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SYNTHESIS AND CHARACTERIZATION OF FLURO PYRANO-PYRIDINE DERIVATIVES FROM CHALCONES OF 2, 6-DICHLORO-4-TRIFLUORO METHYL ANILINE

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Keywords	*Abstract*
Cyclic Imide, Malononitrile, Chalcones, Pyrano-Pyridine.	The chemistry of chalcones, pyrano-pyridine derivatives, and their important role in pharmacological research as well as invention. We have attempted to synthesize these biologically triggered molecules using 2, 6-dichloro-4-trifluoro methyl aniline. These compounds were developed from glutaric anhydride based substituted chalcone derivatives using a convenient method. We have described a series of novel pyrano-pyridine derivatives via substituted chalcones of 2, 6-dichloro-4-trifluoro methyl aniline and malononitrile using most simplistic synthetic approaches. All synthesized molecules were investigated by spectral analysis methods such as FT-IR, ^{1}H-NMR, ^{13}C-NMR, and mass spectroscopy. These compounds were also screened for their antimicrobial properties.

1.0 INTRODUCTION

Heterocycles represent a wide range of organic compounds and play significant role in all aspects of pure and applied chemistry. One of the sub groups of this class called fluorinated heterocycles is relatively new, since comprehensive development of the synthetic chemistry of fluorinated heterocycles started only after World war II[1]. Literature review shows that 2, 6-dichloro-4-trifluoro methyl aniline is a white color low melting crystalline solid compound and one of influential pesticide and initial precursor for several analogs. It is prefentially utilized for development of insecticidal

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pyrazole derivatives[2] along with to synthesize GABA antagonist[3]. It is prepared by several synthetic routes and number of patents has been documented for synthesizing 4-amino 3,5 dichlorobenzotrifluoride.

Chalcones are highly attractive molecules because of their simple structure, ease of construction, and promising biological applications. Chalcones are natural organic frameworks of aromatic ketones and enones, generally colored compounds with the α, β unsaturated keto group (-COCH=CH-) known as a chromophore. The family of flavonoids is a significant biologically active species with anticancer and various therapeutic values, where most chalcones are derived from it[4]. Kostanecki and Tambhor were first reported the aldol adduct 1, 3-diary-2-propen-1-ones. They offered "chalcone" as a name[5]**.** Chalcones are amazingly effective for treating a varied series of diseases[6]. Also, they are used to create some most inventive heterocycles, including pyrano-pyrroles, pyrano-pyrazoles, isoxazoles, flavones, and pyrrozolines, and so forth[7-9]. There are many synthetic routes that have been successfully synthesize chalcones but Claisen-Schmidt and Aldol condensation reactions are one of the most common and typical methods. These reactions proceed just by the condensation of aldehyde and acetophenone to produce chalcones. Chalcones undergo many chemical reactions as well as being used to synthesize heterocyclic compounds

As per the literature review which exhibits that 4H-pyran-nucleated heterocyclic compounds are known to be a rich source of physiologically extraordinary molecules with a variety of biological and pharmacological features[10-13]. Pyrano-pyridines are the remarkable sort of heterocyclic frameworks where pyridine ring fused with pyran nucleus having rich therapeutic assets such as antimicrobial[14], antibacterial[15], antitumour[16].

In continuation of prior study, we have designed a novel 1-(2,6-dichloro-4-(trifluoromethyl)phenyl)piperidine-2,6-dione (3) (cyclic glutaric imide) from 2, 6-dichloro-4-trifluoro methyl aniline and Glutaric anhydride. In the next step compound 3 was further utilized to design a new series of chalcones (4a-e) using several aromatic aldehyde derivatives by a most convenient synthetic technique. This unique class of chalcones was finally used to create curiously inventive substituted pyrano-pyridine derivatives (5a-e). There are diverse synthetic operations have been reported in literature including traditional as well as modern.

