation, antidepressant, antioxidant activity.The heterocyclic system techniques to form pyrazole nucleus are as follows;

The few components of human organism are formed by nucleus of imidazole that are; histidine, components of DNA base structure and purines, amino acids, biotin, histamine and vitamin B_{12} . The imidazole and pyrazoles also act like analgesic, antibacterial, anticancer, antifungal, antiviral and anti-tuberculosis activity.Resonance structures of imidazoles are;

Antimicrobial activity of imidazole and pyrazole compounds

Barus. M, et. al, reported the synthesis and evaluation of antimicrobial activity of new functional derivatives of 3-[5-(4-nitrophenyl)-2-furyl]-4-pyrazole-carbaldehydes. The new synthesized compounds were screened for their antibacterial and antifungal activity using micro method. The synthesized pyrazole derivatives showed antibacterial activity was screened against reference strains of bacteria, E. coli ATCC 25922, S. aureus ATCC 25923 and antifungal activity was screened against fungi of the genus C. albicans ATCC 885653. The compounds 1a-d showed antifungal and antibacterial activity against bacteria S. aureus strain, but compound 1e was less active. Compound 1d was sensitive against E. coli bacteria. The most active compound was 2f, it shows inhibitory effect against E. coli strain.

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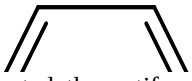

Zinad. D. S, et. al, reported the antifungal activity and theoretical study of synthesized pyrazole-imidazole hybrids. The synthesized compounds were evaluated for antifungal activity using Amphotericin B as a reference compound. The synthesized MPIMPPA was more potent due to hydrogen-bonding formation by the nitrogen atom (NH), while the CMPIP compound less activity against Aspergillus niger.

Compound	R^1, R^2
1a	2-malononitrile, cyano
1b	2-cyano, acrylate
1c	2-cyano, acrylmide
1d	5-methylene,4-thioxo-1,3-thiazolidin-2-one
1e	2-methylen, malononitrile

Vijesh. A. M, et. al, reported the synthesis and antimicrobial studies of some new pyrazole incorporated imidazole derivatives. The synthesized compounds were evaluate for antibacterial and antifungal activities by well plate method using Fluconazole, Streptomycin as a reference drug. The antibacterial activity was screened against Staphylococcus aureus, Escherichia coli, Bacillus subtilis, Clostridium profingens, Salmonella typhimorium and Pseudomonas aeruginosa and newly synthesized compounds were also screened s antifungal activity against Candida albicans, Aspergillus niger, A. flavus, Trichophyton rubrum and Microsporum gypseum. The 4c compound showed excellent response against P. aeruginosa as compare to standard drug Streptomycin during in vitro antibacterial activity, while this compound was showing antifungal activity against T. rubrum compared with fluconazole as reference drug.

Compounds	Ar
4a	2,4-Dichlorophenyl
4b	2,5-Dichlorothiophene
4c	4-SCH_3 -C_6 H_4
4d	4-CH_3 -C_6 H_4

Brahmbhatt. H, et. al, reported the pyrazole nucleus fused tri-substituted imidazole derivatives. The newly synthesized compounds were screened for their biological activities such as antibacterial response using a serial broth dilution method and antioxidant response using the DPPH method. Ampicillin was mainly used as standard drug for comparison. The antimicrobial activity was screened against gram-positive and gram-negative bacteria. The synthesized compounds showed moderate to excellent antioxidant and antimicrobial activity against different bacterial strains and the DPPH radical.

Compound	R_1	R_2	R_3
5a	CH_3	H	CH_3
5b	CH	H	OCH_3
5c	CH_3	H	F
5d	CH_3	H	Cl

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5e	CH_3	H	Br
5f	CH_3	H	I
5g	CH_3	H	NO_2
5h	CH_3	Br	H
5i	CH_3	H	H
5j	Cl	H	CH_3
5k	Cl	H	Cl
5l	Cl	H	Br
5m	Cl	H	NO_2
5n	Cl	Br	F

Nomiya. K, et. al, the two isomeric gold (I) complexes containing Au(L), PPh_3 , HL-pyrazole and imidazole compounds were evaluated for the antimicrobial activity of gold (I) complexes against two gram-positive bacteria; Bacillus subtilis, Staphyloccus aureus ,also show some activities against Candida albicans yeast and show no activity against Escherichia coli, Pencillium citrinum molds. The compounds activity were estimated by minimum inhibitory concentration method and hence the compound Au(tertz)(PPh_3) shown modest activities only against the two gram positive bacteria.

Premkumar. T, et. al, prepared 2-pyrazine carboxylate, 2,3-pyrazinedicarboxylate, 4,5-imidazoledicarboxylate and 3,5-pyrazoledicarboxylate. The disc diffusion method was used to determinine the antimicrobial activity. The micro-organism cultures of E.coli, Salmonella typhi and Vibrio cholera were used to study antimicrobial screening of hydrazinium salt and free acids. The result show dihydrazinium salt have more inhibiting effect than free acids and monohydrazinium salts.

Punia. S, et. al, determined the antimicrobial activity of 18 pyrazole-imidazole-triazole hybrid(2-(4-((2- (substituted-1- H- pyrazol-1-yl) – 4 – phenyl - 1H – imidazole - 1-yl) methyl) - 1H 1, 2, 3 – triazol - 1- yl) – N -(substituted) phenylacetamide) using serial dilution method agans S.aureus, E.coli, B.subtilis, P.aeruginosa, yeast (C.albicans) and fungus (A.niger). The inhibitory compound was ciprofloxacin and the test tubes were incubate for 24 hours at 37˚ C. The 7g and 7m show more activity against P.aeruginosa and E.coli, but 7m show highest activity against C.albicans and A.niger.

Ghorab. M, et. al, defines the antimicrobial activity of pyrazolo (3,4-d) pyrimidine with amino acid, carbonyl, imidazole, pyrazolone, sulfonamide and pyrazole. The antimicrobial activity of compounds screened against E.coli, P.aeruginosa, B.subtilis and S aureus and also against P.species, A.flavus, A.fumigatus and C.albicans. The compound pyrazolo - pyrimidine - imidazole,

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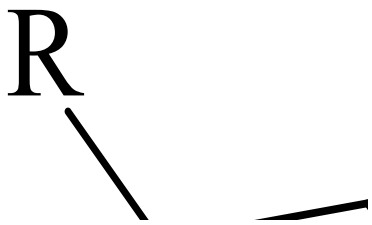
pyrazolo-pyrimidine- N - (4, 6- dimethyl -pyrimidine and pyrazolopyrimidine-benzenesulfonamida equally active as a reference drug chloramphenicol.

Viveka. S, et. al, prepared pyrazole derivatives by imidazole derivatives with substituted 4-formylpyrazole, pyrimidine and 1,4-dihydropyridine. The antimicrobial activity was screened by disc diffusion method against Klebsiella pneumonia, Staphylococcus aureus,P.aeruginosa and E.coli and fungi A.niger and A.flavus. The compound 9c and 9f have highest activity as compare to other compounds and the pyrimidinone include halo substituted 1,3-diarylpyrazole is a great molecule for biological activity. The antifungal activity was screened by serial plate dilution method.



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