INTRODUCTION

Considerable attention has been focused on Pyrazolines and substituted Pyrazolines due to their interesting biological activities. They have found to possess anti-fungal\cite{1}, anti-depressant\cite{2-7}, anti-convulsant\cite{8}, anti-inflammatory\cite{9-12}, anti-bacterial\cite{13-14}, anti-cancer\cite{15-16}, anti-oxidant\cite{17-18}, anti-pyretic\cite{19}, anti-neoplastic activities\cite{20-21}, anti-viral\cite{22}, anti-amoebic\cite{23-24}, Acaricidal agro chemical fungicides or insecticides\cite{25}, anti-cholinergic\cite{26-27}, anti-diabetic\cite{28}, anti-HIV\cite{29-32}, anti-malarial\cite{33}, Anesthetic\cite{34}, Anaxiolytic\cite{35}, anti-parasitic\cite{36}, anti-allergic\cite{37}, anti-microbial\cite{38-40}, anti-tuberculosis\cite{41-44}, Tyrosinase inhibitor\cite{45}, Blue photo luminescence and electro luminescence\cite{46}, Food and chemical toxicology\cite{47}, Herbicidal\cite{48-50}, Hypoglycemic\cite{51}, Hypotensive\cite{52}, immuno suppressive\cite{53}, anti-tumor\cite{54-55}. Moreover, many selectively chloro-substituted organic compounds show peculiar pharmacological and agrochemical properties. The work reported herein was aimed at the preparation of some new pyrazoline derivatives with anticipated biological activities.

EXPERIMENTAL

General

All chemicals were used of A.R. grade (either of B.D.H. or Excel-R or Extra pure E. Merck...
quality). The structures of the compounds were
determined by elemental analysis, IR and NMR
spectral data. All melting points were measured
on an electro thermal melting point apparatus and
are uncorrected. The infrared spectra were
recorded in potassium bromide disks on a Pye
Unicam SP 3-300 or a Shimadzu FT-IR 8101 PC
infrared spectrophotometer. The 1H –NMR (200
MHz) and 13C-NMR (50 MHz) spectra were
recorded in DMSO-d 6 on a Varian Mercury VX 200
NMR using TMS as the internal reference. Mass
spectra were measured on a GCMS-QP 1000 EX
spectrophotometer at 70 eV. Purity of the
compounds is checked on T.L.C. using Silica Gel-
G. Elemental analysis is performed on Carlo-
Erba1108 analyzer.

**Synthesis of Ethyl-2-[2, 3-dichloroanilido]
Ethanoate [1]**

A mixture of 2, 3-dichloroaniline (10ml) and
diethylmalonate (20ml) was refluxed for forty five
minutes in a round bottomed flask fitted with an
air condenser of such a length (14") that ethanol
formed escaped and diethylmalonate flowed back
into the flask. Contents were cooled, ethanol (30
ml) was added, when malon-2, 3-dichlorodianilide
separated out. It was filtered under suction. The
filtrate was poured on to crushed ice (Ca160g) and
stirred when ethyl-2-(2, 3-dichloroanilido)
ethanoate precipitated as green mass. On
recrystallization from aqueous ethanol (50%), ester
was obtained as white crystals. Yield,81%, M.P.
88°C, M.W.276. Anal. calculation for
C11 H11 N 1 O3 Cl2 : Found, C 39.20,  O 14.25,  N 4.14,  Cl 21.09,
Calcd. C 39.21, O 14.26, N 04.15 IR [KBr] V max
cm-1 : 1665-1660 [ C=O diketone ], 1290 [ -C-O-
Ester],  760-755 [ 2, 3- di substituted benzene ],
1250 [ C-Cl Stretching ], 1590, 1520 , 1440 [C=C
Ring stretching], 3150 [N-H Stretching], 3048 [C-H
aromatic], 1670 [C=O diketone]. 1432 [C-Cl aromatic], 1595,
1520, 1445 [C=C ring stretching]. NMR Spectra (δ
DMSO): 2.44 (2H, s, CH 2), 3.2 (3H, s, CH 3), 4.22-
4.32 (1H, t, N-H), 7.2-7.6 (3H, m, Ar-H), 9.2 (1H, s, CO-
NH D 2O exchangeable), 10.6 [1 H, s, Ar-NH D 2O
exchangeable].

**Synthesis of Ethyl-2-[2, 3- dichloroanilido]
acetohydrazide [2]**

Ethyl-2-(2, 3-dichloroanilido) ethanoate
(9.54 gm, 0.03 mol), ethanol (10 ml) and hydrazine
hydrate (15 ml, 80%) were mixed together and
stirred for thirty five minutes. Ethyl-2-(2, 3-
dichloroanilido) acetohydrazide was filtered under
suction and recrystallised from ethanol in white
crystals. Yield, 80%, m.p. = 168°C, M.W. 262:
Analytical calculation for C9 H9 N3 O2 Cl2 : Calculated,
N 09.04 , C 41.32, O 10.33, Cl 15.28, Found, N
09.01, C 41.30, O 10.31, Cl 15.27 IR [KBr] V max
cm⁻¹ : 3160 [N-H Stretching], 3048 [C-H aromatic],
1670 [C=O diketone]. 1432 [C-Cl aromatic], 1595,
1520, 1445 [C=C ring stretching]. NMR Spectra (δ
DMSO): 2.44 (2H, s, CH 2), 3.2 (3H, s, CH 3), 1.3 (3H, s, CH 3),
4.22-4.32 (1H, t, N-H), 7.2-7.6 (3H, m, ArH).