2.0 MATERIAL AND METHODS:

Melting Points were recorded in open glass capillaries and were uncorrected. The chemical structures of the obtained compounds were confirmed by spectral analyses. IR spectra in KBr pallets were recorded on Shimadzu and ATR Brucker alpha FT-IR spectrophotometer. 1H NMR spectra were recorded at 500 MHz by a Brucker spectrophotometer. The rection was monitored by thin layer chromatography, which was performed by using pre-coated silica gel aluminium plates with a mixture of diethyl ether and ethyl acetate in a 6:4 proportion.

3.0 EXPERIMENTAL SECTION:

3.1 General Procedure for the Synthesis of N-phenyl Glutarimide :

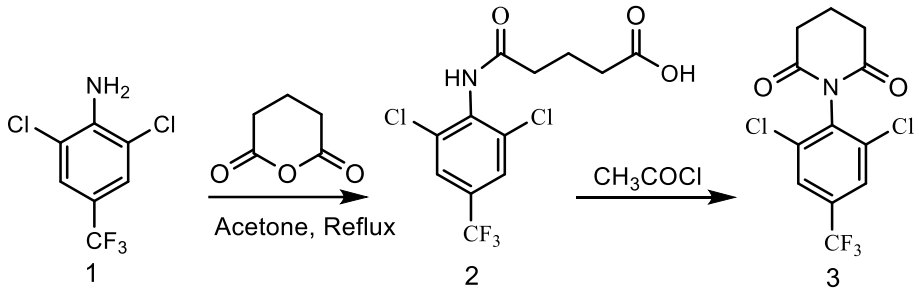
Synthesis of 1-(2, 6-dichloro-4-trifluoromethyl-phenyl)-piperidine -2,6-Dione (3):

Glutaric anhydride (0.01mol) was dissolved in benzene (10ml) then 2, 6-dichloro-4- trifluoromethyl aniline (0.01mol) was added to it vigorously. The 4-((2, 6-dichloro-4- (trifluoromethyl) phenyl)

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amino)-4-oxobutanoic acid (2a) was formed. This imic acid was cyclized by using (0.09) mole of fresh acetyl chloride under reflux conditions leads to give product (3). It is recrystallized from ethanol (Scheme 1).



Scheme-1 Synthesis of 1-(2, 6-dichloro-4-trifluoromethyl-phenyl)-piperidine -2,6-Dione

1-(2, 6-Dichloro-4-triflouromethyl-phenyl)-piperidine-2, 6-Dione (3):

Molecular Formula: $C_{12}H_8Cl_2F_3NO_2$, **Molecular Weight (g/mol):** 326, **Melting Point (ºC):** 70-72, **Physical Appearance:** Off white solid, **Percentage Yield (%):** 72

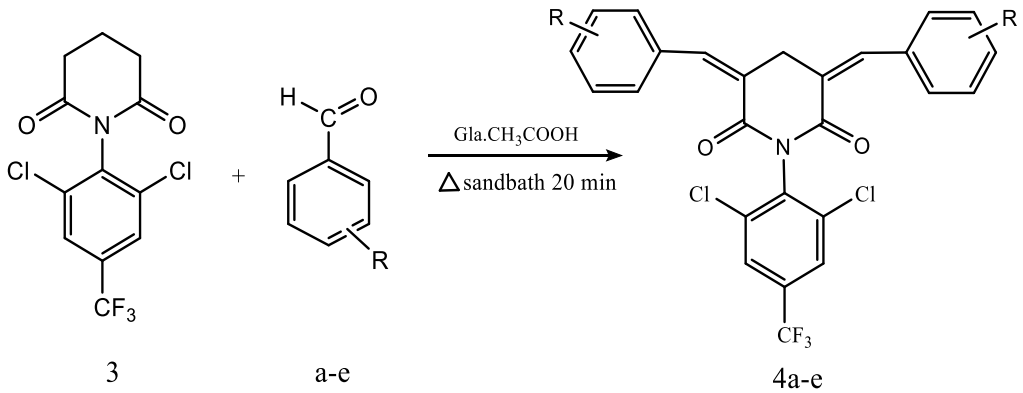
FT-IR (KBr) cm^{-1}: 3088 (C-H stretching), 2870 (C-H stretching of Ar-H), 1737 (C=O stretching), 1575 and 1531 (ArC=C), 1037 (C-F stretching), 886 (Cl stretching)

H^1-NMR (500 MHz, DMSO-d^6 δ ppm): 2.5 (s, 4H), 7.7 (s, 2H, Ar-H).

