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Research Article

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Resourceful synthesis of narrative cyano pyridines

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ABSTRACT

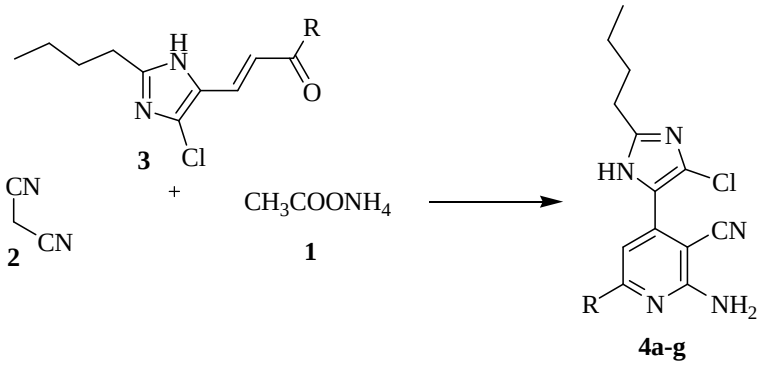
*Synthesis and organic movement of new derivatives of 2-amino-6-(4-substitutedphenyl)-4-(2-butyl-4-chloro-1H-imidazol-5-yl)pyridine-3-carbonitriles **(4a-g)** was achieved (E)-1-(substitutedphenyl)-3-(2-butyl-4-chloro-1H-imidazol-5-yl)prop-2-en-1-one, malononitrile, ammonium acetate and methanol with reflux for 8hours. Reaction mass was cooled to room temperature, poured on to crushed ice and neutralized. Obtained solid was filtered and was with methanol to give pure product. It were supported by FTIR, NMR and mass spectra data.*

Keywords: 2-amino-6-(4-substituted phenyl)-4-(2-butyl-4-chloro-1H-imidazol-5-yl)-pyridine-3-carbonitriles, malononitrile, ammonium acetate condensation synthesis.

INTRODUCTION

In nature occurring and synthetic compounds containing cyanopyran and cyan pyridine gibbet possess interesting pharmacological properties including anticancer [1], antimicrobial [2-6], cardiovascular [7], anticancer [8], anthelminitics [9]. Looking to these multifold properties exhibited by them, we have reported here the synthesis and antimicrobial activities of some new cyanopyrans and cyanopyridines derivatives. In the present study, we used this strategy for the synthesis of these compounds in the hope that they may possess different biological activities. In the initial step chalcones were synthesized by the reaction of 1-(4-mthoxybenzyl)-2-butyl-4-chloro-1H-imidazole-5-carbaldehyde with various aryl ketones in presence of NaOH in methanol at room temperature [10-16], compounds on cyclocondensation with malononitrile in pyridine afforded corresponding cyanopyrans [17-19], while on reaction with malononitrile in presence of ammonium acetate in methanol yielded cyan pyridines[20-23].

To evade these problems, we have developed a new propriety for the synthesis of novel cyano pyridines **(4a-g)** with the plus point of high yield and environmentally easiness **(Scheme-A)**.



4a-g

R=[H,CH3,OCH3,OH,NO2,Cl,Br,phenylcarbonylamino,
2,5-dichloro phenyl-sulphonyl-amino,
4-chloro phenylsulphonyl-amino]phenyl

Scheme-A

EXPERIMENTAL SECTION

Melting points were measured in open capillaries and are uncorrected. ^{1}HNMR spectra were recorded on Brukur spectrophotometer (400MHz). Chemical shifts are expressed in units relative to TMS signal as internal reference. IR spectra were recorded on FT-IR Shimadzu-FT-IR 8400 spectrophotometer on KBr pallets. Mass spectra were recorded on GCMS QP2010 Gas Chromatograph. Thin Layer Chromatography was performed on silica gel-G using hexane: ethylacetate solvent system.

Typical experimental procedure for the synthesis of 2-amino-6-(4-substitutedphenyl)-4-(2-butyl-4-chloro-1H-imidazol-5-yl)pyridine-3-carbonitrile.

A mixture of (E)-1-(substitutedphenyl)-3-(2-butyl-4-chloro-1H-imidazol-5-yl)prop-2-en-1-one (0.01m) malononitrile (0.01m)and ammonium acetate (0.08) dissolved in dioxin was heated under reflux for 8 hrs. the content was poured onto crushed ice. The product was isolated and crystallized from dioxin :methanol (4:1)` to give pure product.

2-amino-4-(2-butyl-4-chloro-1H-imidazol-5-yl)-6-phenylpyridine-3-carbonitrile 4a.