**Mono cyanoethylation of 2, 3-dichloroaniline [3]**

A 250 ml three necked flask equipped with a
stirrer, reflux condenser and thermometer was
charged with 2, 3-dichloro aniline (0.1mol, 16.2g),
acrylonitrile (0.1mol, 10.6 g) and Cupric acetate
monohydrate (1.02g, 4% by weight of the amine).
The mixture was stirred and refluxed on boiling
water bath for three hours. The dark mixture was
then transferred to a 250 ml distilling flask fitted
with a 15.2 cm modified vigorous column and the
unchanged acrylonitrile was first collect at 100 mm
(water pump). The distillation was continued and
the unchanged 2, 3-dichloro aniline B.P. 252°C/ 0.5mm
was recovered. The N-Cyanoethyl-2, 3-
dichloroaniline was obtained as light yellow colored
viscous liquid at 175-176°C/mm which solidified
after keeping overnight. Yield: 15.7g (97%)., m.p.
82°C

**Preparation of Cinnamoyl Chloride [4]**

Cinnamic acid (10 g, 0.067mol) and Thionyl
Chloride (12.0 ml) were taken in a round bottomed
flask fitted with a reflux condenser carrying a calcium
chloride guard tube. The contents were refluxed on
a water bath for two and half hours in a fume
cupboard until the evolution of HCl gas ceased from
the guard tube. After cooling liquid was carefully
transferred to a claisen flask and distilled under
reduced pressure when unreacted thionyl chloride
distilled over first. Cinnamoyl chloride was collected
at 165-166°C/ 18-20mm pressure.

**Synthesis of N-Cinnamoyl –N-2'-Cyanoethyl -2,
3-dichloroaniline [5]**

Solution of cinnamoyl chloride (3.5 g, 0.02
mol), dioxane (2ml), N-2'-cyanoethyl -2, 3-dichloro
aniline (7.90g, 0.02 mol) and triethylamine (2.1 g)
were placed in a round bottomed flask having a Liebig condenser carrying calcium chloride guard tube. The contents were heated for two hours on a boiling water bath. On keeping over night triethylamine hydrochloride separated as solid. It was filtered and contents concentrated when crystals separated out. Two crystallization from ethanol gave shining white needles. Yield: 55 %, M.P.: 156°C. Anal. Calculated for C_{27}H_{14}Cl_{4}N_{5}O_{2}: C 58.14, H 3.44, N 16.44. Found: C 58.08, H 3.45, N 16.45. U.V. Max nm), log \( \lambda \) : 212.2 (4.92), 318.6 (4.78). IR[KBr] V max C m \(^{-1}\) : 3300-2840 [broad band due to N-H stretching, aromatic], 1588 (C=N stretching), 1580, 1470, 1420 (C=C ring stretching, aromatic), 1040, 820, (C-Cl stretching, 2, 3-disubstituted aromatic ring).

**Synthesis of 1-(2, 3-dichloroanilinomalonyl)-3-(N-2'-cyanoethyl -N-2, 3-dichloroanilino)-5-phenyl pyrazoline [6]**

A mixture of N-cinnamoyl-N-2'-cyanoethyl -2, 3-dichloroanilino (0.345 g, 0.001 mol), Ethyl-2-(2, 3-dichloroanilido) acetohydrazide (0.262 g, 0.001 mol), dioxane (3 ml), and glacial acetic acid (2 drops) was refluxed for five hours. The solid which separated during the course of heating was filtered under suction and purified by washing thrice with hot ethanol. Yield: 66%, m.p. 252°C, M.W.: 589, Anal. Calculated for C_{27}H_{21}Cl_{4}N_{5}O_{2}: C 58.14, H 3.44, N 16.44. Found: C 58.08, H 3.45, N 16.44. U.V. Max nm), log \( \lambda \) : 212.2 (4.92), 318.6 (4.78). IR[KBr] V max C m \(^{-1}\) : 3300-2840 [broad band due to N-H stretching, secondary amide (Intra molecular hydrogen bond)], (II) C-H stretching , aromatic , (iii) C-H stretching , aliphatic).


Yield: 66%, m.p. 252°C, M.W.: 589. Synthetic sequence for new pyrazolines has been outlined in scheme 1.

Some characteristics of the synthesized compounds are shown in table 1. Analytical and spectral data (U.V., I.R., \(^{1}H\) –NMR, FAB+-MS) confirmed the structures of the new compounds.

1-[(2, 3-dichloro anilinomalonyl)]-3-(N-2'-cyanoethyl -N-2, 3-dichloroanilino)-5- phenyl pyrazoline [6a]


Yield: 66%, m.p. 252°C, M.W.: 589. Synthetic sequence for new pyrazolines has been outlined in scheme 1.

1-[(2, 3-dichloro anilinomalonyl)]-3-(N-2'-cyanoethyl -N-2, 3-dichloroanilino)-5- phenyl pyrazoline [6b]


and N-H (amide)]), 1590 (C=N stretching), 1585, 1478, 1430 (C=C ring stretching, aromatic), 1045, 822. (C-Cl stretching, 2,3-disubstituted aromatic ring). ¹H-NMR (250 MHz, δ ppm, DMSO-d₆): 2.23-2.48 (2H, s, CH₂), 4.16-4.30 (1H, s, NH), 6.90-7.45 (13H, m, ArH). 3.10 (1H, dd, Jₐₜₜ = 16H₂, Jₐₜₛ = 4.60H₂, C₃-H₃ of pyrazoline ring). 3.98 (1H, dd Jₐₜₛ = 17.90 Hz, Jₚₛₜ = 13.80 Hz, C₄-H₄ of pyrazoline ring), 4.60 (1H, dd, J = 16.43 Hz COCH geminal proton), 5.70 (1H, dd Jₚₛₜ = 12.40 Hz, C₅-H₅ of pyrazoline ring). 1H-NMR (250 MHz, δ ppm, DMSO-d₆): 2.14-2.41 (2H, s, CH₂), 4.28-4.35 (1H, s, NH), 6.80-7.60 (13H, m, ArH). 3.28 (1H, dd, Jₚₛₜ = 17.79 Hz, Jₚₚₜ = 15.87 Hz, C₅-H₅ of pyrazoline ring), 4.68 (1H, dd, J = 16.45 Hz COCH geminal proton), 6.11 (1H, dd Jₐₜₚ = 13.30 Hz, Jₚₚₜ = 4.65 Hz, C₆-H₆ of pyrazoline ring). ¹³C-NMR: /ppm 181.58 (C=O), 157.77 (C=N), 147.22, 143.60, 138.44, 132.83 (4C, Ar C's), 143.01, 136.62, 133.43, 131.80 (4C, Ar C's), 131.47, 130.55, 128.66, 125.77, 112.28 (5C, Ar CH's), 130.34, 126.62, 124.70, 114.31 (5C, Ar CH's), 63.66 (CH₃ ester), 60.81 (C-5, pyrazoline), 46.91 (C-4, pyrazoline), 18.82 (CH₃). –MS-FAB+: m/z: 604 [M].