3.2 General methods for the synthesis of chalcones using cyclic imide (3) and substituted aromatic aldehydes:

3.2. Synthesis of 1-(2,6-dichloro-4-(trifluoromethyl)phenyl)-3,4- bis(substituted-benzylidene) piperidine-2,6-dione (4a-e) :

Cyclic imide (3) (0.01 mol) and substituted aromatic aldehyde (a-e) (0.02mol) were dissolved in glacial acetic acid (10 ml). Reaction mixture was concentrated on a sand bath at a low flame. The progress of reaction was monitored by TLC using n-hexane: ethyl acetate 8:2 as a developing solvent. The colored solid product was afforded (4a-f) and recrystallized from aqueous ethanol.



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R= 4a=4-Cl 4d=4-nitro

4b=4-Br 4e=3-methoxy, 4-hydroxy

4c=4-OH

Scheme-2: Synthesis of bis-chalcones using cyclic imide and derivatives of aromatic aldehyde

1) 6a-3,5-bis (Z) (4-chlorobenzylidene)-1-(2,6 dichloro-4-(trifluoromethyl) phenyl)piperidine-2,6-dione (4a):

Chemical Formula: $C_{26}H_{14}Cl_4F_3NO_2$, **Physical Appearance:** Off white solid **Nature of compound:** Amorphous **Percentage Yield (%):** 74 **Melting Point (ºC):** 162-164 **Molecular Weight (g/mol):** 571

FT-IR (KBr) cm^{-1}: 3092 (C=C-H stretching), 2930 (C-H stretching), 1610 (N-C=O), 1597, 1489 and 1410 (C=C), 1232 (N-C stretching), 1132 (C-F stretching), 923, 850 (C-Cl stretching)

^{1}H-NMR (500 MHz, DMSO-d$_6$, δ ppm): 8.16 (s, 2H, Ar-H, *J* = 2.3 Hz), 7.78 (dd, 4H, Ar-H, *J* = 7.5 Hz), 7.76 (dd, 4H, 2Ar-H, *J* = 7.5 Hz), 6.24 (s, 2H, =C-H), 2.304 (s, 2H, -CH_2)

^{13}C-NMR (125 MHz, DMSO-d$_6$, δ ppm): 123-129 (d, 10C, Ar-C), 130-135 (s, 9C, Ar-C) 127 (d, 2C, Ar-C, C=C), 142 (s, 1C, N-C), 167 (s, 2C, C=O), 33 (t, 1C), 121 (s, 1C, F-C).

2) 6b-3,5-bis (Z) (4-bromobenzylidene)-1-(2,6 dichloro-4-(trifluoromethyl) phenyl) piperidine-2,6-dione (4b) :

Chemical Formula: $C_{26}H_{14}Br_2Cl_2F_3NO_2$ **Physical Appearance:** Off white crystal **Nature of compound:** Needle shape crystals **Percentage Yield (%):** 84 **Melting Point (ºC):** 160-162

Molecular Weight (g/mol): 660

^{1}H-NMR (500 MHz, DMSO-d$_6$, δ ppm): 7.97 (s, 2H, Ar-H, *J* = 2.3 Hz), 7.83 (m, 4H, Ar-H, *J* = 7.5 Hz), 7.707 (m, 4H, *J* = 7.5 Hz, 2Ar-H), 6.46 (s, 2H, =C-H), 2.23 (s, 2H, -CH_2).

