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SYNTHESIS AND ANTIMICROBIAL ACTIVITIES OF 1,3-DIARYL-1H-PYRRAZOL-4-CARBALDEHYDE

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ABSTRACT :

A new series of 1,3-Diaryl-1H-pyrrazol-4-carbaldehyde has been synthesized from hydrzone of aromatic ketone and phenyl hydrazine in presence of Vilsmear Hack reagent. The structures of synthesized compounds has been confirmed by elemental analysis FT-IR, ^{1}H NMR, ^{13}C NMR and mass spectral data. These synthesized compounds observed to show moderate to good Antimicrobial activities against the available strain of bacteria Pseudomonas Aeruginosa , Staphylocoocus Aureus , Ataphylocoocus Pyogenes and Escherichi Coli using commercially available antibiotics ampicillin as astandard drug

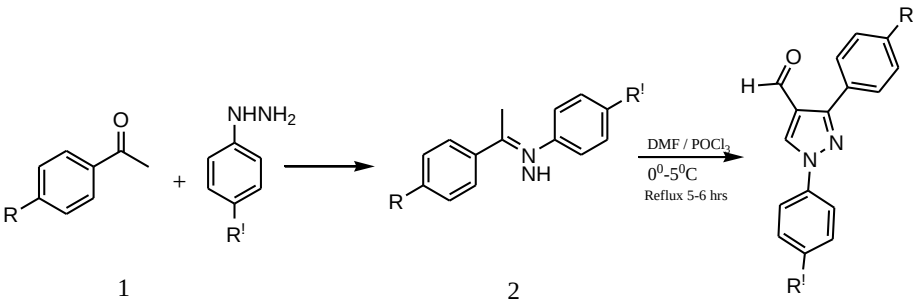
Key Words : *1,3-Diaryl-1H-pyrrazol-4-carbaldehyde, Hydrzone, Vilsmear Hack reagent, Antimicrobial activity*

INTRODUCTION

A pyrazole having remarkable pharmacological activities due to five member heterocyclic nitrogenous ring. Pyrazole are medicinally potent scaffold and exhibit broad spectrum of biological activities such as Anti-Inflammatory [1], Antimicrobial[2], Anticancer[3], AntiHIV[4], Antioxident[5], Antipyratic[6], Antiviral[7] in pesticides pyrazole derivatives are effective against Tobacco Mosaic Virus which cause serious damage to plant[8], Acyl group at fourth position of pyrazole ring show Antifungi activity against Pythium aphanidermatum wich is a soil born pathogen and Rhizoctonia is a plant pathogenic fungus with a wide host range[9], peethamber et al synthesized and revealed that some pyrazole derivatives show Antioxident and Antihyperglaycemic activity [10], Sharma et al synthesized and explained Antimicrobial activities of pyrazole[11], Alegaon et al synthesized and explained Anti-Inflametory Activity of Pyrazole derivatives[12], Selvam et al studied microvave assisted synthesis and Biological Activities of pyrazole[13], Shrivastava et al synthesized and studied Anti hypoglycemic activity[14].

A new series of 1,3-Diaryl-1H-pyrrazol-4-carbaldehyde has been synthesized from hydrazone of substituted phenyl hydrazine and substituted acetophenone by cyclization with Vilsmear Hack reagent. These newly synthesized compounds show antimicrobial activity against available strain of bacteria Pseudomonas Aeruginosa is rod shaped Gram negative bacterium that can cause disease in animals and plant, Staphylocoocus Aureus is a round shaped Gram positive bacterium found in nose respiratory track, Ataphylocoocus Pyogenes is a Gram positive bacterium found in nasal mucous membrane and skin and Escherichi Coli is a Gram negative road shaped bacterium found in environment, food, intestine of people and animal, using commercially available antibiotics ampicillin as a standard drug.Amoung the synthesized compounds 4-chlorophenyl group substituted at 3rd position of pyrazole ring show potent Antimicrobial activity.

Reaction Scheme:



1 2 3a-e

R= OH, NO_2, Cl R!= Br, CH_3

Experimental :

Chemicals, reagents and solvents were of analytical grade or of the highest quality commercially available. The chemicals were purchased from ACS Thermo Fischer and SDFL respectively, these solvents used were of analytical grade and purified before their use.

Preparation of Hydrazone(2)from substituted Acetophenone and Phenyl hydrazine

Hydrozone(**2**) were prepared by simple condensation of substituted Acetophenone (0.01mole) with Substituted Phenyl hydrazine (0.01mole) in acidic medium. The reaction is monitored on TLC after completion of reaction, cool reaction mixture at room temperature and poured into ice cold water with constant stirring obtains a precipitate , filter it wash residue with cold water and recrystallized from Ethanol

Preparation of 1,3-Diaryl-1H-pyrrazol-4-carbaldehyde(3) from Hydrazone(2)

Hydrazone (12 mmol) was added to a cold solution of dimethylformamide (40.0 mmol) then Phosphorylchloride (40.0 mmol) was added and the resulting mixture was stirred at 60^0Cfor 6 h. The mixture was poured into ice-cold water. A saturated solution of potassium carbonate was added to neutralize the mixture; the solid precipitated was filter; washed with water; dried and recrystallized from ethanol.