1-[(m-methyl) 2, 3-dichloroanilinomalonal)yl]-3-(N-2’-cyanoethyl -N-2, 3-dichloroanilino)-5- phenyl pyrazoline [6 c]

Yield: 56%, m.p.: 266°C, M.W.: 604, Anal. Calculated for C₃₆H₂₃Cl₂N₅O₂: Cl: 13.0, N: 6.3%. U.V. [λ [α]max nm], log α]: 212.2 (4.92), 318.6 (4.78). IR[KBr] V max Cm⁻¹: 3300-2950 [broad band due to (I) N-H stretching, secondary amide (Intra molecular hydrogen bond), (II) C-H stretching, aromatic, (iii) C-H stretching, aliphatic], 2240(C-N stretching), 1670 [C=O and N-H (amide)], 1575 [C=N stretching], 1560, 1430, 1410 (C=C ring stretching, aromatic), 1050, 815, (C-Cl stretching, 2,3-disubstituted aromatic ring). ¹H-NMR (250 MHz, δ ppm, DMSO-d₆): 2.32-2.56 (2H, s, CH₂), 4.35-4.55 (1H, s, NH), 6.40-7.20 (13H, m, ArH). 3.10 (1H, dd, Jₚₚₜ = 17.79 Hz, Jₚₚₚ = 15.87 Hz, C₅-H₅ of pyrazoline ring), 4.68 (1H, dd, J = 16.45 Hz COCH geminal proton), 6.11 (1H, dd Jₚₚₚ = 13.30 Hz, Jₚₚₚ = 4.65 Hz, C₆-H₆ of pyrazoline ring), ¹³C-NMR: /ppm 178.55 (C=O), 157.77 (C=N), 139.15, 135.65, 133.44, 131.80 (4C, Ar C's), 131.42, 129.85, 126.62, 124.64, 111.17 (5C, Ar CH's), 64.61 (CH₃ ester), 62.81 (C-5, pyrazoline), 45.92 (C-4, pyrazoline), 17.93 (CH₃). –MS-FAB+: m/z: 604 [M].

1-[(o-chloro) 2, 3-dichloroanilinomalonyl)]-3-(N-2’-cyanoethyl -N-2, 3-dichloroanilino)-5- phenyl pyrazoline [6 e]

Yield: 55%, m.p. 271°C, M.W.: 623.5, Anal. Calculated for C₃₆H₂₃Cl₂N₅O₂: Cl: 14.5, N: 6.0%. U.V. [λ [α]max nm], log α]: 215.5 (5.10), 319.2 (5.16). IR[KBr] V max Cm⁻¹: 3300-3110[broad band due to (I) N-H stretching, secondary amide (Intra molecular hydrogen bond), (II) C-H stretching, aromatic, (iii) C-H stretching, aliphatic], 2290(C-N stretching), 1680 [C=O and N-H (amide)], 1540 [C=N stretching], 1530, 1490, 1440 (C=C ring stretching, aromatic), 1080, 890, (C-Cl stretching, 2, 3-disubstituted aromatic ring). ¹H-NMR (250 MHz, δ ppm, DMSO-d₆): 3.10-3.18 (2H, s, CH₂), 4.19-4.55 (1H, s, NH), 6.87-7.20 (13H, m, ArH). 3.10 (1H, dd, Jₚₚₚ = 17.79 Hz, Jₚₚₚ = 15.87 Hz, C₅-H₅ of pyrazoline ring), 4.05 (1H, dd Jₚₚₚ = 18.10 Hz, Jₚₚₚ = 13.90 Hz, C₆-H₆ of pyrazoline ring), 4.60 (1H, dd, J = 16.19 Hz COCH geminal proton), 5.45 (1H, dd Jₚₚₚ = 13.15 Hz, Jₚₚₚ = 5.10 Hz, C₇-H₇ of pyrazoline ring). ¹³C-NMR: /ppm 164.79 (C=O), 154.72 (C=N), 147.22, 143.60, 138.44, 132.83 (4C, Ar C's), 130.79, 128.85, 123.63, 121.72, 115.26 (5C, Ar CH's), 64.60 (CH₃ ester), 60.92 (C-5, pyrazoline), 47.15 (C-4, pyrazoline), 19.10 (CH₃). –MS-FAB+: m/z: 623[M], 624 [M+1].
1-[(m-chloro) 2, 3-dichloroanilinomalonyl]-3-(N-2'-cyanoethyl -N-2, 3-dichloroanilino)-5- phenyl pyrazoline [6 f]

Yield: 61%, m.p. 263°C, M.W.: 623.5, Anal. Calculated for C_{27}H_{20}Cl_{5}N_{5}O_{2}, Cl: 17.4, N: 6.8, found Cl: 17.2, N: 6.6%. U.V. (λ_{max} nm), log ε: 214.6 (4.97), 322.4 (4.81). IR [KBr] \nu_{max} \text{ cm}^{-1}: 3300-3120 [broad band due to (I) N-H stretching, secondary amide (Intra molecular hydrogen bond)], (II) C-H stretching, aromatic, (iii) C-H stretching, aliphatic], 2240 (C=O and N-H (amide)), 1605 (C=N stretching), 1570, 1460, 1430 (C=C ring stretching, aromatic), 1070, 830 (C-Cl stretching, 2, 3-disubstituted aromatic ring). 1^H-NMR (250 MHz, δ ppm, DMSO-d_6): 2.58-3.34 (2H, s, CH_2), 4.15-4.60 (1H, s, NH), 7.10-7.55 (13H, m, ArH), 3.34 (1H, dd, J_M = 18 Hz, J_X = 4.70 Hz, C_4-H of pyrazoline ring), 4.15 (1H, dd J_M = 17.90 Hz, J_{ax} = 13.20 Hz, C_4-H of pyrazoline ring), 4.60 (1H, d, J = 16.44 Hz COCH geminal proton)

Scheme 1: (The reaction scheme for the complete synthesis of compounds)
C-Cl stretching, 2,3-disubstituted aromatic ring).