Yield: 79%; mp 142ºC; IR (cm-1): 3411 (N-H stretching of Amine), 3334 (N-H stretching of Secondary Amine), 2935 (C-H asymmetrical stretching of CH3 group), 2845 (C-H symmetrical stretching of CH3 group), 2235 (Nitrile stretching), 1037 (C-H stretching of Aromatic), 1500 and 1454 (C=C stretching of aromatic ring), 1454 (C-H asymmetrical deformation of CH3 group), 1343 (C-H symmetrical deformation of CH3 group), 1634 (C=N stretching), 1675 (N-H stretching of imidazole) 1365 (C-O-C stretching OCH3); 1H NMR (DMSO-d6) δ ppm: 0.92 (t, 3H), 1.73 (m, 2H), 2.11 (m, 2H), 2.44 (t, 2H), 6.96 (s, 1H), 7.45 to 7.56 (t, 3H), 7.67 and 7.85 (d, 2H), 8.25 (d, 1H), 8.35 and 8.51 (s, 2H); MS: m/z 351; Anal. Calcd. for $C_{19}H_{18}ClN_5$ C, C, 64.86; H, 5.16; Cl, 10.08; N, 19.71; Found: C, 64.66; H, 5.02; Cl, 9.94; N, 19.46%

2-amino-4-(2-butyl-4-chloro-1H-imidazol-5-yl)-6-p-tolylpyridine-3-carbonitrile 4b.

Yield: 72%; mp 165ºC; IR (cm-1): 3409 (N-H stretching of Amine), 3308 (N-H stretching of Secondary Amine), 2946 (C-H asymmetrical stretching of CH3 group), 2837 (C-H symmetrical stretching of CH3 group), 2224 (Nitrile stretching), 1007 (C-H stretching of Aromatic), 1500 and 1467 (C=C stretching of aromatic ring), 1454 (C-H asymmetrical deformation of CH3 group), 1346 (C-H symmetrical deformation of CH3 group), 1655 (C=N stretching), 1650 (N-H stretching of imidazole) 1356 (C-O-C stretching OCH3); 1H NMR (DMSO-d6) δ ppm: 0.89 (t, 3H), 1.12 (s, 3H), 1.75 (m, 2H), 2.19 (m, 2H), 2.42 (t, 2H), 6.26 (s, 1H), 7.45 (d, 2H), 7.67 and 7.85 (d, 2H), 8.25 (d, 1H), 8.35 and 8.51 (s, 2H); MS: m/z 365; Anal. Calcd. for $C_{20}H_{20}ClN_5O$ C, 65.66; H, 5.51; Cl, 9.69; N, 19.14; Found: C, 65.36; H, 5.31; Cl, 9.39; N, 19.04%

2-amino-4-(2-butyl-4-chloro-1H-imidazol-5-yl)-6-(4-methoxyphenyl)pyridine-3-carbonitrile 4c.
Yield: 77%; mp 151ºC; IR (cm-1): 3428 (N-H stretching of Amine), 3335 (N-H stretching of Secondary Amine), 2956(C-H asymmetrical stretching of CH3 group), 2857 (C-H symmetrical stretching of CH3 group), 2224 (Nitrile stretching), 1007 (C-H stretching of Aromatic), 1500 and 1467 (C=C stretching of aromatic ring), 1424 (C-H asymmetrical deformation of CH3 group), 1346 (C-H symmetrical deformation of CH3 group), 1655 (C=N stretching), 1640 (N-H stretching of imidazole) 1346 (C-O-C stretching OCH3); 1H NMR (DMSO-d6) δ ppm: 0.89 (t, 3H), 1.74 (m, 2H), 2.19 (m, 2H), 2.42 (t, 2H), 3.72 (s, 3H), 6.26 (s, 1H), 7.43 (d, 2H), 7.67 and 7.85 (d, 2H), 8.24 (d, 1H), 8.30 and 8.51 (s, 2H); MS: m/z 381; Anal. Calcd. for $C_{20}H_{20}ClN_5O$ C, 62.91; H, 5.28; Cl, 9.28; N, 18.34; O, 4.19; Found: C, 62.41; H, 5.08; Cl, 9.08; N, 18.31; O, 4.10%.

2-amino-4-(2-butyl-4-chloro-1H-imidazol-5-yl)-6-(4-hydroxyphenyl)pyridine-3-carbonitrile 4d.
Yield: 60%; mp 180ºC; IR (cm-1): 3411 (N-H stretching of Amine), 3312 (N-H stretching of Secondary Amine), 2915 (C-H asymmetrical stretching of CH3 group), 2835 (C-H symmetrical stretching of CH3 group), 2212 (Nitrile stretching), 1007 (C-H stretching of Aromatic), 1512 and 1487 (C=C stretching of aromatic ring), 1454 (C-H asymmetrical deformation of CH3 group), 1346 (C-H symmetrical deformation of CH3 group), 1655 (C=N stretching), 1645 (N-H stretching of imidazole); 1H NMR (DMSO-d6) δ ppm: 0.92 (t, 3H), 1.64 (m, 2H), 2.17 (m, 2H), 2.32 (t, 2H), 4.32 (s, 1H), 6.49 (s, 1H), 7.47 (d, 2H), 7.50 and 7.77 (d, 2H), 8.24 (d, 1H), 8.34 and 8.55 (s, 2H); MS: m/z 367; Anal. Calcd. for $C_{19}H_{18}ClN_5O$ C, 62.04; H, 4.93; Cl, 9.64; N, 19.04; O, 4.35; Found: C, 61.74; H, 4.73; Cl, 9.44; N, 19.04; O, 4.05%.