3) 6c-3,5-bis (Z) (4-hydroxybenzylidene)-1-(2,6 dichloro-4-(trifluoromethyl) phenyl)piperidine-2,6-dione (4c) :

Chemical Formula: $C_{26}H_{16}Cl_2F_3NO_4$,, **Physical Appearance:** Off white solid, **Nature of compound:** Amorphous, **Percentage Yield (%):** 86, **Melting Point (ºC):** 82-84, **Molecular Weight (g/mol):** 534

FT-IR (KBr) cm^{-1}: 3176 (Ar-O-H stretching), 3099 (C=C-H stretching), 2985 (C-H stretching), 1697 (N-C=O), 1589, 1496 and 1465 (Ar-C=C, ethylene), 1394 (O-H bending), 1255 (C-N stretching), 1315 (C-O Stretching), 1120 (C-F stretching), 860 (C-Cl stretching) .

^{1}H-NMR (500 MHz, DMSO-d$_6$, δ ppm): 9.818 (s, 2H, Ar-O-H), 8.00 (s, 2H, Ar-H, *J* = 2.3 Hz), 7.776 (dd, 4H, Ar-H, *J* = 7.5 Hz), 6.946 (dd, 4H, Ar-H, *J* = 7.5 Hz), 6.55 (s, 2H, =C-H), 2.23 (s, 2H, -CH_2).

4) 6d-3,5-bis (Z) (3-methoxy, 4-hydroxybenzylidene)-1-(2,6 dichloro-4-(trifluoromethyl) phenyl)piperidine-2,6-dione (4d):

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Chemical Formula: $C_{28}H_{20}Cl_2F_3NO_6$, **Physical Appearance:** Creamy solid, **Nature of compound:** Amorphous, **Percentage Yield (%):** 80, **Melting Point (ºC):** 80-82, **Molecular Weight (g/mol):** 594

FT-IR (KBr) cm^{-1}: 3392 (Ar-OH stretching), 3001 (C=C-H stretching), 2982 (C-H stretching), 2937 (O-CH_3 stretching), 1699 (C=O stretching), (Ar-C=C, ethylene), 1398 (O-H bending), 1323 (C-O Stretching), 1278 (N-C stretching), 1095 (C-F stretching), 885 (C-Cl stretching).

^{1}H-NMR (500 MHz, DMSO-d$_6$, δ ppm): 9.77 (s, 2H, Ar-O-H), 8.003 (s, 2H, Ar-H, *J* = 2.3 Hz), 7.435-7.416 (s, 4H, Ar-H, *J* = 2.3 Hz), 7.39 (s, 2H, Ar-H, *J* = 7.5 Hz), 6.97 (s, 2H, =CH), 3.99 (s, 6H, OCH_3), 2.24 (s, 2H, -CH_2)

5) 6e- 3,5-bis (Z) (4-nitrobenzylidene)-1-(2,6 dichloro-4-(trifluoromethyl) phenyl)piperidine-2,6-dione (4e):

Chemical Formula: $C_{26}H_{14}Cl_2F_3N_3O_6$, **Physical Appearance:** Yellow solid, **Nature of compound:** Amorphous, **Percentage Yield (%):** 82, **Melting Point (ºC):** 96-98, **Molecular Weight (g/mol):** 592

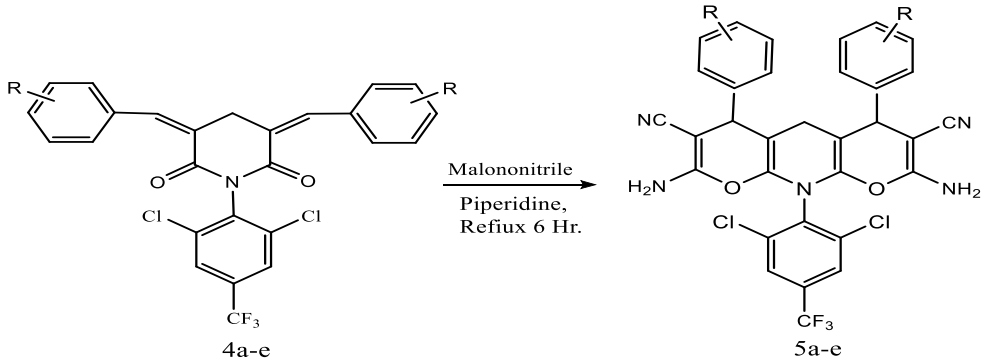
^{1}H-NMR (500 MHz, DMSO-d$_6$, δ ppm): 8.39 (dd, 4H, Ar-H, *J* = 2.3 Hz), 8.17 (s, 2H, Ar-H, *J* = 2.3 Hz), 7.94 (dd, 4H, Ar-H, *J* = 7.5 Hz), 6.85 (s, 2H, =C-H), 2.21 (s, 2H, -CH_2) .