IR[KBr] V_max cm⁻¹: 3300-2910 [broad band due to (I) N-H stretching, secondary amide (Intramolecular hydrogen bond)], (II) C-H stretching, aromatic, (iii) C-H stretching, aliphatic], 2270(C=N stretching), 1640 [C=O and N-H (amide)], 1575 (C=N stretching), 1570, 1455, 1420, 1395, 1382 (C=O and N-H (amide))

N-H (amide) [C=O and N-H (amide)], 1620 (C=N stretching), 1590 (C=N stretching), 1585, 1480, 1410 (C=C ring stretching, aromatic), 1290, 1280, 116.18 (5C, Ar H's), 63.66 (CH₃ ester), 63.68 (C=5, pyrazoline), 45.92 (C-4, pyrazoline), 19.15(CH₃). –MS-FAB+: m/z: 620 [M].

1-[(m-methoxy) 2, 3-dichloroanilinonamaloyl]-3-(N-2'-cyanoethyl-N-2, 3-dichloroanilino)-5-phenyl pyrazoline [6 i]


'1-H-NMR (250 MHz, δ ppm, DMSO-d₆): 2.38-2.51 (2H, s, CH₂), 4.29-4.50 (1H, s, NH), 6.90-7.20 (13H, m, ArH). 3.27 (1H, dd, J₆₈ = 17 HZ, J₈₉ = 4.55 HZ, C₈-H₈ of pyrazoline ring). 3.98 (1H, dd J₆₈ = 17 HZ, J₈₉ = 13.80 HZ, C₉-H₉ of pyrazoline ring), 4.82 (1H, d, J = 16.23 HZ COCH geminal proton), 5.51 (1H, dd J₆₈ = 11.90 HZ, J₈₉ = 4.40 HZ, C₉-H₉ of pyrazoline ring).

13C-NMR: 157.72 (C=O), 153.77 (C=O), 142.05, 139.42, 134.45, 132.45, 129.45, 123.80, 116.18 (5C, Ar H's), 63.66 (CH₃ ester), 63.68 (C=5, pyrazoline), 45.92 (C-4, pyrazoline), 19.15(CH₃). –MS-FAB+: m/z: 620 [M].
aliphatic ], 2230(C, N stretching ), 1680 [C=O and N-H (amide) ], 1610 (C=C ring stretching , aromatic ), 1030, 840, ( C-Cl stretching, 2, 3-disubstituted aromatic ring ).

1H-NMR (250 MHz, δ ppm, DMSO-d_6): 2.20-2.56 (2H, s, CH_2), 4.10-4.80 (1H, s, NH), 6.85-7.10 (13H, m, ArH). 3.18 (1H, dd, J_MAX = 13.6 Hz, J_MAX = 6.2 Hz of pyrazoline ring).

ArCH's), 63.10 (CH_2 ArC's), 130.28, 129.50, 126.60, 122.70, 111.88 (5C, 1H-NMR (250 MHz, δ ppm, DMSO-d_6,): 2.30-2.56 (2H, s, CH_2), 4.25-4.45 (1H, s, NH), 6.80-7.20 (13H, m, ArH). 3.17 (1H, dd, J_MAX = 17.8 Hz, J_MAX = 4.60 Hz of pyrazoline ring).

13C-NMR: 174.55 (C=O), 158.72 (C=N), 143.10, 138.60, 137.45, 133.85 (4C, ArC's), 132.48, 128.66, 125.75, 114.68 (5C, Ar CH's), 62.80 (C-5, pyrazoline), 46.80 (C-4, pyrazoline), 18.86 (CH_3). –MS-FAB+: m/z: 620 [M].

1-{(p-floro) 2, 3-dichloroanilinomalonyl}]-3-(N-2'-cyanoethyl -N-2, 3-dichloroanilino)-5- phenyl pyrazoline [6 k]

Yield: 54%, m.p. 234°C, M.W.: 608, Anal. Calculated for C_{29}H_{23}Cl_2 N_5 O_3: Cl: 12.6, N: 6.2, found Cl: 12.5, N: 5.9%. U.V. [(λ, δ CH_max nm), log δ]: 222.5 (4.98), 517.9 (4.73).

IR[KBr] V_max Cm⁻¹: 3300-2880 [broad band due to (I) N-H stretching, secondary amide (Intra molecular hydrogen bond ), (II) C-H stretching , aromatic , (iii) C-H stretching, aliphatic ], 2250(C, N stretching ), 1660 [C=O and N-H (amide) ], 1575 (C=N stretching ), 1570, 1460, 1430 (C=C ring stretching , aromatic ), 1070, 860, ( C-Cl stretching, 2, 3-disubstituted aromatic ring ).

1H-NMR (250 MHz, δ ppm, DMSO-d_6): 2.18-2.34 (2H, s, CH_2), 4.16-4.70 (1H, s, NH), 6.70-7.10 (13H, m, ArH). 3.16 (1H, dd, J_MAX = 17.8 Hz, J_MAX = 4.60 Hz of pyrazoline ring). 3.93 (1H, dd, J_MAX = 17.9 Hz, J_MAX = 13.7 Hz, C_5-H_5 of pyrazoline ring) , 4.90 (1H, d, J = 16.40 Hz COCH geminal proton ), 5.55 (1H, dd, J_MAX = 12.9 Hz, J_MAX = 4.55 Hz, C_5-H_5 of pyrazoline ring). 13C-NMR: 176.58 (C=O), 156.78 (C=N), 142.05, 137.62, 135.45, 132.84 (4C, ArC's), 130.28, 129.50, 126.60, 122.70, 111.88 (5C, Ar CH's), 63.10 (CH_2 ester), 62.40 (C-5, pyrazoline), 47.10 (C-4, pyrazoline), 18.95 (CH_3). –MS-FAB+: m/z: 608[M].

