Novel approaches for the synthesis of a library of fluorescent chromeno pyrimidine derivatives

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Supporting Information

General Information

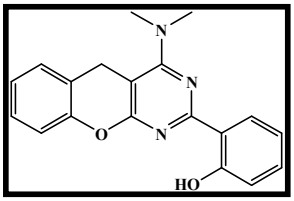
General Procedure

Spectral and Analytical Characterization

NMR spectra of the products

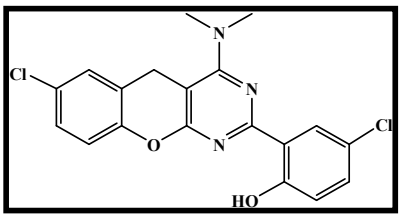
Spectral and Analytical Characterization

2-((4-Dimthylamino)-5*H*-chromeno [2, 3-*d*] pyrimidin-2-yl) phenol (6{2, 3})



Colorless crystals; mp 175°C; IR (KBr): ν_{max}; 3051 1623, 1615, 1149, 1056, 1028 cm^{-1}; ^1H NMR ($CDCl_3$, 500 MHz): δ_H 3.24 (6H, s, $2CH_3$), 4.15 (2H, s, CH_2), 6.95-7.0, 7.01-7.02, 7.13-7.14, 7.19-7.21, 7.26-7.27, 7.37-7.39, 8.43-8.46 (8H, 7m, H-Ar), 13.48 (br s, OH) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ_C 26.47 (CH_2), 41.46 ($2CH_3$), 94.93, 117.44, 117.92, 119.04, 119.18, 119.77, 124.70, 128.63, 128.97, 129.64, 133.15, 150.87, 160.88, 162.04, 164.55, 164.82 (Ar, imine carbons); MS: m/z: 319(M^+), 314(M^+ -CH_3), 265(M^+ -$N(CH_3)_2$), 182 (M^+ -N $(CH_3)_2$, Ar), 93(Ar^+), 44(N^+ $(CH_3)_2$)); Anal. Calcd for $C_{19}H_{18}N_3O_2$: C, 71.46; H, 5.37; N, 13.16; Found: C, 71.43; H, 5.39; N, 13.18.

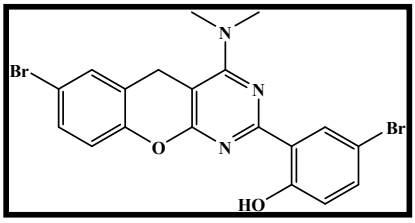
4-Chloro-2-(7-chloro-4-(dimethylamino)-5*H*-chromeno [2, 3-*d*] pyrimidin-2-yl) phenol (6{6, 3})



Colorless crystals; mp 197°C; IR (KBr): ν_{max}; 3054, 1638, 1616, 1255, 1181, 1053, 812, 741 cm^{-1}; ^1H NMR ($CDCl_3$, 500 MHz): δ_H 3.23 (6H, s, $2CH_3$), 4.06 (2H, s, CH_2), 6.91-

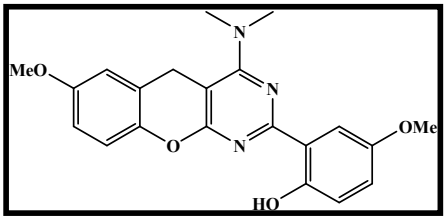
6.93, 7.09-7.11, 7.18-7.19, 7.21-7.24, 7.28-7.31, 8.35-8.36 (6H, 6m, H-Ar), 13.39 (br s, OH) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ_C 26.37 (CH_2), 41.50 ($2CH_3$), 94.31, 118.71, 119.47, 119.91, 121.23, 124.12, 128.71, 128.78, 129.72, 132.99, 149.24, 159.43, 160.97, 164.97 (Ar, imine carbons); MS: m/z: 387, 389 (M^+,M^++2), 372, 374 (M^+, M^++2 - CH_3), 345,347 (M^+,M^++2-N$(CH_3)_2$), 181 (M^+ -N $(CH_3)_2$, Ar), 44 (N^+ $(CH_3)_2$)) ; Anal. Calcd for $C_{19}H_{15}Cl_2N_3O_2$: C, 58.78; H, 3.89; N, 10.82; Found: C, 58.80; H, 3.89; N, 10.84.

4-Bromo-2-(7-bromo-4-(dimethylamino)-5*H*-chromeno [2, 3-*d*] pyrimidin-2yl) phenol (6{7, 3})



Colorless crystals; mp 215 ^oC; IR (KBr): ν_{max}: 3059, 1642, 1618, 1236, 1186, 1058, 815, 732 cm^{-1}; ^{1}H NMR ($CDCl_3$, 500 MHz): δ_H 3.18 (6H, s, $2CH_3$), 3.98 (2H, s, CH_2), 6.81-6.83, 6.97-6.98, 7.27-7.30, 7.32-7.34, 7.37-7.39, 8.42-8.43 (6H, 6m, H-Ar), 13.31 (br s, OH) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ_C 26.19 (CH_2), 41.46 (CH_3), 94.01, 111.10, 117.08, 118.94, 119.89, 120.40, 121.59, 131.60, 131.67, 135.70, 149.55, 159.92, 160.68, 164.17 (Ar, imine carbons); MS: m/z: 477,475 (M^+,M^++2), 461, 459 (M^+,M^++2 - CH_3), 433, 431 (M^+,M^++2-N$(CH_3)_2$), 395 (M^+-HBr), 351 (M^+-N $(CH_3)_2$, HBr), 44 ($N^+(CH_3)_2$)); Anal. Calcd for $C_{19}H_{15}Br_2N_3O_2$: C, 47.83; H, 3.17; N, 8.81; Found: C, 47.85; H, 3.16; N, 8.84.

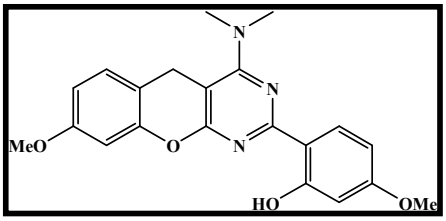
2-(4-(Dimethylamino)-7-methoxy-5*H*-chromeno [2, 3-*d*] pyrimidin-2-yl)-4-methoxyphenol (6{8, 3})



Colorless crystals; mp 180 ^oC ; IR (KBr): ν_{max}: 3079, 1656, 1622, 1246, 1188, 1066, 1029 cm^{-1}; ^{1}H NMR ($CDCl_3$, 500 MHz): δ_H 3.23 (6H, s, $2CH_3$), 3.83-3.89 (6H, 2s, $2OCH_3$), 4.07 (2H, s, CH_2), 6.71-6.72, 6.81-6.83, 6.93-6.95, 6.99-7.01, 7.12-7.13, 7.95-7.96 (6H, 6m, H-Ar), 13.32 (br s, OH) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ_C 26.80 (CH_2), 41.47 ($2CH_3$ of NMe_2), 56.09, 56.47 ($2OCH_3$), 94.54, 112.31, 113.44, 114.21, 118.20, 118.78, 118.86, 120.47, 121.15, 144.76, 152.57, 155.24, 156.59, 161.78, 164.97, 165.35 (Ar, imine carbons) ; MS: m/z: 379 (M^+), 364 (M^+ -CH_3), 347 (M^+ -CH_3OH), 335 (M^+-N$(CH_3)_2$), 181 [M^+-

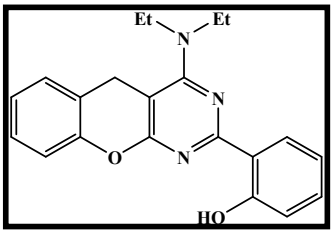
$N(CH_3)_2$, CH_3OH, Ar], 44 ($N^+(CH_3)_2$)); Anal. Calcd for $C_{21}H_{21}N_3O_4$: C, 66.48; H, 5.58; N, 11.58; Found: C, 66.48; H, 5.55; N, 11.61.