^{13}C-NMR (125 MHz, DMSO-d$_6$, δ ppm): 123-130 (d, 10C, Ar-C), 131-134 (s, 5C, Ar-C), 140-151 (s, 5C, Ar-C), 137 (d, 2C, Ar-C, C=C), 168 (s, 2C, C=O), 33 (t, 1C), 121 (s, 1C, F-C).

3.3 General methods for the synthesis of Pyrano-pyridine derivatives using Chalcones:

3) Synthesis of Pyrano-pyrrole derivatives of 6a-3,5-bis (Z) (benzylidene)-1-(2,6 dichloro-4-(trifluoromethyl) phenyl)piperidine-2,6-dione (4a-e) and malononitrile :
Synthesis of 2,8-diamino-10-(2,6-dichloro-4-(trifluoromethyl)phenyl)-4,6-diphenyl-4,5,6,10-tetrahydrodipyrano[2,3-b:3',2'-e]pyridine-3,7-dicarbonitrile (5a-e):

Substituted chalcone (4a-e) (1 mmol) was dissolved in 60% ethanol and then malononitrile (2 mmol) was transferred slowly at room temperature. The reaction mixture was refluxed at 95°C for 6 hr. with constant stirring. Reaction was simultaneously observed by TLC using silica-coated metal plates with appropriate solvent system (n-hexane: ethyl acetate 8:2). The reaction mixture was transferred to crushed ice, to furnish solid precipitate. Precipitate was obtained by filtration, wiped via distilled water and allowed to air dry. Finally, the product was recrystallized from methanol to afford desired compounds (5a-e).



4a-e 5a-e

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R= 5a=4-Cl 5d=4-nitro

5b=4-Br 5e=3-methoxy, 4-hydroxy

5c=4-OH

Scheme-3: Synthesis of pyrano-pyridine derivatives using substituted chalcone

i) 2,8-diamino-4,6-bis(4-chlorophenyl)-10-(2,6-dichloro-4-(trifluoromethyl)phenyl)-4,5,6,10-tetrahydrodipyrano[2,3-b:3',2'-e]pyridine-3,7-dicarbonitrile (5a):

Molecular Formula: $C_{32}H_{18}Cl_4F_3N_5O_2$, **Physical Appearance:** White solid, **Nature of compound:** Crystalline, **Percentage Yield (%):** 64, **Melting Point (ºC):** 166-168, **Molecular Weight (g/mol):** 703

FT-IR (KBr) cm^{-1}: 3180 (N-H stretching) 3093 (C=C-H stretching), 2928 (C-H stretching), 1673 (N-H bending), 1578 and 1528 (Ar-C=C), 1282 (C-N), 1153 (C-F stretching), 935 and 851 (C-Cl stretching), 1153 (C-F stretching), 684 (N-H Wagging)

^{1}H-NMR (500 MHz, DMSO-d^6, δ ppm): 8.32 (s, 2H, N-H),8.00 (s, 2H, Ar-H, *J* = 2.3 Hz), 7.67 (dd, 4H, Ar-H, *J* = 7.5 Hz), 7.17 (dd, 4H, Ar-H, *J*= 7.5 Hz), 4.48 (s, 2H), 3.33 (s, 2H)