1-{(o-ethoxy) 2, 3-dichloroanilinomalonyl}]-3-(N-2'-cyanoethyl -N-2, 3-dichloroanilino)-5- phenyl pyrazoline [6 m]


IR[KBr] V_max Cm⁻¹: 3300-2920 [broad band due to (I) N-H stretching, secondary amide (Intra molecular hydrogen bond ), (II) C-H stretching , aromatic , (iii) C-H stretching, aliphatic ], 2260(C, N stretching ), 1640 [C=O and N-H (amide) ], 1580 (C=N stretching ), 1590, 1480, 1460 (C=C ring stretching , aromatic ), 1050, 860, ( C-Cl stretching, 2, 3-disubstituted aromatic ring ).

1H-NMR (250 MHz, δ ppm, DMSO-d_6): 2.30-2.44 (2H, s, CH_2), 4.14-4.40 (1H, s, NH), 6.80-7.20 (13H, m, ArH). 3.17 (1H, dd, J_MAX = 17.8 Hz, J_MAX = 13.65 Hz, C_5-H_5 of pyrazoline ring) , 4.55 (1H, d, J = 16.35 Hz COCH geminal proton ), 5.68 (1H, dd, J_MAX = 13.10 Hz, J_MAX = 4.70 Hz, C_5-H_5 of pyrazoline ring) , 4.04 (1H, dd, J_MAX = 17.70 Hz, J_MAX = 13.50 Hz, C_5-H_5 of pyrazoline ring) .

13C-NMR: 178.70 (C=O), 158.72 (C=N), 141.10, 138.40, 136.49, 130.85 (4C, ArC's), 131.48, 130.32, 127.66, 124.77, 113.38 (5C, Ar CH's), 62.60 (CH_2 ester), 61.84 (C-5, pyrazoline), 45.92 (C-4, pyrazoline), 19.06 (CH_3). –MS-FAB+: m/z: 669[M].
1-[(m-ethoxy) 2, 3-dichloroanilinomalonyl]-3-(N-2'-cyanoethyl -N-2, 3-dichloroanilino)-5-phenyl pyrazoline [6 n]

Yield: 65%, m.p. 249°C (d), M.W.: 634, Anal. Calculated for C_{29}H_{25}Cl_{4}N_{5}O_{3}, Cl: 14.6, N: 7.0%. U.V. \((\lambda_{\text{max}}^{\text{nm}})\), log \(\varepsilon\): 210.2 (4.89), 318.5 (4.72). 

\[\nu_{\text{max}} \text{Cm}^{-1}}: 3300-2890 \text{ [broad band due to (I) N-H stretching, secondary amide (Intra molecular hydrogen bond), (II) C-H stretching , aromatic , (iii) C-H stretching , aliphatic ]}, 2240(C-N stretching ), 1670 [ C=O and N-H (amide) ] , 1570 ( C=N stretching ), 1580, 1460, 1430 (C=C ring stretching , aromatic ), 1055, 830, ( C-Cl stretching , 2, 3-disubstituted aromatic ring ). 

\[^{1}H\text{-NMR (250 MHz, } \delta \text{ ppm, DMSO-d}_{6})\]: 2.14-2.26 (2H, s, CH\text{2}), 4.18-4.30(1H, s, NH), 7.0-7.30 (13H, m, ArH). 3.15(1H, dd, J_{AM} = 18 Hz, J_{AX} = 4.60 Hz, C_{4}-HA of pyrazoline ring). 3.90 (1H, dd J_{MA} = 17.90 Hz, J_{MX} = 13.55 Hz, C_{4}-HM of pyrazoline ring), 4.75(1H, d, J = 16.12 Hz COCH geminal proton), 5.55(1H, dd J_{MX} 12.70 Hz, J_{AX} = 4.50 Hz, C_{5}-H of pyrazoline ring). 

\[^{13}C\text{-NMR: /ppm 174.54 (C=O), 153.78 (C=N), 143.10, 140.64, 137.45, 136.85 (4C, ArC's), 133.48, 131.55, 127.66, 124.57, 112.28 (5C, Ar CH's), 64.65 (CH\text{3} ester), 62.85 (C-5, pyrazoline), 46.45 (C-4, pyrazoline), 18.95 (CH\text{3}).}\] 

1-

\[^{1}H\text{-NMR (250 MHz, } \delta \text{ ppm, DMSO-d}_{6})\]: 2.14-2.26 (2H, s, CH\text{2}), 4.18-4.30(1H, s, NH), 7.0-7.30 (13H, m, ArH). 3.15(1H, dd, J_{AM} = 18 Hz, J_{AX} = 4.60 Hz, C_{4}-HA of pyrazoline ring). 3.90 (1H, dd J_{MA} = 17.90 Hz, J_{MX} = 13.55 Hz, C_{4}-HM of pyrazoline ring), 4.75(1H, d, J = 16.12 Hz COCH geminal proton), 5.55(1H, dd J_{MX} 12.70 Hz, J_{AX} = 4.50 Hz, C_{5}-H of pyrazoline ring). 

\[^{13}C\text{-NMR: /ppm 174.54 (C=O), 153.78 (C=N), 143.10, 140.64, 137.45, 136.85 (4C, ArC's), 133.48, 131.55, 127.66, 124.57, 112.28 (5C, Ar CH's), 64.65 (CH\text{3} ester), 62.85 (C-5, pyrazoline), 46.45 (C-4, pyrazoline), 18.95 (CH\text{3}).}\]

Table 1: [1- (Unsubstituted / Substituted 2, 3-dichloroanilinomalonyl) -3-(N-2'-cyanoethyl-N-2, 3-dichloroanilino)-5-phenyl pyrazolines]