2-(4-(Dimethylamino)-8-methoxy-5*H*-chromeno [2, 3-*d*] pyrimidin-2-yl)-5-methoxy phenol (6{9, 3})



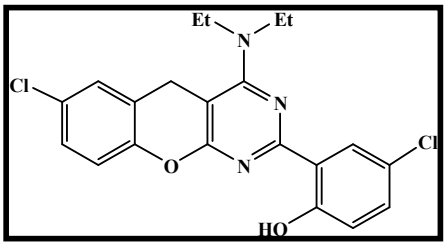
Colorless crystals; mp 190°C; IR (KBr): ν_{max}: 3085, 1653, 1625, 1262, 1198, 1157, 1064, 1027 cm^{-1}; ^1H NMR ($CDCl_3$, 500 MHz): δ_H 3.21 (6H, s, $2CH_3$ of NMe_2), 3.84, 3.87 (6H, 2s, $2OCH_3$), 4.00 (2H, s, CH_2), 6.51-6.54, 6.68-6.69, 6.70-6.71, 6.74-6.75, 7.08-7.09, 8.33-8.35 (6H, 6m, H-Ar), 13.67 (br s, OH) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ_C 25.81 (CH_2), 41.42 ($2CH_3$ of NMe_2), 55.74, 55.90 ($2OCH_3$), 94.85, 101.65, 102.32, 106.86, 111.43, 111.66, 112.60, 129.46, 130.90, 151.52, 154.16, 155.57, 159.95, 162.61, 163.89 (Ar, imine carbons) ; MS: m/z: 379 (M^+), 364(M^+ -CH_3), 347 (M^+ -CH_3OH), 335 [M^+ -$N(CH_3)_2$], 181 (M^+ -$N(CH_3)_2$, CH_3OH, Ar), 44 ($N^+(CH_3)_2$) ; Anal. Calcd for $C_{21}H_{21}N_3O_4$: C, 66.48; H, 5.58; N, 11.08; Found: C, 66.46; H, 5.56; N, 11.10.

2-((4-Diethylamino)-5*H*-chromeno [2, 3-*d*] pyrimidin-2-yl) phenol (6{2, 4})



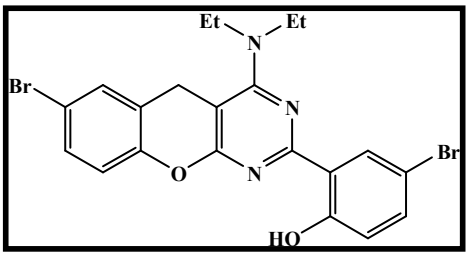
Colorless crystals; mp 143°C; IR (KBr): ν_{max}: 3046, 1632, 1611, 1248, 1189, 1058 cm^{-1}; ^1H NMR ($CDCl_3$, 500 MHz): δ_H 1.34-1.36 (6H, t, $2CH_3$of Et), 3.58-3.62 (4H, q, *J*= 7.08 Hz, $2CH_2$ of Et),4.03 (2H, s, CH_2),6.93-6.96, 7.00-7.02, 7.12-7.14, 7.19-7.21, 7.22-7.27, 7.36-7.38, 8.42-8.44 (8H,7m, H-Ar), 13.51 (br s, OH) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ_C 14.12 (CH_3 of Et), 26.29(CH_2), 45.12 (CH_2 of Et), 95.20, 117.38, 117.93, 119.11, 119.17, 119.86, 124.66, 128.65, 128.99, 129.63, 133.09, 150.81, 160.84, 161.92, 163.71 (Ar, imine carbons) ; MS: m/z: 347 (M^+), 332 (M^+ -CH_3), 318 (M^+ - C_2H_5), 275(M^+ -N $(C_2H_5)_2$), 182(M^+ -N $(C_2H_5)_2$, Ar), 93 (Ar^+), 72 ($N^+(C_2H_5)_2$) , 57(N C_3H_7) $^+$; Anal. Calcd for $C_{21}H_{22}N_3O_2$: C, 72.60; H, 6.09; N, 12.10; Found: C, 72.61; H, 6.11; N, 12.13.

4-Chloro-2-(7-chloro-4-(diethylamino)-5*H*-chromeno [2, 3-*d*] pyrimidin-2-yl) phenol (6{6, 4})



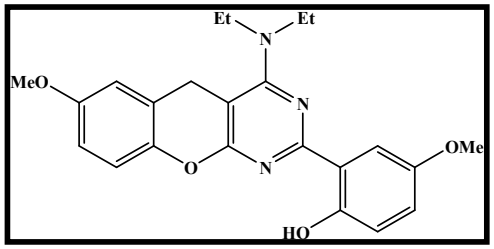
Colorless crystals; mp 190 ^{o}C; IR (KBr): 3060, 1639, 1612, 1253, 1183, 1069, 818, 698cm^{-1}; ^{1}H NMR ($CDCl_3$, 500 MHz): δ_H 1.34-1.37 (6H, t, 2CH_3 of Et), 3.59-3.62 (4H, q, *J*= 7.06 Hz, 2CH_2 of Et), 4.01 (2H, s, CH_2), 6.93-6.95, 7.12-7.14, 7.21-7.25, 7.29-7.32, 8.35-8.36 (6H, 5m, H-Ar), 13.35 (br s, OH) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ_C 14.12 (CH_3 of Et), 26.21 (CH_2), 45.19 (CH_2 of Et), 94.21, 118.71, 119.46, 120.10, 121.38, 124.12, 128.73, 128.81, 128.83, 129.66, 132.95, 149.27, 159.40, 161.01, 165.12 (Ar, imine carbons); MS: m/z: 417, 415 (M^+,M^++2), 388, 386 [M^+,M^++2 - C_2H_5], 345, 343 (M^+,M^++2-N $(C_2H_5)_2$), 181 (M^+ -N $(C_2H_5)_2$, Ar), 72 (N^+ $(C_2H_5)_2$) , 57 (N $C_3H_7)^+$; Anal. Calcd for $C_{21}H_{19}Cl_2N_3O_2$: C, 60.59; H, 4.60; N, 10.09; Found: C, 60, 61; H, 4.57; N, 10.11.

4-Bromo-2-(7-bromo-4-(diethylamino)-5*H*-chromeno [2, 3-*d*] pyrimidin-2-yl) phenol (6{7, 4})



Colorless crystals; mp 178 ^{o}C; IR (KBr): 3034, 1631, 1617, 1255, 1182, 1063, 813, 748 cm^{-1}; ^{1}H NMR ($CDCl_3$, 500 MHz): δ_H 1.29-1.37 (6H, t, 2$CH_3$of Et), 3.59-3.63 (4H, q, *J*= 7.08 Hz, 2CH_2 of Et), 4.06 (2H, s, CH_2), 6.89-6.91, 7.08-7.10, 7.38-7.40, 7.34-7.46, 8.51-8.52 (6H, 5m, H-Ar), 13. 31(br s, OH) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ_C 14.09 (CH_3 of Et), 26.10 (CH_2), 45.33 (CH_2 of Et), 98.96, 111.26, 117.17, 119.11, 119.96, 120.59, 121.82, 131.72, 131.78, 131.81,135.89, 149.77, 159.88, 160.85, 164.71 (Ar, imine carbons); MS: m/z: 507,505 (M^+,M^++2), 478,476 (M^+,M^++2 - C_2H_5), 435, 433 (M^+,M^++2- N $(C_2H_5)_2$) 425(M^+ -HBr), 353 (M^+ -N $(C_2H_5)_2$, HBr), 72 (N^+ $(C_2H_5)_2$), 57 (N^+ C_3H_7); Anal. Calcd for $C_{21}H_{19}Br_2N_3O_2$: C, 49.93; H, 3.77; N, 8.32; Found: C, 49.96; H, 3.81; N, 8.35.

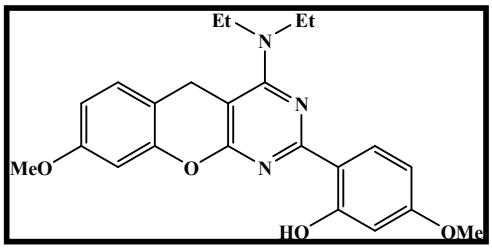
2-(4-(Diethylamino)-7-methoxy-5*H*-chromeno [2, 3-*d*] pyrimidin-2-yl)-4-methoxy phenol (6{8, 4})



Colorless crystals; mp 152 ^{o}C; IR (KBr): ν_{max}: 3088, 1651, 1619, 1251, 1207, 1153, 1032 cm^{-1}; ^{1}H NMR ($CDCl_3$, 500 MHz): δ_H 1.35 (6H, t,

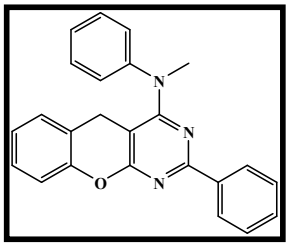
$2CH_3$of Et), 3.58-3.62 (4H, q, *J*= 7.08 Hz, $2CH_2$ of Et), 3.84, 3.88 (6H, 2s, $2OCH_3$), 4.01 (2H,s, CH_2), 6.72-6.73, 6.81-6.84, 6.94-6.96, 6.99-7.01, 7.12-7.13, 7.95-7.96 (6H, 6m, H-Ar), 13.09 (br s, OH) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ_C 14.10 ($2CH_3$ of NEt_2), 26.64 (CH_2), 45.11 ($2CH_2$ of NEt_2), 56.12, 56.41 (2OCH3), 95.63, 112.34, 113.45, 114.26, 118.16, 118.77, 119.01, 120.56, 121.00, 144.73, 152.54, 155.19, 156.57, 161.67, 163.91, 164.56 (Ar, imine carbons); MS: m/z: 407 (M^+), 378(M^+ - C_2H_5), 335 (M^+ -N $(C_2H_5)_2$), 181 (M^+ -N $(C_2H_5)_2$, C_2H_5OH, Ar), 72 (N^+ $(C_2H_5)_2$), 57 (N $C_3H_7)^+$; Anal. Calcd for $C_{23}H_{25}N_3O_4$: C, 67.80; H, 6.18; N, 10.31; Found: C, 67.83; H, 6.17; N, 10.33.