^{13}C-NMR (125 MHz, DMSO-d$_6$, δ ppm): 127-131 (d, 10C, Ar-C), 162 (s, 2C, N-C-O), 139 (s, 2C, Ar-C), 132 (s, 4C, Ar-C), 83 (s, 2C, Ar-C), 151 (s, 3C, Ar-C), 114 (s, 2C, CN), 76 (s, 2C, Ar-C), 34 (s, 2C), 26 (s, 1C), 121 (s, 1C, F-C)

ii) 2,8-diamino-4,6-bis(4-bromophenyl)-10-(2,6-dichloro-4-(trifluoromethyl)phenyl)-4,5,6,10-tetrahydrodipyrano[2,3-b:3',2'-e]pyridine-3,7-dicarbonitrile (5b):

Molecular Formula: $C_{32}H_{18}Br_2Cl_2F_3N_5O_2$ **Physical Appearance:** White solid, **Nature of compound:** Crystalline, **Percentage Yield (%):** 68, **Melting Point (ºC):**152-154, **Molecular Weight (g/mol):** 792

^{13}C-NMR (125 MHz, DMSO-d$_6$, δ ppm): 126-130 (d, 10C, Ar-C), 159 (s, 2C, N-C-O), 141 (s, 2C, Ar-C), 124-129 (s, 4C, Ar-C), 86 (s, 2C, Ar-C), 149 (s, 3C, Ar-C), 119 (s, 2C, CN), 75 (s, 2C, Ar-C), 35 (s, 2C), 22 (s, 1C), 123 (s, 1C, F-C).

iii) 2,8-diamino-10-(2,6-dichloro-4-(trifluoromethyl)phenyl)-4,6-bis(4-hydroxyphenyl)-4,5,6,10-tetrahydrodipyrano[2,3-b:3',2'-e]pyridine-3,7-dicarbonitrile (5c):

Molecular Formula: $C_{32}H_{20}Cl_2F_3N_5O_4$, **Physical Appearance:** Off-white solid, **Nature of compound:** Crystalline, **Percentage Yield (%):** 65, **Melting Point (ºC):** 124-126, **Molecular Weight (g/mol):** 666

FT-IR (KBr) cm^{-1}: 3342 (N-H stretching), 3172 (Ar-O-H stretching broad), 3021 (C=C-H stretching), 2981 (C-H stretching), 2227 (C-N stretching Nitrile), 1668 (N-H bending), 1578, 1517, and 1444 (Ar-C=C), 1388 (C-N stretching), 1287 (C-O Stretching), 1159 (C-F stretching), 885 and 823 (C-Cl stretching), 695 (N-H wagging) .

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^{1}H-NMR (500 MHz, DMSO-d_6, δ ppm): 8.49 (s, 2H, N-H),7.99 (s, 2H, Ar-H, *J* = 2.3 Hz), 7.60 (dd, 4H, Ar-H, *J* = 7.5 Hz), 7.45 (dd, 4H, Ar-H, *J*= 7.5 Hz), 8.88 (s, 2H, O-H), 4.55 (s, 2H), 3.58 (s, 2H).

iv) 2,8-diamino-10-(2,6-dichloro-4-(trifluoromethyl)phenyl)-4,6-bis(4-hydroxy-3-methoxyphenyl)-4,5,6,10-tetrahydrodipyrano[2,3-b:3',2'-e]pyridine-3,7-dicarbonitrile (5d):

Molecular Formula: $C_{34}H_{24}Cl_2F_3N_5O_6$, Physical Appearance: Faint brown solid, Nature of compound: Crystalline, Percentage Yield (%): 70, Melting Point (ºC):178-180, Molecular Weight (g/mol): 726

FT-IR (KBr) cm^{-1}: 3412 (N-H stretching), 3186 (Ar-O-H stretching), 3021 (C=C-H stretching), 2842 (C-H stretching), 2221 (C-N stretching Nitrile), 1662 (N-H bending), 1567, 1505, and 1433 (Ar-C=C), 1388 (C-N stretching), 1293 (C-O Stretching), 1153 (C-F stretching), 885 (C-Cl stretching), 695 (N-H wagging)

HRMS (ESI): Cal: 726 (exact mass) Obs: m/z: 724.95 [M+H]

v) 2,8-diamino-10-(2,6-dichloro-4-(trifluoromethyl)phenyl)-4,6-bis(4-nitrophenyl)-4,5,6,10-tetrahydrodipyrano[2,3-b:3',2'-e]pyridine-3,7-dicarbonitrile (5e):