<table>
<thead>
<tr>
<th>CS. No.</th>
<th>R</th>
<th>Color</th>
<th>m.p.(°C)</th>
<th>Yield (%)</th>
<th>M.W.</th>
<th>Molecular Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>6a.</td>
<td>H</td>
<td>Yellow</td>
<td>252</td>
<td>66</td>
<td>589</td>
<td>C_{27}H_{21}Cl_{4}N_{5}O_{2}</td>
</tr>
<tr>
<td>6b.</td>
<td>CH_{3}(o)</td>
<td>Cream</td>
<td>275</td>
<td>48</td>
<td>604</td>
<td>C_{28}H_{23}Cl_{4}N_{5}O_{2}</td>
</tr>
<tr>
<td>6c.</td>
<td>CH_{3}(m)</td>
<td>Light Yellow</td>
<td>266</td>
<td>56</td>
<td>604</td>
<td>C_{28}H_{23}Cl_{4}N_{5}O_{2}</td>
</tr>
<tr>
<td>6d.</td>
<td>CH_{3}(p)</td>
<td>Light Yellow</td>
<td>242</td>
<td>66</td>
<td>604</td>
<td>C_{28}H_{23}Cl_{4}N_{5}O_{2}</td>
</tr>
<tr>
<td>6e.</td>
<td>Cl(o)</td>
<td>white</td>
<td>271</td>
<td>55</td>
<td>623.5</td>
<td>C_{27}H_{20}Cl_{5}N_{5}O_{2}</td>
</tr>
<tr>
<td>6f.</td>
<td>Cl(m)</td>
<td>Light Yellow</td>
<td>263</td>
<td>61</td>
<td>623.5</td>
<td>C_{27}H_{20}Cl_{5}N_{5}O_{2}</td>
</tr>
<tr>
<td>6g.</td>
<td>Cl(p)</td>
<td>Cream</td>
<td>267</td>
<td>64</td>
<td>623.5</td>
<td>C_{27}H_{20}Cl_{5}N_{5}O_{2}</td>
</tr>
<tr>
<td>6h.</td>
<td>O-CH_{3}(o)</td>
<td>Yellow</td>
<td>241</td>
<td>68</td>
<td>620</td>
<td>C_{28}H_{22}Cl_{4}N_{5}O_{3}</td>
</tr>
<tr>
<td>6i.</td>
<td>O-CH_{3}(m)</td>
<td>White</td>
<td>257</td>
<td>74</td>
<td>620</td>
<td>C_{28}H_{23}Cl_{4}N_{5}O_{3}</td>
</tr>
<tr>
<td>6j.</td>
<td>O-CH_{3}(p)</td>
<td>Cream</td>
<td>266</td>
<td>77</td>
<td>620</td>
<td>C_{28}H_{23}Cl_{4}N_{5}O_{3}</td>
</tr>
<tr>
<td>6k.</td>
<td>F(p)</td>
<td>Yellow</td>
<td>234</td>
<td>54</td>
<td>608</td>
<td>C_{27}H_{20}Cl_{4}F_{1}N_{5}O_{3}</td>
</tr>
<tr>
<td>6l.</td>
<td>Br(o)</td>
<td>Dark brown</td>
<td>258</td>
<td>64</td>
<td>669</td>
<td>C_{27}H_{20}Cl_{4}O_{2}Br</td>
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<tr>
<td>6m.</td>
<td>O-C_{2}H_{5}(o)</td>
<td>L. Brown</td>
<td>264</td>
<td>69</td>
<td>634</td>
<td>C_{29}H_{21}Cl_{5}N_{5}O_{3}</td>
</tr>
<tr>
<td>6n.</td>
<td>O-C_{2}H_{5}(m)</td>
<td>Brown</td>
<td>249</td>
<td>65</td>
<td>634</td>
<td>C_{29}H_{21}Cl_{5}N_{5}O_{3}</td>
</tr>
<tr>
<td>6o.</td>
<td>O-C_{2}H_{5}(p)</td>
<td>Brown</td>
<td>245</td>
<td>61</td>
<td>634</td>
<td>C_{29}H_{21}Cl_{5}N_{5}O_{3}</td>
</tr>
<tr>
<td>6p.</td>
<td>CO_{2}H(o)</td>
<td>Brown</td>
<td>253</td>
<td>70</td>
<td>634</td>
<td>C_{29}H_{21}Cl_{5}N_{5}O_{3}</td>
</tr>
<tr>
<td>6q.</td>
<td>CO_{2}H(m)</td>
<td>Brown</td>
<td>248</td>
<td>65</td>
<td>634</td>
<td>C_{28}H_{21}Cl_{5}N_{5}O_{4}</td>
</tr>
<tr>
<td>6r.</td>
<td>CO_{2}H(p)</td>
<td>L. brown</td>
<td>267</td>
<td>59</td>
<td>634</td>
<td>C_{28}H_{21}Cl_{5}N_{5}O_{4}</td>
</tr>
<tr>
<td>6s.</td>
<td>Br(m)</td>
<td>Brown</td>
<td>243</td>
<td>63</td>
<td>669</td>
<td>C_{27}H_{20}Cl_{4}O_{2}Br</td>
</tr>
<tr>
<td>6t.</td>
<td>Br(p)</td>
<td>Brown</td>
<td>256</td>
<td>54</td>
<td>669</td>
<td>C_{27}H_{20}Cl_{4}O_{2}Br</td>
</tr>
</tbody>
</table>

All compounds gave satisfactory elemental analysis.
NMR (250 MHz, δ ppm, DMSO-d$_6$): 2.20-2.46 (2H, s, CH$_2$), 4.10-4.45 (1H, s, NH), 6.90-7.30 (13H, m, ArH). 3.20 (1H, dd, J$_{AM}$ = 17.0 Hz, J$_{AX}$ = 13.50 Hz, C$_4$-H$_A$ of pyrazoline ring). 3.95 (1H, dd, J$_{AM}$ = 17.0 Hz, J$_{AX}$ = 13.50 Hz, C$_4$-H$_A$ of pyrazoline ring). 4.70 (1H, d, J = 16.10 Hz COCH geminal proton ), 5.80 (1H, dd, J$_{MX}$ = 12.90 Hz, J$_{AX}$ = 4.70 Hz, C$_2$-H$_Z$ of pyrazoline ring). 13C-NMR: γ/δ ppm: 178.57 (C=O), 157.77 (C=N), 157.77 (C=N), 140.15, 136.64, 134.40, 130.80 (4C, ArCHs), 130.18, 128.75, 127.66, 125.78, 113.19 (5C, ArCHs), 61.62 (CH$_2$ ester), 60.88 (C-5, pyrazoline), 46.90 (C-4, pyrazoline), 18.75 (CH$_3$). –MS-FAB+: m/z: 669 [M].