2-(4-(Diethylamino)-8-methoxy-5*H*-chromeno [2, 3-*d*] pyrimidin-2-yl)-5-methoxy phenol (6{9, 4})



Colorless crystals; mp 120 ^oC; IR (KBr): ν_{max}: 3081, 1662, 1638, 1259, 1194, 1086, 1024 cm^{-1}; ^1H NMR ($CDCl_3$, 500 MHz): δ_H 1.33 (6H, t, $2CH_3$ of Et), 3.55-3.59 (4H, q, *J*= 7.05 Hz, $2CH_2$ of Et), 3.84, 3.86 (6H, 2s, $2OCH_3$), 3.94 (2H, s,CH_2), 6.46-6.54, 6.86-6.70, 6.71-6.75, 7.08-7.10, 8.32-8.34 (6H, 5m, H-Ar),13.63 (br s, OH) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ_C 14.14 (CH_3 of Et), 25.61 (CH_2), 30.13, 32.36 ($2OCH_3$), 55.73, 55.90 (CH_2 of Et), 94.94, 101.60, 102.24, 106.93, 111.41, 111.69, 112.42, 129.48, 130.88, 151.43, 154.00, 155.40, 159.97, 162.55, 163.86 (Ar, imine carbons); MS: m/z: 407 (M^+), 378 (M^+ - C_2H_5), 335 (M^+ -N $(C_2H_5)_2$), 181 (M^+ -N $(C_2H_5)_2$, C_2H_5OH, Ar), 72 (N^+ $(C_2H_5)_2$), 57 (N $C_3H_7)^+$; Anal. Calcd for $C_{23}H_{25}N_3O_4$: C, 67.80; H, 6.18; N, 10.31; Found: C, 67.81; H, 6.21; N, 10.33.

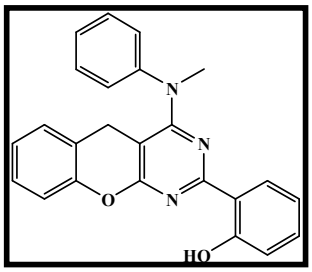
***N*-Methyl-*N*, 2-diphenyl-5*H*-chromeno [2, 3-*d*] pyrimidin-4-amine (7{1, 1, 1})**



Colorless crystals; mp 147 ^oC; IR (KBr): ν_{max}; 3036, 2895, 1598,1573, 1161, 1111 cm^{-1}; ^1H NMR ($CDCl_3$, 500 MHz): δ_H 3.14 (2H, s, CH_2), 3.67 (3H, s, CH_3 of CH_3N), 6.82-6.84, 6.96-6.99, 7.17-7.18, 7.22-7.24, 7.26-7.28, 7.40-7.43, 7.51-7.53, 8.54-8.56 (14H, 8m, aromatic protons) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ_C 25.92 (CH_2), 42.55 (CH_3 of CH_3N), 97.68, 117.29, 120.31, 124.28, 125.62, 125.97, 128.20, 128.59, 128.72, 129.09, 130.06, 130.93, 137.90, 147.52, 150.89, 162.17, 164.07, 165.59 (Ar, imine carbons); MS: m/z: 365 (M^+), 350 (M^+-CH_3), 288 (M^+-Ar), 273 (M^+- CH_3,

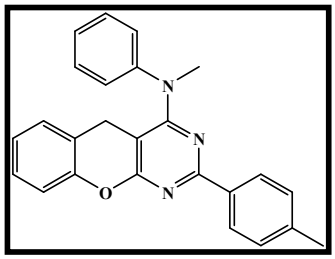
Ar), 259 (M^+- C_7H_8N), 91, 77; Anal. Calcd for $C_{24}H_{19}N_3O$: C, 78.88; H, 5.24; N, 11.50; Found: C, 78.90; H, 5.24; N, 11.53.

2-(4-(*N*-Methyl-*N*-phenylamino)-5*H*-chromeno [2, 3-*d*] pyrimidin-2-yl) phenol (7{2, 1, 1})



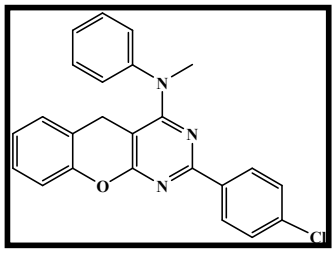
Colorless crystals; mp 179 ^oC; IR (KBr): ν_{max}; 3628, 3039, 2894, 1599,1543, 1188, 1107 cm^{-1}; ^1H NMR ($CDCl_3$, 500 MHz): δ_H 3.09 (2H, s, CH_2), 3.60 (3H, s, CH_3N), 6.78-6.79, 6.96-6.99, 7.03-7.05, 7.10-7.12, 7.16-7.19, 7.23-7.24, 7.30-7.33, 7.39-7.46, 8.50-8.51 (13H, 9m, H-Ar), 13.37 (1H, brs, OH) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ_C 25.76 (CH_2), 42.90 (CH_3 of CH_3N), 96.83, 117.21, 118.06, 119.08, 119.28, 119.86, 124.57, 126.18, 126.81, 128.33, 129.10, 129.68, 130.24, 133.28, 146.78, 151.06, 160.93, 162.51, 162.57 (Ar, imine carbons); MS: m/z: 381 (M^+), 366 (M^+-CH_3), 304 (M^+-Ar), 275 (M^+-C_7H_8N), 91, 77; Anal. Calcd for $C_{24}H_{19}N_3O_2$: C, 75.57; H, 5.02; N, 11.02; Found: C, 75.58; H, 5.03; N, 11.04.

***N*-Methyl-*N*-phenyl-2-*p*-tolyl-5*H*-chromeno [2, 3-*d*] pyrimidin-4-amine (7[3, 1, 1})**



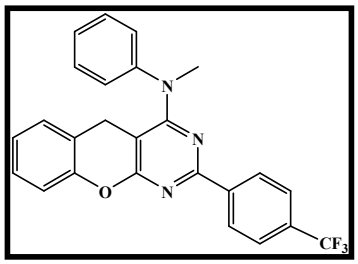
Colorless crystals; mp 169 ^oC; IR (KBr): ν_{max}; 2920, 1597,1570, 1158, 1110,1088 cm^{-1}; ^1H NMR ($CDCl_3$, 500 MHz): δ_H 2.47 (3H, s, CH_3 of CH_3-Ar), 3.14 (2H, s, CH_2), 3.67 (3H, s, CH_3 of CH_3N), 6.81-6.83, 6.96-6.99, 7.17-7.18, 7.22-7.27, 7.31-7.33, 7.40-7.43, 8.43-8.45 (13H, 7m, aromatic protons) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ_C 21.99 (CH_3 of CH_3-Ar), 25.90(CH_2), 42.56 (CH_3 of CH_3N), 97.39, 117.30, 120.36, 124.24, 125.59, 125.90, 128.18, 128.55, 129.11, 129.50, 130.05, 135.16, 141.15, 147.54, 150.89, 162.23, 164.03, 165.50 (Ar, imine carbons); MS: m/z: 379 (M^+), 364 (M^+-CH_3), 349 (M^+-$2CH_3$), 302 (M^+-Ar), 273 (M^+-CH_3, Ar), 91, 77; Anal. Calcd for $C_{25}H_{21}N_3O$: C, 79.13; H, 5.58; N, 11.07; Found: C, 79.12; H, 5.57; N, 11.10.