3-(4-Hydroxyphenyl)-1-phenyl-1H-pyrazole-4-carbaldehyde

(3a). Colorless solid powder; Yield: 60%; m.p.: 126–138^0C; IR (KBr, cm^{-1}): 2778 (CH of CHO), 1668 (C=O), 1628(C=C), 1568 (C=N). 1H NMR (400 MHz, d, ppm, , CDCl3): 7.42 (t, 1H, J = 7.1 Hz, Ar-H), 7.56 (t, 2H, J = 7.4 Hz, Ar-H), 7.70 (d, 2H, J = 8.4 Hz, Ar-H), 7.90 (d, 2H, J = 8.6 Hz, Ar-H), 7.94 (d, 2H, J = 8.2 Hz, Ar-H), 9.32 (s, 1H,pyrazole), 9.76 (s, 1H, CHO), 9.96 (s, 1H, OH).

3-(4-Nitrophenyl)-1-phenyl-1H-pyrazole-4-carbaldehyde

(3b). Light yellowish powder; Yield: 64%, m.p.:164–166^0 C; IR (KBr, cm^{-1}): 276 (CH of CHO), 1732 (C=O), 1630(C=C), 1566 (C=N). 1H NMR (400 MHz, d, ppm, , CDCl3): 7.44 (t, 1H, J = 7.0 Hz, Ar-H), 7.62 (t, 2H, J = 7.6 Hz, Ar-H), 7.89 (d, 2H, J = 8.4 Hz, Ar-H), 7.91 (d, 2H, J = 8.6 Hz, Ar-H) 7.94 (d, 2H, J = 8.2 Hz, ArAH) 9.18 (s, 1H, pyrazole), 9.80 (s, 1H, CHO).

3-(4-Chlorophenyl)-1-phenyl-1H-pyrazole-4-carbaldehyde

(3c) Colorless solid powder; Yield: 68%; m.p.: 125–127^0C; IR (KBr, cm^{-1}): 2756 (CH of CHO), 1672(C=O), 1639(C=C), 1552(C=N).678(C-Cl) 1H NMR (400 MHz, d, ppm, , CDCl3): 7.39 (t, 1H, J = 7.3 Hz, Ar-H), 7.62 (t, 2H, J = 7.6 Hz, Ar-H), 7.74 (d, 2H, J = 8.0 Hz, Ar-H), 7.76 (d, 2H, J = 8.4 Hz, Ar-H), 7.84(d, 2H, J = 7.8 Hz, Ar-H), 9.26 (s, 1H,pyrazole), 9.62 (s, 1H, CHO).

1-(4-Bromophenyl)-3-phenyl-1H-pyrazole-4-carbaldehyde

(3d) Yield: 74%; mp. 172–174^{0}C, IR (KBr cm^{-1}) :2771 (C–H in CHO), 1680 (C=O), 1570 (C=N)1612(C=C), 662 (C–Br); 1H NMR (300 MHz, d ppm, CDCl3): 7.22 (t, 1H, J = 7.1 Hz, Ar-H), 7.48 (t, 2H, J = 7.4 Hz, Ar-H), 7.56 (d, 2H, J = 7.8 Hz, Ar-H), 7.68 (d, 2H, J = 7.4 Hz, Ar-H), 7.62(d, 2H, J = 7.2 Hz, Ar-H8.92 (s, 1H, CHO),8.71 (s, 1H, Pyrazole).

1-(4-Methylphenyl)-3-diphenyl-1H-pyrazole-4-carbaldehyde

(3e) Yield 64%, mp. 166–168^{0}C; IR (KBr) cm^{-1}: 2748 (C–H of CHO), 1710 (C=O), 1524(C=N),1498 (C=C); 1H NMR (300 MHz, d ppm, CDCl3): 7.20 (t, 1H, J = 7.2 Hz, Ar-H), 7.56 (t, 2H, J = 7.2 Hz, Ar-H), 748 (d, 2H, J = 7.6 Hz, Ar-H), 7.66(d, 2H, J = 7.4 Hz, Ar-H), 7.48(d, 2H, J = 7.0 Hz, Ar-H 8.19(s, 1H, CHO), 7.78 (s, 1H, Pyrazole),

Biological Evaluation:

The synthesized 1,3-Diaryl-1H-pyrrazol-4-carbaldehyde show good to moderate activities against bacterial stain among them 3-(4-Chlorophenyl)-1-phenyl-1H-pyrazole-4-carbaldehyde have more zone of inhibition (%) as compared to other synthesized compounds of 1,3-Diaryl-1H-pyrrazol-4-carbaldehyde.we had taken biological activities of synthesized compounds againest two types of microorganisms one Gram positive Staphylocoocus Aureus and Ataphylocoocus Pyogenes and other Gram negative Pseudomonas Aeruginosa and Escherichi Coli

Conclusion

It is concluded that substituent at 4th position of phenyl ring to the 3rd position of pyrazole ring an important for variation of microbial activity Chloro substituent is more active as compared to Nitro substituent also variation in activity occurs at 1st position of pyrazole ring attached with different substituent of phenyl ring

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