1-[(p-bromo) 2,3-dichloroanilinomalonyl)]-3-(N-2'-cyanoethyl -N-2, 3-dichloroanilino)-5- phenyl pyrazoline [6 t]

Yield: 54%, m.p. 256°C, M.W.: 669, Anal. Calculated for C$_{27}$H$_{20}$Cl$_4$N$_5$O$_2$Br: Cl: 11.9, N: 5.9, found Cl: 11.7, N: 5.6%. U.V. ([λ$_{max}$, nm], log α): 210.2 (4.94), 318.7 (4.76). IR[KBr] $\nu_{max}$ Cm$^{-1}$: 3300-2850 (broad band due to (I) N-H stretching, secondary amide (Intra molecular hydrogen bond ), (II) C-H stretching , aromatic, (iii) C-H stretching, aliphatic ). 2240 (C N stretching ), 1660 (C=O and N-H (amide)), 1577 (C=N stretching ). 3.15 (1H, dd, J$_{AM}$ = 17.0 Hz, J$_{AX}$ = 13.50 Hz, C$_4$-H$_A$ of pyrazoline ring). 3.95 (1H, dd, J$_{AM}$ = 17.0 Hz, J$_{AX}$ = 13.50 Hz, C$_4$-H$_A$ of pyrazoline ring), 4.60 (1H, d, J = 16.10 Hz COCH geminal proton ), 5.80 (1H, dd, J$_{AX}$ = 12.90 Hz, J$_{AX}$ = 4.70 Hz, C$_2$-H$_Z$ of pyrazoline ring). 13C-NMR: γ/δ ppm: 178.57 (C=O), 157.77 (C=N), 157.77 (C=N), 140.15, 136.64, 134.40, 130.80 (4C, ArCHs), 130.18, 128.75, 127.66, 125.78, 113.19 (5C, ArCHs), 61.62 (CH$_2$ ester), 60.88 (C-5, pyrazoline), 46.90 (C-4, pyrazoline), 18.75 (CH$_3$). –MS-FAB+: m/z: 669 [M].

Biological evaluation

Anti-bacterial activity

Newly synthesized compounds (6a-t) have been tested for their antibacterial activity against gram positive bacteria S. albus, S. aureus and gram negative bacteria E.Coli and Pseudomonas poisonous by agar plate disc diffusion method at 30 µg/mL concentration. Ampicillin and Tetracycline used as a reference compound. The compound (6a, 6b, 6c, 6f, 6g, 6j, 6m, and 6r ) shown significant activity and the compound (6i, 6k, 6l, 6p, 6t, ) have shown moderate activity.

Anti-fungal activity

The same compounds were tested for their antifungal activity against Candida albicans, Aspergillus Niger and Alternaria alternata at concentration of 30 mg/mL using sabouraud dextrose agar media. The compound (6c, 6j, 6m, and 6r) shown significant activities and compound (6a, 6b, 6f, and 6g) were found to be moderately active against Candida albicans and Aspergillus Niger. All the other compounds did not show significant activity against the fungi at the concentration used.

Tuberculostatic activity

Some new compounds have been tested for antitubercular activity in-vivo using...
Mycobacterium tuberculosis. The compounds were incorporated into Lowenstein Jensen egg medium having concentrations of 10 and 100 mg/mL and were inoculated with Mycobacterium tuberculosis, H$_2$, R$_v$ strains, incubated at 37°C and observed, weekly for the growth of organism for eight weeks. The compound (6a, 6b, 6c, 6f, 6g, 6j, and 6m) inhibited the growth of M. tuberculosis at 100 mg/mL concentration other compounds were found to be inactive. Results are assembled in Table 2.

### RESULTS AND DISCUSSION

Newly synthesized 1-[[2, 3-dichloroanilinomalonyl]]-3-(N-2'-cyanoethyl -N-2, 3-dichloroanilino)-5-phenyl pyrazolines have been