2-(4-Chlorophenyl)-*N*-methyl-*N*-phenyl-5*H*-chromeno [2, 3-*d*] pyrimidin-4-amine (7{4, 1, 1})



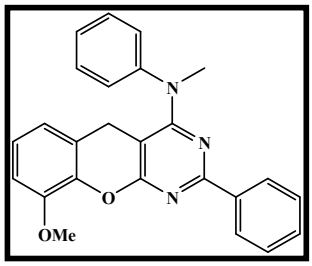
Colorless crystals; mp 200 ^{o}C; IR (KBr): ν_{max}; 3034, 2920, 1598, 1564, 1159, 1110, 848, 781 cm^{-1}; ^{1}H NMR ($CDCl_3$, 500 MHz): δ_H 3.12 (2H, s, CH_2), 3.65 (3H, s, CH_3N), 6.81-6.82, 6.96-6.99, 7.16-7.19, 7.22-7.24, 7.25-7.29, 7.40-7.43, 7.47-7.48, 8.47-8.48 (13H, 8m, H-Ar) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ_C 25.82 (CH_2), 42.53 (CH_3 of CH_3N), 97.64, 117.09, 120.13, 124.32, 125.66, 126.13, 128.17, 128.80, 129.07, 129.86, 130.03, 136.39, 136.87, 147.24, 150.66, 160.96, 163.91, 165.43 (Ar, imine carbons); MS: m/z: 399, 401 (M^+, M^++2), 384, 386 (M^+, M^++2 - CH_3), 322, 324 (M^+, M^++2-Ar), 322, 324 (M^+, M^++2- CH_3, Ar), 91, 77; Anal. Calcd for $C_{24}H_{18}ClN_3O$: C, 72.09; H, 4.54; N, 10.51; Found: C, 72.11; H, 4.53; N, 10.54.

2-(4-(Trifluoromethyl) phenyl)-*N*-methyl-*N*-phenyl-5*H*-chromeno [2, 3-*d*] pyrimidin-4 amine (7{5, 1, 1})



Colorless crystals; mp 196 ^{o}C; IR (KBr): ν_{max}; 2911, 1598,1570, 1152, 1533 1112 cm^{-1}; ^{1}H NMR ($CDCl_3$, 500 MHz): δ_H 3.14 (2H, s, CH_2), 3.67 (3H, s, CH_3 of CH_3N), 6.81-6.83, 6.97-7.00, 7.16-7.20, 7.24-7.25, 7.29-7.30, 7.42-7.45, 7.76-7.77, 8.64-8.65 (13H, 8m, aromatic protons) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ_C 25.93 (CH_2), 42.65 (CH_3 of CH_3N), 98.25, 117.23, 119.06, 120.09, 124.43, 125.63, 125.82, 126.30, 128.28, 129.09, 129.63, 130.12, 141.23, 147.27, 150.71, 160.69, 164.03, 165.59 (Ar, CF_3, imine carbons); MS: m/z: 433 (M^+), 318 (M^+-CH_3), 356(M^+-Ar), 327 (M^+-C_7H_8N), 91, 77; Anal. Calcd for $C_{25}H_{18}F_3N_3O$: C, 69.28; H, 4.19; N, 9.69; Found: C, 69.29; H, 4.17; N, 9.70.

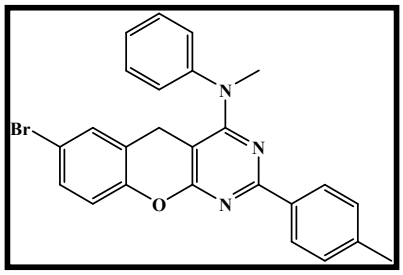
9-Methoxy-*N*-methyl-*N*, 2-diphenyl-5*H*-chromeno [2, 3-*d*] pyrimidin-4-amine (7{1, 4, 1})



Colorless crystals; mp 210 ^{o}C; IR (KBr): ν_{max}; 3058, 2935, 1574, 1533, 1169, 1101 cm^{-1}; ^{1}H NMR ($CDCl_3$, 500 MHz): δ_H 3.14 (2H, s, CH_2), 3.67 (3H, s, CH_3 of CH_3N), 3.93 (3H, s, CH_3 of CH_3O), 6.40-6.42, 6.76-6.78, 6.90-6.93, 7.22-7.26, 7.40-7.43, 7.50-7.51, 8.58-8.59 (13H, 7m, aromatic protons) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ_C 25.90 (CH_2), 42.55 (CH_3 of

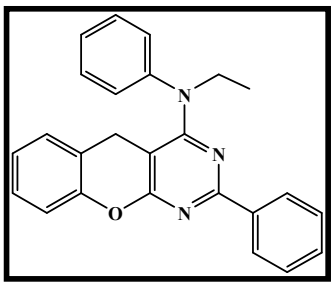
CH_3N), 56.31 (CH_3 of CH_3O), 97.56, 110.33, 120.39, 121.23, 123.94, 125.55, 125.87, 128.62, 128.75, 130.05, 130.85, 137.90, 140.43, 147.56, 148.42, 162.11, 163.99, 165.43 (Ar, imine carbons); MS: m/z: 395 (M^+), 380 (M^+-CH_3), 365 (M^+-2CH_3), 318 (M^+-Ar), 91, 77; Anal. Calcd for $C_{25}H_{21}N_3O_2$: C, 75.93; H, 5.35; N, 10.63; Found: C, 75.94; H, 5.33; N, 10.65.

7-Bromo-*N*-methyl-*N*-phenyl-2-*p*-tolyl-5*H*-chromeno [2, 3-*d*] pyrimidin-4-amine (7{1, 3, 1})



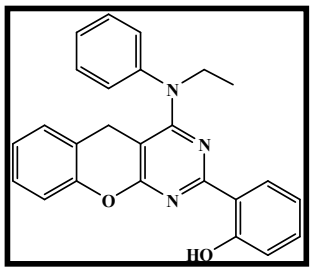
Colorless crystals; mp 239 ^oC; IR (KBr): ν_{max}; 2912, 1586, 1569, 1161, 1116, 802, 733 cm^{-1}; ^1H NMR ($CDCl_3$, 500 MHz): δ_H 2.46 (3H, s, CH_3-Ar), 3.09 (2H, s, CH_2), 3.66 (3H, s, CH_3N), 6.95-6.96, 7.03-7.04, 7.21-7.23, 7.25-7.27, 7.29-7.33, 7.40-7.44, 8.40-8.42 (12H, 7m, H-Ar) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ_C 21.94 (CH_3 of CH_3-Ar), 25.75 (CH_2), 42.59 (CH_3 of CH_3N), 96.43, 116.53, 119.02, 122.57, 125.75, 126.20, 128.55, 129.50, 130.125, 131.140, 131.67, 135.01, 141.27, 147.45, 150.05, 162.42, 163.97, 165.15 (Ar, imine carbons); MS: m/z: 457, 459 (M^+, M^++2), 442, 444 (M^+, M^++2 -CH_3), 427, 429 (M^+, M^++2-2CH_3), 380, 382 (M^+, M^++2 -Ar), 91, 77; Anal. Calcd for $C_{25}H_{20}BrN_3O$: C, 65.51; H, 4.40; N, 9.17; Found: C, 65.52; H, 4.38; N, 9.20.

***N*-Ethyl-*N*, 2-diphenyl-5*H*-chromeno [2, 3-*d*] pyrimidin-4-amine (7{1, 1, 2})**



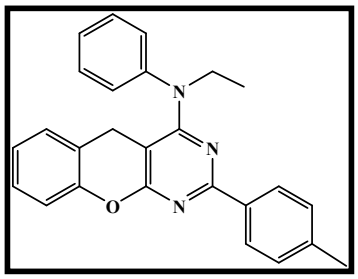
Colorless crystals; mp 167 ^oC; IR (KBr): ν_{max}; 3041, 2926, 1601, 1573, 1156, 1114 cm^{-1}; ^1H NMR ($CDCl_3$, 500 MHz): δ_H 1.39 (3H, t, C_2H_5N), 3.10 (2H, s, CH_2), 4.20-4.22 (2H, q, *J*=6.94 Hz, C_2H_5N), 6.80-6.82, 6.96-6.99, 7.16-7.17, 7.20-7.22, 7.25-7.29, 7.40-7.43, 7.51-7.53, 8.52-8.54 (14H, 8m, H-Ar) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ_C 13.49 (CH_3 of C_2H_5N), 26.02 (CH_2), 49.21 (CH_2 of C_2H_5N), 97.27, 117.23, 120.44, 124.22, 126.01, 126.53, 128.15, 128.58, 128.72, 129.09, 129.94, 130.86, 138.04, 145.55, 150.91, 162.00, 163.42, 165.70 (Ar, imine carbons) ; MS: m/z: 379 (M^+), 364 (M^+-CH_3), 302 (M^+-Ar), 273 (M^+-C_3H_5, Ar), 91, 77; Anal. Calcd for $C_{25}H_{21}N_3O$: C, 79.13; H, 5.58; N, 11.07; Found: C, 79.15; H, 5.57; N, 11.09.

