Research Paper Science

Syntheses and Mass Spectra Investigation of Coumarino – [4,3-d] – Pyrimidine Derivatives

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ABSTRACT

Potassium salt of 2 mercapto – 4 – hydroxy – 5H [1] – benzopyrano – [4,3-d] – pyrimidin – 5 –one (2) was prepared by reaction of I with thiourea in presence of anhydrous potassium carbonate. Treatment of 2 with substituted phenacyel bromides , hydrazine hydrate and ammonia yielded the corresponding 2-(substituted) thio – 4 hydroxy –benzopyrano –pyrimidines (3a,b), 2-hydrazino- 4- hydroxyl- 5H-[1]- benzopyrano- [4,3-d]- pyrimidin- 5-one (4) and 2- amino-4-hydroxy- 5H-[1]-benzopyrano-[4,3-d]pyrimidin- 5-one (6), respectively.

Acetylation of 6 with acetic anhydride gave the corresponding n- acetyl derivative (7). 2-(substituted) amino – 4 – hydroxy -5H – [1] – benzopyrano – [4,3-d] – pyrimidin-5-one (8) was prepared via the reaction of 6 with substituted phenacyle bromides . The electron impact mass spectra of both the above compounds have also been recorded and their fragmentation pattern is discussed.

Keywords :

Introduction

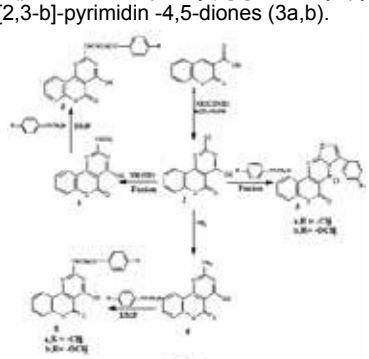
In the courses of recent investigation (1-6) involving 3-ethoxy carbonyl coumarin and thiourea in presence of anhydrous potassium carbonate , it was found that potassium salt of 2-mercapro -4- hydroxy-5H-[1] benzopyrano-[4,3-d] – pyrimidin-5-one (2) is converted into 2-hydrazino – (or 2 –amino -) – 4-hydroxy -5H-[1]–benzopyrano –[4,3-d]pyrimidin-5-ones (4 and 6) by the action of hydrazine hydrate and ammonia under fusion. The fact that only limited information is available on the mass spectra of 2- substituted- 4- hydroxyl- 5H-[1]benzopyrano-[4,3-d]-pyrimidin-5-ones (4 and 6), along with the preparation of fused coumarino –[4,3-d] –pyrimidin -5-ones .has prompted us to report their synthsies and study their electron impact (EI) mass spectral fragmentation .

Results and discussion

Chemistry

The potassium salt of 2-mercapto -4-hydroxy- 5H-[1]- benzyopyrano –[4,3-d] – pyrimidin -5-one (2) was prepared from the reaction of 3- carboethoxy coumarin (1) with thiourea in the presence of anhydrous potassium carbonate in methanol under reflax.

Heating the potassium salt of 2-mercapto -4-hydroxy -5H-[1]-benzopyrano –[4,3-d] –pyrimidin -5-one (2) with alkyl halides (such as 4-methylphenacyl bromide and 4-methoxyphenacyle bromide) under fusion conditions gave the corresponding 3-(p-substituted phenyl)-[1] – benzyopyrano[4,3-d] – thiazolo[[2,3-b]-pyrimidin -4,5-diones (3a,b).



Hydrozinolysis of potassium salt of compound 2 with hydrazine hydrate by fusion at 13oC, gave the corresponding 2-hydrazino -4-hydroxy-5H-[1] – benzopyrano-[4,3-d]-pyrimidin -5-one (4) .

Treatment of compound 4 with alkyl halides (namely 4-methyl phenacyle bromide and 4-methoxyphenacyle bromide) in dimethyl formamide under reflax yielded the corresponding 2- alkyl hydrazine- 4- hydroxyl -5H-[1] – benzopyrano –[4,3-d]- pyrimidin-5-ones (5a,b).

Amonolysis of potassium salt of 2-mercapto-4- hydroxyl -5H – [1]- benzopyrano - [4,3-d] – pyrimidin -5-one (2) with ammonia from ammonium acetate and/or formamide under fusion afforded the corresponding 2-amino -4-hydroxy – 5H –[1] –benzopyrano –[4,3-d] – pyrimidin -5-one (6, scheme I) Acetylation 7 of compound 6 with acetic anhydride under reflux yielded the corresponding 2- acetylamino- 4-hydroxy -5H –[1] –benzopyrano – [4,3-d] – pyrimidin – 5 – one (7) The reaction of 2 amino – 4-hydroxy -5H –[1] – benzopyrano –[4,3-d] – pyrimidin – 5-one (6) with alkyl halides (such as 4- methylphenacyle bromide and 4 – methoxyphenacyle bromide) in dimethyl formamide under reflux produced 2- (substituted) amino – 4- hydroxyl -5H-[1]]-benzopyrano –[4,3-d] – pyrimidin – 5- ones (8 a , b ; scheme 1).