Molecular Formula: $C_{32}H_{18}Cl_2F_3N_7O_6$, **Physical Appearance:** Yellow solid, **Nature of compound:** Crystalline, **Percentage Yield (%):** 68, **Melting Point (ºC):**146-148 **Molecular Weight (g/mol):** 724

FT-IR (KBr) cm^{-1}: 3252 (N-H stretching), 3032 (C=C-H stretching), 2852 (C-H stretching), 2221 (C-N stretching Nitrile), 1672 (N-H bending), 1572 (N-O asymmetric stretching), 1483 (Ar-C=C), 1405 (N-O symmetric stretching), 1287 (C-N stretching), 1209 (C-O Stretching), 1120 (C-F stretching), 885 (C-Cl stretching), 706 (N-H wagging)

^{1}H-NMR (500 MHz, DMSO-d_6, δ ppm): 8.51 (s, 2H, N-H), 8.30 (dd, 4H, Ar-H, *J* = 7.5 Hz), 8.00 (s, 2H, Ar-H, *J* = 2.3 Hz), 7.70 (dd, 4H, Ar-H, *J* = 7.5 Hz), 5.10 (s, 2H), 3.65 (s, 2H).

4.0 BIOLOGICAL STUDY:

4.1 Antimicrobial activity:

A new series of compounds (5a-e) were evaluated for their antimicrobial activities against two bacterial strains such as gram-positive *"Bacillus subtilis",* gram-negative "*Escherichia coli"* and two fungal strains, *Aspergillus niger* and *Candida albicans* by disc diffusion method in vitro. 6 mm circular shaped cellular paper discs containing a fixed concentration of test sample solution along with paper discs saturated by controls were placed on inoculated solid agar plates. These plates were kept in the incubator at optimum growth temperature for few days and the final consequences were monitored by observing zone of inhibition Table (1.0).

Microbiological media was created under the guideline of high-media producers. Using sterile forceps, paper discs of 6 mm in diameter containing a set volume of test sample solution was placed on the surface of inoculated agar plates and simultaneously pushed down to ensure that discs and agar surface were in contact. In the same manner paper discs saturated with controls (DMSO and reference standard) were placed on agar plates and forwarded to incubator at optimum temperature for 24 hours (for antibacterial activity investigation) and 3 to 7 days (for antifungal activity investigation).

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Ultimately, results were examined carefully. The zone of inhibition around the disc has shown antimicrobial activity. This indicates that microbial growth has been inhibited by effective test samples. The diameter of the zone of inhibition was measured by Vernier Caliper in mm and tabulated in Table (1.0).

5.0 RESULT AND DISCUSSION:

A clutch of bis-chalcones (4a-e) was developed from cyclic imide (3) **(**Scheme 1) and numerous substituted aromatic aldehyde derivatives respectively by using a convenient and environment friendly synthetic route **(**Scheme 2). Compounds (4a-e) were further treated with malononitrile to furnish a novel series of pyrano-pyridine derivatives (5a-e). **(**Scheme 3). These newly synthesized compounds (3), (4a-e) and (5a-e) were investigated by FT-IR, ^{1}H-NMR, ^{13}C-NMR, HRMS spectroscopy. Compounds (5a-e) were anticipated to be biologically effective entities therefore they have been also investigated for their antimicrobial significance against bacterial and fungal strains in vitro.

i) Biological activity :

All compounds were tested for their antimicrobial properties over bacterial and fungal strains. In entire series most of compounds were found to be antibacterial agents against both bacterial strains Compounds 5c, 5d and 5e were observed effective against *Bacillus stibillis* while compound 5b shows mild antibacterial effect against *Escherichia coli*. Similarly, these compounds were investigated for their antifungal properties against two fungal strains. It was observed that compounds 5c and 5e were exhibited good antifungal activity against *Aspergillus niger* and *Candida albicans* respectively. However, compounds 5b and 5c were found to be moderately effective against both fungal strains. Table (1.0).