2-(4-(*N*-Ethyl-*N*-phenylamino)-5*H*-chromeno [2, 3-*d*] pyrimidin-2-yl) phenol (7{2, 1, 2})



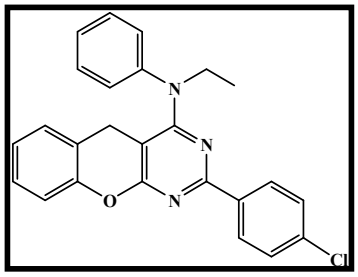
Colorless crystals; mp 175 ^{o}C; IR (KBr): ν_{max}; 3619, 3041, 1600, 1541, 1155, 1108 cm^{-1}; ^{1}H NMR ($CDCl_3$, 500 MHz): δ_H 1.38 (3H, t, C_2H_5N), 3.05 (2H, s, CH_2), 4.13-4.16 (2H, q, *J*=7.02 Hz, C_2H_5N), 6.78-6.80, 6.97-7.00, 7.04-7.06, 7.12-7.14, 7.17-7.20, 7.23-7.24, 7.30-7.33, 7.40-7.46, 8.48-8.50 (13H, 9m, H-Ar), 13.32 (1H, br s, OH) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ_C 13.17 (CH_3 of C_2H_5N), 25.92 (CH_2), 49.38 (CH_2 of C_2H_5N), 96.57, 117.17, 118.05, 119.21, 119.26, 120.03, 124.52, 126.76, 126.95, 128.31, 129.07, 129.68, 130.10, 133.21, 144.78, 150.45, 160.89, 162.03, 162.48 (Ar, imine carbons); MS: m/z: 395 (M^+), 380 (M^+-CH_3), 366 (M^+-C_2H_5), 318 (M^+-Ar), 275 (M^+- $C_8H_{10}N$), 91, 77; Anal. Calcd for $C_{25}H_{21}N_3O_2$: C, 75.93; H, 5.35; N, 10.63; Found: C, 75.92; H, 5.37; N, 10.66.

***N*-Ethyl-*N*-phenyl-2-*p*-tolyl-5*H*-chromeno [2, 3-*d*] pyrimidin-4-amine (7{3, 1, 2})**



Colorless crystals; mp 144 ^{o}C; IR (KBr): ν_{max}; 2968, 1584, 1566, 1152, 1114 cm^{-1}; ^{1}H NMR ($CDCl_3$, 500 MHz): δ_H 1.39 (3H, t, C_2H_5N), 2.47 (3H, s, CH_3-Ar), 3.08 (2H, s, CH_2), 4.18-4.21 (2H, q, *J*=6.90 Hz, C_2H_5N), 6.80-6.81, 6.94-6.98, 7.15-7.21, 7.24-7.27, 7.33-7.35, 7.39-7.42, 8.44-8.46 (13H, 7m, H-Ar) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ_C 13.48 (CH_3 of C_2H_5N), 22.00 (CH_3 of CH_3-Ar), 26.01 (CH_2), 49.21 (CH_2 of C_2H_5N), 96.97, 117.25, 120.48, 124.18, 125.94, 126.50, 128.14, 128.54, 129.10, 129.50, 129.93, 135.30, 141.05, 145.55, 162.07, 163.38, 165.60 (Ar, imine carbons) ; MS: m/z: 393 (M^+), 378 (M^+-CH_3), 364 (M^+-C_2H_5), 349 (M^+-C_2H_5, CH_3), 316 (M^+-Ar), 273 (M^+- $C_8H_{10}N$), 91, 77 ; Anal. Calcd for $C_{26}H_{23}N_3O$: C, 79.36; H, 5.89; N, 10.68; Found: C, 79.38; H, 5.92; N, 10.65.

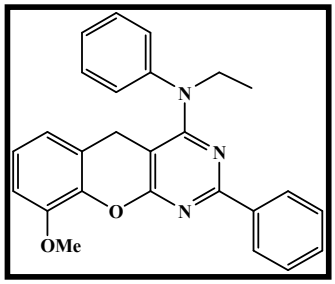
2-(4-Chlorophenyl)-*N*-ethyl-*N*-phenyl-5*H*-chromeno [2, 3-*d*] pyrimidin-4-amine (7{4, 1, 2})



Colorless crystals; mp 184 ^{o}C; IR (KBr): ν_{max}; 3067, 2981, 1572, 1531, 1156, 1115, 840, 765 cm^{-1}; ^{1}H NMR ($CDCl_3$, 500 MHz): δ_H 1.36 (3H, t, C_2H_5N), 3.06 (2H, s, CH_2), 4.16-4.19 (2H, q, *J*=6.74 Hz, C_2H_5N), 6.78-6.80, 6.95-6.97, 7.15, 7.20-7.21, 7.26-7.29, 7.40-7.43, 7.46-7.48, 8.44-8.46 (13H,

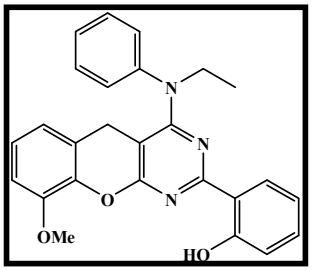
8m, H-Ar) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ_C 13.40 (CH_3 of C_2H_5N), 26.00 (CH_2), 49.27 (CH_2 of C_2H_5N), 97.29, 117.21, 120.31, 124.30, 126.19, 126.64, 128.20, 128.91, 129.10, 129.88, 129.97, 136.50, 136.93, 145.31, 150.75, 160.96, 163.35, 165.60 (Ar, imine carbons); MS: m/z: 413, 415 (M^+, M^++2), 398, 400 (M^+, M^++2 - CH_3), 384, 386 (M^+, M^++2-C_2H_5) 336, 338 (M^+, M^++2-Ar), 120 $(C_8H_{10}N)^+$, 91, 77; Anal. Calcd for $C_{25}H_{20}ClN_3O$: C, 72.55; H, 4.87; N, 10.15; Found: C, 72.57; H, 4.90; N, 10.17.

_N_-Ethyl-9-methoxy-_N_, 2-diphenyl-5_H_-chromeno [2, 3-_d_] pyrimidin-4-amine (7{1, 4, 2})



Colorless crystals; mp 139 ^oC; IR (KBr): ν_{max}; 2923, 1572, 1533, 1156, 1095 cm^{-1}; ^1H NMR ($CDCl_3$, 500 MHz): δ_H 1.39 (3H, t, C_2H_5N), 3.10 (2H, s, CH_2), 3.93 (3H, s, CH_3O), 4.19-4.22 (2H, q, J=6.94 Hz, C_2H_5N), 6.38-6.40, 6.75-6.77, 6.89-6.92, 7.20-7.22, 7.24-7.27, 7.39-7.42, 7.50-7.53, 8.57-8.59 (13H, 8m, H-Ar) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ_C 13.48 (CH_3 of C_2H_5N), 26.12 (CH_2), 49.15 (CH_2 of C_2H_5N), 56.33 (CH_3 of CH_3O), 97.20, 110.41, 120.40, 121.40, 123.86, 125.86, 126.41, 128.59, 128.73, 129.90, 130.74, 138.07, 140.53, 145.65, 148.43, 161.99, 163.38, 165.60 (Ar, imine carbons); MS: m/z: 409 (M^+), 394 (M^+-CH_3), 380 (M^+-C_3H_5), 365 (M^+-C_3H_5, CH_3), 332 (M^+-Ar), 91, 77; Anal. Calcd for $C_{26}H_{23}N_3O_2$: C, 76.26; H, 5.66; N, 10.26; Found: C, 76.25; H, 5.64; N, 10.29.