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Compounds</th>
<th>Growth at conc. [mg/mL]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>6a.</td>
<td>1-[[2, 3-dichloro anilinomalonyl]]-3-(N-2'-cyanoethyl -N-2, 3-dichloroanilino)-5-phenyl pyrazoline</td>
<td>+</td>
</tr>
<tr>
<td>6b.</td>
<td>1-[[o-methyl] 2, 3-dichloro anilinomalonyl]]-3-(N-2'-cyanoethyl -N-2, 3-dichloroanilino)-5-phenyl pyrazoline</td>
<td>+</td>
</tr>
<tr>
<td>6c.</td>
<td>1-[[m-methyl] 2, 3-dichloro anilinomalonyl]]-3-(N-2'-cyanoethyl -N-2, 3-dichloroanilino)-5-phenyl pyrazoline</td>
<td>+</td>
</tr>
<tr>
<td>6d.</td>
<td>1-[[p-methyl] 2, 3-dichloro anilinomalonyl]]-3-(N-2'-cyanoethyl -N-2, 3-dichloroanilino)-5-phenyl pyrazoline</td>
<td>+</td>
</tr>
<tr>
<td>6e.</td>
<td>1-[[o-chloro] 2, 3-dichloro anilinomalonyl]]-3-(N-2'-cyanoethyl -N-2, 3-dichloroanilino)-5-phenyl pyrazoline</td>
<td>+</td>
</tr>
<tr>
<td>6f.</td>
<td>1-[[m-chloro] 2, 3-dichloro anilinomalonyl]]-3-(N-2'-cyanoethyl -N-2, 3-dichloroanilino)-5-phenyl pyrazoline</td>
<td>+</td>
</tr>
<tr>
<td>6g.</td>
<td>1-[[p-chloro] 2, 3-dichloro anilinomalonyl]]-3-(N-2'-cyanoethyl -N-2, 3-dichloroanilino)-5-phenyl pyrazoline</td>
<td>+</td>
</tr>
<tr>
<td>6h.</td>
<td>1-[[o-methoxy] 2, 3-dichloro anilinomalonyl]]-3-(N-2'-cyanoethyl -N-2, 3-dichloroanilino)-5-phenyl pyrazoline</td>
<td>+</td>
</tr>
<tr>
<td>6i.</td>
<td>1-[[m-methoxy] 2, 3-dichloro anilinomalonyl]]-3-(N-2'-cyanoethyl -N-2, 3-dichloroanilino)-5-phenyl pyrazoline</td>
<td>+</td>
</tr>
<tr>
<td>6j.</td>
<td>1-[[p-methoxy] 2, 3-dichloro anilinomalonyl]]-3-(N-2'-cyanoethyl -N-2, 3-dichloroanilino)-5-phenyl pyrazoline</td>
<td>+</td>
</tr>
<tr>
<td>6k.</td>
<td>1-[[p-fluoro] 2, 3-dichloro anilinomalonyl]]-3-(N-2'-cyanoethyl -N-2, 3-dichloroanilino)-5-phenyl pyrazoline</td>
<td>+</td>
</tr>
<tr>
<td>6l.</td>
<td>1-[[o-bromo] 2, 3-dichloro anilinomalonyl]]-3-(N-2'-cyanoethyl -N-2, 3-dichloroanilino)-5-phenyl pyrazoline</td>
<td>+</td>
</tr>
<tr>
<td>6m.</td>
<td>1-[[o-ethoxy] 2, 3-dichloro anilinomalonyl]]-3-(N-2'-cyanoethyl -N-2, 3-dichloroanilino)-5-phenyl pyrazoline</td>
<td>+</td>
</tr>
<tr>
<td>6n.</td>
<td>1-[[m-ethoxy] 2, 3-dichloro anilinomalonyl]]-3-(N-2'-cyanoethyl -N-2, 3-dichloroanilino)-5-phenyl pyrazoline</td>
<td>+</td>
</tr>
<tr>
<td>6o.</td>
<td>1-[[p-ethoxy] 2, 3-dichloro anilinomalonyl]]-3-(N-2'-cyanoethyl -N-2, 3-dichloroanilino)-5-phenyl pyrazoline</td>
<td>+</td>
</tr>
<tr>
<td>6s.</td>
<td>1-[[m-bromo] 2, 3-dichloro anilinomalonyl]]-3-(N-2'-cyanoethyl -N-2, 3-dichloroanilino)-5-phenyl pyrazoline</td>
<td>+</td>
</tr>
<tr>
<td>6t.</td>
<td>1-[[p-bromo] 2, 3-dichloro anilinomalonyl]]-3-(N-2'-cyanoethyl -N-2, 3-dichloroanilino)-5-phenyl pyrazoline</td>
<td>+</td>
</tr>
</tbody>
</table>

'+' and '0' indicate presence and inhibition of growth respectively.
synthesized by the reaction of N-cinnamoyl-N-2'-cyanoethyl -2, 3-dichloro aniline with Ethyl-2-(2, 3-dichloroanilido) acetoxyhydradizde. Pyrazolines are yellow, cream and brown color solids, having high melting points. Identity of these products has been established by elemental analysis and spectral data. Newly synthesized compounds (6a-t) have been tested for their antibacterial activity against gram positive bacteria S. albus, S. aureus and gram negative bacteria E. coli and Pseudomonas poisonous. The compound (6a, 6b, 6c, 6f, 6g, 6j, 6m, and 6r) shown significant activity and the compound (6i, 6k, 6l, 6p, 6t,) have shown moderate activity. The same compounds were tested for their antifungal activity against Candida albicans, Aspergillus niger and Alternaria alternata. The compound (6c, 6j, 6m, and 6r) shown significant activities and compound (6a, 6b, 6f, and 6g) were found to be moderately active against Candida albicans and Aspergillus niger. All the other compounds did not show significant activity against the fungi at the concentration used. Some new compounds have been tested for antitubercular activity in-vitro using Mycobacterium tuberculosis. The compounds were incorporated into Lowenstein Jensen egg medium having concentrations of 10 and 100 mg/mL and were inoculated with Mycobacterium tuberculosis, H\textsubscript{27}, Rv strains, incubated at 37°C and observed, the compound (6a, 6b, 6c, 6f, 6g, 6j, and 6m) inhibited the growth of Mycobacterium tuberculosis at 100mg/mL concentration other compounds were found to be inactive.

**CONCLUSION**

Newly synthesized compounds (6a-t) have been tested for their antibacterial activity against gram positive bacteria S. albus, S. aureus and gram negative bacteria E. coli and Pseudomonas poisonous. The compound (6a, 6b, 6c, 6f, 6g, 6j, 6m, and 6r) shown significant activity and the compound (6i, 6k, 6l, 6p, 6t,) have shown moderate activity. The same compounds were tested for their antifungal activity against Candida albicans, Aspergillus niger and Alternaria alternata. The compound (6c, 6j, 6m, and 6r) shown significant activities and compound (6a, 6b, 6f, and 6g) were found to be moderately active against Candida albicans and Aspergillus niger. All the other compounds did not show significant activity against the fungi at the concentration used. Some new compounds have been tested for antitubercular activity in-vitro using Mycobacterium tuberculosis. The compounds were incorporated into Lowenstein Jensen egg medium having concentrations of 10 and 100 mg/mL and were inoculated with Mycobacterium tuberculosis, H\textsubscript{27}, Rv strains, incubated at 37°C and observed, the compound (6a, 6b, 6c, 6f, 6g, 6j, and 6m) inhibited the growth of Mycobacterium tuberculosis at 100mg/mL concentration other compounds were found to be inactive.

**ACKNOWLEDGEMENTS**

The authors are thankful to Director, C. D. R. I. Lucknow (U. P.), for elemental analysis, Director, Tuberculosis Research Centre, Amargadh (Gujrat), for testing tuberculostatic activity and Director, D. R. D. E. Gwalior (M.P.), for spectral studies, and Director, Cancer Hospital and Research Institute, G.R. Medical College and Birla Institute of Medical Research, Gwalior (M. P.), for Biological activities. We are also grateful to principal SMS Government Model Science College, Gwalior (M.P), for providing research facilities.

**REFERENCES**

(2007).