Antibacterial activity of 5a-e series:

Sr. No.	Sample Code	E-Coli	B. Subtills	A. Niger	C. Albicans
1	5a	-	-	12.22±0.02	-
2	5b	7.24±0.06	-	10..34±0.09	7.22±0.20
3	5c	-	6.96 ± 0.12	16.14±0.14	8.68±0.06
4	5d	-	8.32±0.13	7.45±0.09	-
5	5e	-	7.64 ± 0.18	-	8.96±0.08
Standard	**Chloramphenicol**	20.57± 0.17	19.95±0.28	NA	14.29±0.07
Standard	**Amphotericin-B**	NA	NA	21.84 ±0.17	14.21±0.12

Table 1.0: Antibacterial activity of 5a-e series

6.0 CONCLUSION:

A novel series of pyrano pyridines (5a-e) was successfully synthesized under milder conditions from chalcones(4a-e) and malononitrile. Some methods have been reviewed and established the most convenient and non-hazardous synthetic strategy to carry out the synthetic route for the preparation of

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pyrano-pyran derivatives with ease and minimal work-up difficulties. This also provides remarkable yield within short time.

It was observed that aromatic rings of initial moieties with electron donating groups have provided significant yield while ring having electron withdrawing substituent led to mild yield of product. All these synthesized compounds were resourcefully predicted by using distinct spectroscopic techniques such as FT-IR, ^{1}H-NMR, ^{13}C-NMR, and Mass. These compounds (5a-e) were significantly assayed for their antimicrobial activity. It was also concluded that most of compounds among (5a-e) were found to be good to mildly effective against bacterial and fungal strains while compound 5e was observed significant antifungal agent against *C. Albicans*.

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REFERENCES

Petrov, V. A. **(2009)**. Fluorinated heterocyclic compounds: synthesis, chemistry, and applications. John Wiley & Sons.

Tomlin C. D. S., **(2006),** The Pesticide Manual. England Hampshire; **14th ed.,** British Crop Protection Council, 462-464.

Maayan S., Ohad N., Soliman K., **(2005),** Bioorg. Med. Chem., **13(2):** 433–441.

Kostanecki S. V, and Tabor J., **(1899),** Berichte Der Deutschen Chemischen Gesellschaft, **32(2):** 1921–1926.

Li P., Akk G., **(2008),** Br J Pharmacol, **155(5):** 783-794.

Prasad Y. R., Ravi K. P., Asha Deepti C. H., Venkata Ramana M. E., **(2006),** Eur. J. Chem.,**3(4):** 236–241

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Ponnala S., Prasad S. D., **(2006),** Synth. Commun., **36:** 2189–2194.

Kalirajan R., Sivakumar S. U., Jubie S., Gowramma B, and Suresh B., **(2009),** International Journal of ChemTech Research, **1(1):** 27-34.

Rajput, S. S.; Sayyed R. M, IJCTPR, **(2017),** 5(1), 10–15.

Wesam S., Shehab, Amira A., Ghoneim., **(2016)**, Arabian Journal of Chemistry, **9:** S966–S970

Cingolant G.M., Gualtieri F., Pigini M., **(1989),** J. Med. Chem., **12:** 531.

12.Gohar A.K.M.M., Abdel-Latif F. F., El-Ktatny M.S., **(1987),** Indian J. Chem., **26B:** 274**.**

Alexander J.O., Wheeler G.R., Hill D.D, and Moms M.P., **(1966)** Biochern. Pharmacol, **15:** 881.

S.Y.K. Tam, R.S. Klein, I. Wempen and J.J. Fox, **(1979),** J. Org. Chem. 44,4547.

Abdel Hameed, A.M. Environ Chem Lett **16,** 1423–1427 (2018). Abd El-Sattar NEA, El-Adl K, El-Hashash MA, Salama SA, Elhady MM **(2021),** Bioorg Chem, **115** 105186.

Paronikyan, E.G., Oganesyan, A.K., Noravyan, A.S. et al. Pharm Chem J, **29:** 194–196 (1995).

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