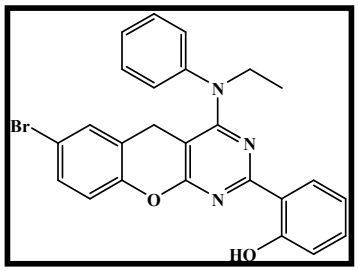
2-(4-(_N_-Ethyl-_N_-phenylamino)-9-methoxy-5_H_-chromeno [2, 3-_d_] pyrimidin-2-yl) phenol (7{2, 4, 2})



Colorless crystals; mp 206 ^oC; IR (KBr): ν_{max}; 2936, 1569, 1543, 1150, 1113 cm^{-1}; ^1H NMR ($CDCl_3$, 500 MHz): δ_H 1.37 (3H, t, C_2H_5N), 3.04 (2H, s, CH_2), 3.92 (3H, s, CH_3O), 4.12-4.15 (2H, q, J=6.64 Hz, C_2H_5N), 6.34-6.36, 6.75-6.77, 6.89-6.92, 6.96-6.98, 7.03-7.05, 7.22-7.24, 7.29-7.32, 7.38-7.40, 7.42-7.45, 8.54-8.55 (12H, 10m, H-Ar), 13.31 (1H, br s, OH) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ_C 13.14 (CH_3 of C_2H_5N), 25.99 (CH_2), 49.32 (CH_2 of C_2H_5N), 59.41 (CH_3 of CH_3O), 96.41, 110.67, 117.96, 119.15, 119.29, 120.41, 120.99, 124.22, 126.69, 126.95, 129.94, 130.07, 133.09, 140.05, 144.79, 148.32, 160.88, 161.99, 162.42 (Ar, imine carbons) ; MS: m/z: 425 (M^+), 410 (M^+-CH_3), 396 (M^+-C_3H_5), 381 (M^+-C_3H_5, CH_3) 348 (M^+-Ar), 91,

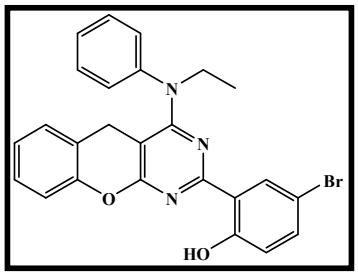
77; Anal. Calcd for $C_{26}H_{23}N_3O_3$: C, 79.13; H, 5.58; N, 11.07; Found: C, 79.13; H, 5.60; N, 11.06.

2-(4-(*N*-Ethyl-*N*-phenylamino)-7-bromo-5*H*-chromeno [2, 3-*d*] pyrimidin-2-yl) phenol (7{2, 3, 2})



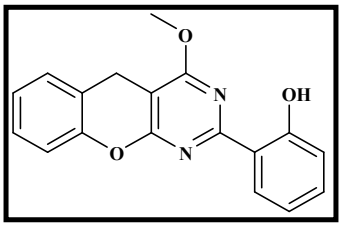
Colorless crystals; mp 245 ^{o}C; IR (KBr): ν_{max}; 3672, 2914, 1599, 1571, 1152, 1111, 856, 753 cm^{-1}; ^{1}H NMR ($CDCl_3$, 500 MHz): δ_H 1.37 (3H, t, C_2H_5N), 3.00 (2H, s, CH_2), 4.12-4.14 (2H, q, *J*=7.02 Hz, C_2H_5N), 6.91-6.92, 6.96-7.00, 7.03-7.05, 7.22-7.23, 7.27-7.29, 7.33-7.36, 7.39-7.43, 7.44-7.47, 8.45-8.47 (14H, 9m, H-Ar), 13.21 (1H, brs, OH) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ_C 13.08 (CH_3 of C_2H_5N), 26.00 (CH_2), 49.47 (CH_2 of C_2H_5N), 96.57, 116.87, 118.06, 118.88, 119.01, 119.24, 122.56, 126.92, 127.03, 129.94, 130.18, 131.12, 131.66, 135.72, 144.68, 150.76, 160.84, 162.47, 164.10 (Ar, imine carbons); MS: m/z: 473, 475 (M^+,M^++2), 458, 460 (M^+,M^++2 -CH_3), 444, 446 (M^+,M^++2-C_2H_5) 353, 355 (M^+,M^++2- $C_8H_{10}N$), 120 $(C_8H_{10}N)^+$, 91, 77; Anal. Calcd for $C_{25}H_{20}BrN_3O_2$: C, 63.30; H, 4.25; N, 8.86; Found: C, 63.32; H, 4.23; N, 8.90.

2-(4-(*N*-Ethyl-*N*-phenylamino)-5*H*-chromeno [2, 3-*d*] pyrimidin-2-yl)-4-bromo phenol (7{7, 1, 2})



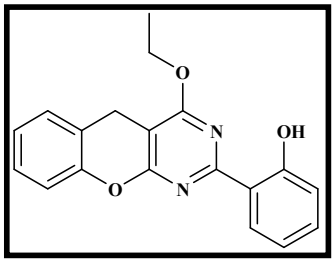
Colorless crystals; mp 199 ^{o}C; IR (KBr): ν_{max}; 2935, 1574, 1531, 1157, 1109, 814, 743 cm^{-1}; ^{1}H NMR ($CDCl_3$, 500 MHz): δ_H 1.38 (3H, t, C_2H_5N), 3.04 (2H, s, CH_2), 4.11-4.14 (2H, q, *J*=6.97 Hz, C_2H_5N), 6.77-6.78, 6.91-6.93, 6.97-7.00, 7.11-7.12, 7.17-7.20, 7.23-7.25, 7.32-7.35, 7.44-7.47, 8.58-8.59 (12H, 9m, H-Ar), 13.35 (1H, br s, OH) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ_C 13.09 (CH_3 of C_2H_5N), 25.91 (CH_2), 49.45 (CH_2 of C_2H_5N), 96.89, 111.22, 117.11, 119.83, 119.96, 120.78, 124.62, 126.99, 127.10, 128.34, 129.08, 130.12, 131.80, 135.71, 144.50, 150.25, 159.92, 161.19, 161.91 (Ar, imine carbons) ; MS: m/z: 473, 475 (M^+, M^++2), 458, 460 (M^+, M^++2 -CH_3), 444, 446 (M^+, M^++2-C_2H_5), 353, 355 (M^+, M^++2- $C_8H_{10}N$), 120 $(C_8H_{10}N)^+$, 91, 77; Anal. Calcd for $C_{25}H_{20}BrN_3O$: C, 63.30; H, 4.25; N, 8.86; Found: C, 63.29; H, 4.27; N, 8.88.

2-(4-Methoxy-5*H*-chromeno [2, 3-*d*] pyrimidin-2-yl) phenol (8{2, 1, 1})



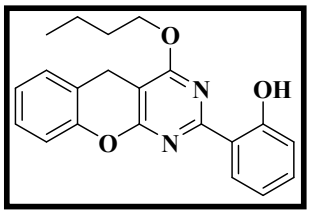
Colorless crystals; mp 200 °C; IR (KBr): ν; 2989, 1600, 1541, 1187, 1155, 1074, 1028.^{1}H NMR ($CDCl_3$, 500 MHz): δ_H 3.03 (2H, s, CH_2) 4.15(3H, s, CH_3O), 6.94, 7.00-7.01, 7.11-7.14, 7.14, 7.16, 7.20-7.25, 7.37, 8.41 (8H, 4m, Ar), 12.78(1H, br s) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δC 21.29 (CH_2), 54.26 (CH_3 of CH_3O), 94.41, 116.84, 117.31, 117.88, 118.43, 124.16, 127.76, 128.70, 128.75, 132.62, 136.82, 149.81, 159.78, 161.70, 167.13, (Ar, imine carbons); MS: m/z: 306 (M^+), 291(M^+- CH_3), 277 (M^+- CH_3O). ; Anal. Calcd for $C_{18}H_{14}N_2O_3$: C, 70.58; H, 4.61; N, 9.15; Found: C, 70.64; H, 4.69; N, 9.20.

2-(4-Ethoxy-5*H*-chromeno [2, 3-*d*] pyrimidin-2-yl) phenol (8{2, 1, 2})



Colorless crystals; mp 180 °C; IR (KBr): ν; 2924, 1591, 1555, 1182, 1141, 1092 cm-1. ^{1}H NMR ($CDCl_3$, 500 MHz): δ_H 1.52 (3H, t, *J* =7.00 Hz, CH_3), 3.94(2H, s, CH_2), 4.56-4.60 (2H, q, *J* =7.00 Hz, CH_2 of Et), 6.92-6.95, 7.00-7.02, 7.11-7.14, 7.16- 7. 17, 7.21-7.24, 7.21 -7.24, 7.26-7.27, 7.33-7.39, 8.41-8.42 (8H, 8 m, Ar), 12.82(1H, br s) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ_C 9.75 (CH_3 of C_2H_5O), 21.35 (CH_2),63.19 (CH_2 of C_2H_5O), 94.38 , 116.85, 117.30, 117.97, 118.42, 118.62, 122.29, 124.14, 127.75, 128.70, 128.73, 132.57, 159.77, 161.69, 166.70, (Ar, imine carbons); MS: m/z: 320 (M^+), 305 (M^+-CH_3), 291(M^+-C_2H_5), 275(M^+-C_2H_5O). Anal. Calcd for $C_{19}H_{16}N_2O_3$: C, 71.24; H, 5.03; N, 8.74; Found: C, 71.22; H, 5.06; N, 8.79.