2-amino-4-(2-butyl-4-chloro-1H-imidazol-5-yl)-6-(4-nitrophenyl)pyridine-3-carbonitrile 4e.
Yield: 64%; mp 135ºC; IR (cm-1): 3404 (N-H stretching of Amine), 3306 (N-H stretching of Secondary Amine), 2916 (C-H asymmetrical stretching of CH3 group), 2845 (C-H symmetrical stretching of CH3 group), 2208 (Nitrile stretching), 1123 (C-H stretching of Aromatic), 1495 and 1473 (C=C stretching of aromatic ring), 1445 (C-H asymmetrical deformation of CH3 group), 1346 (C-H symmetrical deformation of CH3 group), 1657 (C=N stretching), 1642 (N-H stretching of imidazole); 1H NMR (DMSO-d6) δ ppm: 0.90 (t, 3H), 1.70 (m, 2H), 2.14 (m, 2H), 2.34 (t, 2H) 6.89 (s, 1H), 7.44 (d, 2H), 7.50 and 7.74 (d, 2H), 8.04 (d, 1H), 8.14 and 8.54 (s, 2H); MS: m/z 396; Anal. Calcd. for $C_{19}H_{17}ClN_6O_2$ C, 57.51; H, 4.32; Cl, 8.93; N, 21.18; O, 8.06; Found: C, 57.41; H, 4.10; Cl, 8.74; N, 21.01; O, 8.00%.

2-amino-4-(2-butyl-4-chloro-1H-imidazol-5-yl)-6-(4-chlorophenyl)pyridine-3-carbonitrile 4f.
Yield: 70%; mp 170ºC; IR (cm-1): 3450(N-H stretching of Amine), 3340 (N-H stretching of Secondary Amine), 2920 (C-H asymmetrical stretching of CH3 group), 2850 (C-H symmetrical stretching of CH3 group), 2212 (Nitrile stretching), 1084 (C-H stretching of Aromatic), 1470 and 1440 (C=C stretching of aromatic ring), 1470 (C-H asymmetrical deformation of CH3 group), 1390 (C-H symmetrical deformation of CH3 group), 1608 (C=N stretching), 1622 (N-H stretching of imidazole), 1006 (C-Cl stretching); 1H NMR (DMSO-d6) δ ppm: 0.97 (t, 3H), 1.74 (m, 2H), 2.14 (m, 2H), 2.35 (t, 2H) 6.76 (s, 1H), 7.37 (d, 2H), 7.76 and 7.86 (d, 2H), 8.19 (d, 1H), 8.28 and 8.57 (s, 2H); MS: m/z 385; Anal. Calcd. for $C_{19}H_{17}Cl_2N_5$ C, 59.08; H, 4.44; Cl, 18.36; N, 18.13; N, 16.26; Found: C, 58.67; H, 4.25; Cl, 18.16; N, 18.03%.

2-amino-4-(2-butyl-4-chloro-1H-imidazol-5-yl)-6-(4-bromophenyl)pyridine-3-carbonitrile 4g.
Yield: 74%; mp 172ºC; IR (cm-1): 3454 (N-H stretching of Amine), 3346 (N-H stretching of Secondary Amine), 2925 (C-H asymmetrical stretching of CH3 group), 2858 (C-H symmetrical stretching of CH3 group), 2212 (Nitrile stretching), 1093 (C-H stretching of Aromatic), 1475 and 1443 (C=C stretching of aromatic ring), 1475 (C-H asymmetrical deformation of CH3 group), 1396 (C-H symmetrical deformation of CH3 group), 1602 (C=N stretching), 1602 (N-H stretching of imidazole), 976 (C-Br stretching); 1H NMR (DMSO-d6) δ ppm: 0.94 (t, 3H), 1.79 (m, 2H), 2.11 (m, 2H), 2.38 (t, 2H) 6.89 (s, 1H), 7.41 (d, 2H), 7.57 and 7.70 (d, 2H), 8.12 (d, 1H), 8.25 and 8.50 (s, 2H); MS: m/z 430; Anal. Calcd. for $C_{19}H_{17}BrClN_5$ C, 52.98; H, 3.98; Br, 18.55; Cl, 8.23; N, 16.26; Found: C, 52.58; H, 3.78; Br, 18.25; Cl, 8.13; N, 16.16%.

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