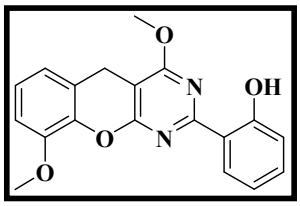
2-(4-Butoxy-5*H*-chromeno [2, 3-*d*] pyrimidin-2-yl) phenol (8{2, 1, 4})



Colorless crystals; mp145 °C; IR (KBr): ν; 2935, 1574, 1531, 1157, 1031. ^{1}H NMR (CDC l_3, 500 MHz): δ_H 1.04 (3H, t, *J*=7.10Hz, CH_3), 1.54-1.56 (2H, m, C_4H_9O), 1.86-1.87 (2H, m, C_4H_9O), 3.91(2H, s ,CH_2), 4.49-4.51 (2H, t, *J*=6.4 Hz C_4H_9O), 6.93-6.94, 6.99-7.01, 7.11-7.16, 7.20- 7. 24, 7.37, 8.39-8.41(8H,

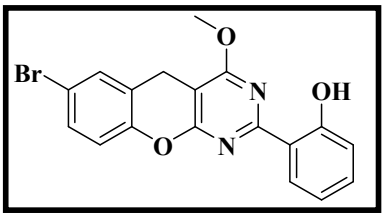
6m, Ar), 12.82 (1H, br s,) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ_C 13.37(CH_3), 18.74, 21.31, 30.33, 67.09, 94.38,116 .33, 117.27, 117.96, 118.41, 118.57, 124.11, 127.72, 128.70, 128.73, 132.54, 149.83, 159.77, 161.65, 166.87 (Ar, imine carbons); MS: m/z: 348 (M^+), 291(M^+ -C_4H_9), 275 (M^+-C_4H_9O). Anal. Calcd for $C_{21}H_{20}N_2O_3$: C, 72.40; H, 5.79; N, 8.04; Found: C, 72.46; H, 5.72; N, 8.09.

2-(4- Methoxy-9- methoxy -5*H*-chromeno [2, 3-*d*] pyrimidin-2-yl) phenol (8{2, 4, 1})



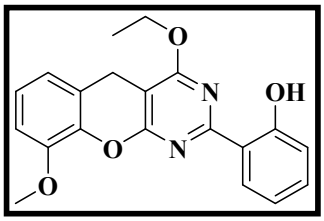
Colorless crystals; mp 205 °C; IR (KBr): ν; 2912, 1569, 1528, 1116, 1025, ^1H NMR($CDCl_3$, 500 MHz): δ_H 3.91 (3H, s, CH_3O), 3.93(3H, s, CH_3O), 4.13 (2H, s ,CH_2) , 6.78, 6.82- 6.83, 6.93, 7.02-7.04, 7.27, 7.37, 8.45-8.46 (8H, 3m, Ar), 12.76(1H, br s) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ_C 21.38(CH_2) 54.23, 55.52 (2CH_3 of CH_3O), 94.25, 110.07, 117.26, 117.96, 118.34, 119.46, 120.02, 123.85, 128.91, 132.53, 139.45, 147.75, 159.77, 161.66, 167.15 (Ar, imine carbons); MS: m/z: 336 (M^+), 321 (M^+- CH_3), 305 (M^+-CH_3O). Anal. Calcd for $C_{19}H_{16}N_2O_4$: C, 67.85; H, 4.79; N, 8.33; Found: C, 67.81; H, 4.76; N, 8.38.

2-(7- Bromo -4- methoxy -5*H*-chromeno [2, 3-*d*] pyrimidin-2- yl) phenol (8{2, 3, 1})



Colorless crystals; mp 245 °C; IR (KBr): ν; 2912, 1569, 1528, 1116, 1025, ^1H NMR ($CDCl_3$, 500 MHz): δ_H 3.92(2 , s CH_2), 4.16 (3H, s, CH_3O) , 6.93-6.96, 7.01-7.03, 7.05-7.06, 7.05-7.06, 7.367.37-7.38, 7.39-7.41, 8.41-8.43 (7H, 6m, Ar), 12.70 (1H, br s) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ_C 21.70(CH_3 of CH_3O), 54.86 (CH_2), 94.25, 117.07, 117.87, 118.28, 119.00, 119.09, 121.22, 129.24, 131.32, 131.91, 133.29, 133.69, 149.46, 160.31, 161.70, 167.13 (Ar, imine carbons); MS: m/z: 385 (M^+). Anal. Calcd for $C_{18}H_{13}BrN_2O_3$: C, 56.12; H, 3.40; N, 7.27; Found: C, 56.18; H, 3.37; N, 7.31.

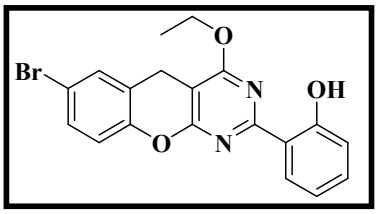
2-(4- Ethoxy -9- methoxy -5*H*-chromeno [2, 3-*d*] pyrimidin-2- yl) phenol (8{2, 4, 2})



Colorless crystals; mp 200°C; ^1H NMR ($CDCl_3$, 500 MHz): δ_H 1.52(3H, t, *J*=7.1 Hz, C_2H_5O), 3.94(2H, s, CH_2), 3.95 (3H, s, CH_3O), 4.56-4.61 (2H, q, *J*=7.1 Hz, C_2H_5O), 6.79-6.81, 6.84-

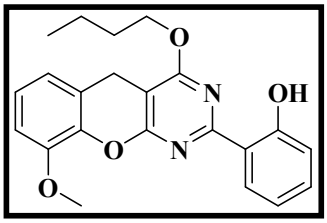
6.85, 6.92-6.95, 7.00-7.02, 7.04-7.07, 7.36-7. 39, 8.45-8.47 (7H, 7m, Ar), 12.80(1H, br s) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ_C 14.46, 21.93, 56.03, 63.64, 94.70, 110.59, 117.74, 118.54, 118.82, 120.08, 120.51, 124.32, 129.40, 132.96, 140.02, 148.27, 159.77, 161.70, 166.81 (Ar,imine carbons) ; MS: m/z: 350 (M^+), 335 (M^+-CH_3), 321 (M^+-C_2H_5), 305,296,91. Anal. Calcd for $C_{20}H_{18}N_2O_4$: C, 68.56; H, 5.18; N, 8.00; Found: C, 68.60; H, 5.12; N, 8.05.

2-(7- Bromo -4- ethoxy -5*H*-chromeno [2, 3-*d*] pyrimidin-2- yl) phenol (8{2, 3, 2})



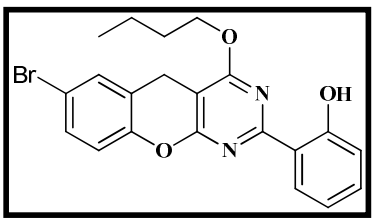
Colorless crystals; mp 220 °C; ^{1}H NMR ($CDCl_3$, 500 MHz): δ_H 1.52 (3H, t, *J* =6.35 Hz,CH_3), 3.90 (2 H, s ,CH_2), 4.56-4.60 (2H, q, *J* =7.01 Hz, C_2H_5O) , 6.92-6.95, 7.00-7.01, 7.03-7.05, 7.27-7.28, 7.35-7.36,7.38-7.40, 8.38-8.40 (7H,7 m, Ar), 12.70 (1H, brs,) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ_C 14.43(CH_3 of C_2H_5O), 21.72 (CH_2), 63.39 (CH_2 of C_2H_5O), 94.19, 117.00, 117.83, 118.31, 118.97, 119.05, 119.35, 121.31, 126.48, 129.20, 131.25, 131.88, 133.20, 149.47, 160.28, 162.39, 167.32 (Ar, imine carbons); MS: m/z: 399 (M^+). Anal. Calcd for $C_{19}H_{15}BrN_2O_3$: C, 57.16; H, 3.79; N, 7.02; Found: C, 57.20; H, 3.76; N, 7.08.

2-(4- Butoxy -9- methoxy -5*H*-chromeno [2, 3-*d*] pyrimidin-2- yl) phenol (8{2, 4, 4})



Colorless crystals; mp 156°C; ^{1}H NMR ($CDCl_3$, 500 MHz): δ_H 1.04 (3H, t, *J*=7.35 Hz, C $_4H_9O$), 1.55-1.58(2H, m, C_4H_9O), 1.86-1.88(2H, m, C_4H_9O), 3.94(2H, s, CH_2), 3.95 (3H,s, CH_3O), 4.52-4.54 (2H, t, *J*=6.45 Hz, C_4H_9O), 6.80-6.81, 6.84-6.86, 6.92-6.95, 7.00-7.02, 7.05-7.08, 7.36-7.39, 8.46-8.47 (7H, 6m, Ar), 12.80(1H, br s) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ_C 13.84 (CH_3 of C_4H_9O), 19.22, 21.91, 30.83, 56.04, 67.55, 94.72, 110.58,117 .73, 118.55, 118.84, 120.05, 120.52, 124.32, 129.41, 132.98, 140.02, 148.27, 160.25, 162.16, 163.08, (Ar,imine carbons); MS: m/z: 378 (M^+), Anal. Calcd for $C_{22}H_{22}N_2O_4$: C, 69.83; H, 5.86; N, 7.40; Found: C, 69.86; H, 5.84; N, 7.45.

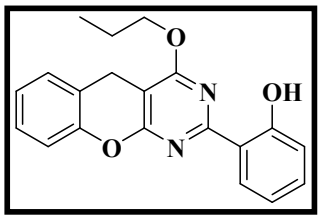
2-(7- Bromo -4- butoxy -5*H*-chromeno [2, 3-*d*] pyrimidin-2- yl) phenol (8{2, 3, 4})



Colorless crystals; mp 220 °C; ^{1}H NMR ($CDCl_3$, 500 MHz): δ_H 1.04 (3H, t, *J*=7.40 Hz, C_4H_9O), 1.51-1.57(2H, m,

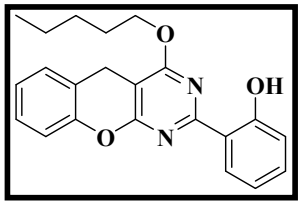
C_4H_9O), 1.83-1.89 (2H, m, C_4H_9O), 3.90 (2H, s, CH_2), 4.50-4.53(2H, t, *J*=6.5 Hz, C_4H_9O), 6.92-6.95, 7.00-7.01, 7.03-7.05, 7.27, 7.35-7.36, 7.38-7.39, 8.38-8.40(7H, 7 m, Ar), 12.70 (1H, br s) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ_C 13.83(CH_3), 19.21, 21.71, 30.78, 67.72, 94.20, 116 .99, 117.82, 118.32, 118.97, 119.06, 121.28, 129.20, 131.26, 131.90, 133.20, 149.48, 160.28, 162.40, 162.84 (Ar, imine carbons); MS: m/z: 426 (M^+). Anal. Calcd for $C_{21}H_{19}BrN_2O_3$: C, 59.03; H, 4.48; N, 6.56; Found: C, 59.07; H, 4.46; N, 6.60.

2-(4-Propoxy-5*H*-chromeno [2, 3-*d*] pyrimidin-2-yl) phenol (8{2, 1, 3})



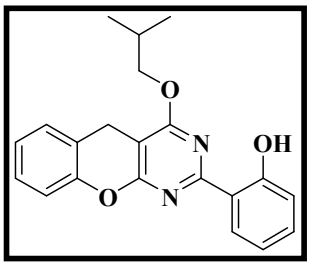
Colorless crystals; mp 150 °C; ^1H NMR ($CDCl_3$, 500 MHz): δ_H 1.01(3H, t, *J* =7.40 Hz, CH_3), 1.89-1.93(2H, m), 3.94(2H, s, CH_2), 4.46-4.49 (2H, q, *J* =6.50 Hz, C_3H_7O), 6.93-6.96, 7.00-7.02, 7.11-7.14, 7.16- 7. 18, 7.22-7.23, 7.26-7.27, 7.36-7.39, 8.41-8.42 (8H, 8 m, Ar), 12.83 (1H, br s) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ_C 10.47(CH_3 of C_3H_7O), 21.80, 22.17, 69.26, 94.89, 117.34, 177.77, 118.46, 118.91, 119.07, 124.61, 128.23, 129.21, 133.04, 150.35, 160.25, 162.18, 163.22, (Ar,imine carbons); MS: m/z: 334 (M^+). Anal. Calcd for $C_{20}H_{18}N_2O_3$: C, 71.84; H, 5.43; N, 8.38; Found: C, 71.86; H, 5.49; N, 8.43.

2-(4-Pentyloxy-5*H*-chromeno [2, 3-*d*] pyrimidin-2-yl) phenol (8{2, 1, 5})



Colorless crystals; mp 115 °C; ^1H NMR ($CDCl_3$, 500 MHz): δ_H 1.03(3H, t, *J* =6.8 Hz, CH_3), 1.22-1.25(2 H, m, $C_5H_{11}O$), 1.73-1.77(2H, m, $C_5H_{11}O$), 3.82 (2H, s, CH_2), 4.46-4.49 (2H, t, *J* =6.8 Hz, $C_5H_{11}O$) , 6.88-6.91, 6.97-6.99, 7.05-7.07, 7.08- 7.10, 7.15-7.17, 7.19- 7.22, 7.34-7.36, 8.34-8.36 (8H, 8 m, Ar), 12.78(1H, br s) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ_C 16.51, 21.75, 22.64, 25.21, 26.14, 66.33, 94.80, 117.24, 117.73, 118.41, 118.83, 119.02, 124.53, 128.13, 129.15, 129.20, 132.94, 150.25, 160.28, 162.06, 162.96 (Ar, imine carbons); MS: m/z: 362 (M^+). Anal. Calcd for $C_{22}H_{22}N_2O_3$: C, 72.91; H, 6.12; N, 7.73; Found: C, 72.94; H, 6.08; N, 7.76.

2-(4- *iso*-Butoxy-5*H*-chromeno [2, 3-*d*] pyrimidin-2-yl) phenol (8{2, 1, 6})

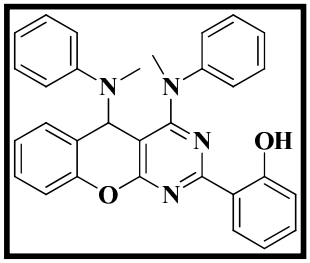


Colorless crystals; mp 158 °C; ^1H NMR ($CDCl_3$, 500 MHz): δ_H 1.1(6H, d, *J*=6.65 Hz, $2CH_3$), 2.20 -2.23(1H, m), 3.95(2H, s, CH_2),

4.28-4.30(2H, d, *J*=6.55 Hz, C_4H_9O), 6.93-6.96, 7.01-7.02, 7.11-7.14, 7.16-7.18, 7.23-7.26, 7.37-7.40, 8.41-8.43(8H, 8m, Ar), 12.83

(1H, br s) ppm. ^{13}C NMR ($CDCl_3$, 125 MHz): δ_C 19.20, 21.80, 27.97, 73.74, 94.90, 117.37, 177.77, 118.47, 118.94, 119.05, 124.63, 128.27, 129.22, 129.25, 133.07, 150.38, 160.26, 162.21, 163.23 (Ar, imine carbons); MS: m/z: 348 (M^+). Anal. Calcd for $C_{21}H_{20}N_2O_3$: C, 72.40; H, 5.79; N, 8.04; Found: C, 72.38; H, 5.76; N, 8.09.

2-(4, 5-Bis(*N*-methyl-*N*-phenylamino)-5*H*-chromeno[2,3-*d*]pyrimidin-2-yl)phenol (9)



Colorless crystals; mp 132 ^oC; IR (KBr): ν_{max}; 2926, 1609, 1585, 1171, 1099 cm^{-1}; ^1H NMR ($CDCl_3$, 500 MHz): δ_H 2.78, 3.51 (6H, 2s, CH_3N), 4.12 (1H, s, CH), 6.43-6.45, 6.67-6.68, 6.76-6.77, 6.97-7.00, 7.04-7.07, 7.18-7.21, 7.24-7.33, 7.43-7.48, 8.54-8.56 (18H, 10m, H-Ar), 13.36(1H, br s) ppm. ^{13}C NMR($CDCl_3$, 125 MHz): δ_C 31.10 (CH), 39.97, 42.38(2CH_3 of CH_3N), 101.50, 112.89, 117.38, 118.11, 119.07, 119.37, 124.77, 125.03, 125.49, 126.35, 128.17, 128.20, 128.95, 129.71, 130.31, 133.41, 133.73, 146.70, 148.55, 149.67, 159.15, 160.96, 162.76 (Ar, imine carbons); MS: m/z: 486(M^+), 469 (M^+- CH_3), 380 (M^+-NCH_3Ph), 376 (M^+-PhOH, CH_3), 376 (M^+-$C_{13}H_{14}NO$), 105, 91, 77. Anal. Calcd for $C_{31}H_{26}N_4O_2$: C, 76.52; H, 5.39; N, 11.51; Found: C, 76.54; H, 5.41; N, 11.57.