Mass spectrometry

The mass spectral decomposition modes of 8, 9 of some fused coumarino – [4, 3-d] – pyrimidin derivatives contaning different substituents in position two have been investigated and fragmentation pathways have been suggested.

Compounds 5a, b

The mass spectra of compounds 5a.b figure (1, 2) are fully consistent with the assigned structures.

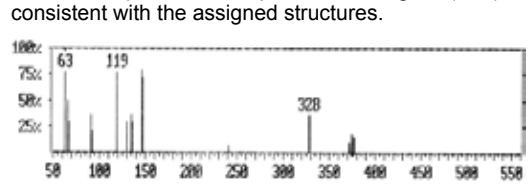


Fig. 1

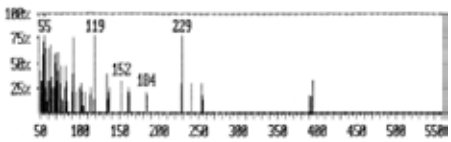
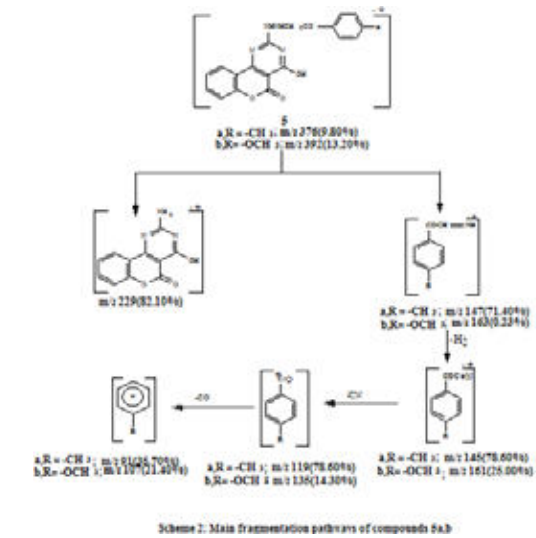


Fig. 2



Thus, compounds 5a, b showed intense molecular ion peaks at m/z 376 and 392, consistent with the molecular formula C20H16N4O4 and C20H16N4O5, respectively.

The molecular ion of compounds 5a and 5b (scheme 2) underwent fragmentations to produce peaks at m/z 147 and m/z 163. It further underwent loss of H2, CN and CO to give peaks at m/z 145, 161, m/z 119, 135 and m/z 91, 107 respectively. Base peaks at m/z 63 and 55, found in the MS of compounds 5a and 56. The molecular ions of compounds 5a and 56 were also found to undergo fragmentations to produce the ion of 2-amino -4- hydroxy-5H- [1] benzopyrano –[4,3-d] pyrimidin -5H- [1] benzopyrano – [4,3-d] – pyrimidin – 5 – one at m/z 229.

Compounds 6 and 7

The mass spectrum of compounds 6 and 7 showed an intense molecular ion peaks at m/z 229 and m/z 271, corresponding to the molecular formula C11H7N3O4 and C13H9N3O4, respectively. The molecular ion of compound 6 (figure 3) underwent fragmentation to produce a peak at m/z 214 by losing NH group. The loss of cyano group (CN) from the ion at m/z 214 resulted in an ion at m/z 188. The ion at m/z 188 underwent loss of CO and NH2 to give peaks at m/z 160 and 144, respectively.

Also, the molecular ion at m/z 229 underwent loss of amino group (NH2) to give peak at m/z 213, which further broke to give an ion at m/z 187.

The ion of m/z 187 broke to give an ion at m/z 173 which lost nitrogen atom. Ion of m/z 173 fragmented to give ion of m/z 145 which lost carbonyl group (CO).

The molecular ion of compound 7 (m/z 271, figure 4) had fragmented to give the stable fragmented ion of m/z 229, corresponding to the molecular ion of compound 6 by losing CH2=C= O ketene molecule. The stable fragmentation of m/z 229 was broken via pathway in the same fragmented processes which was observed for compound 6 (scheme 3).

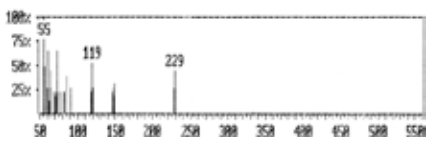


Fig. 3

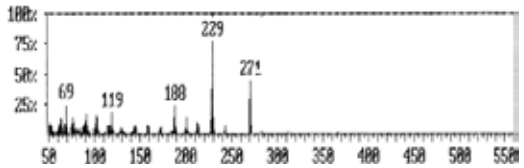
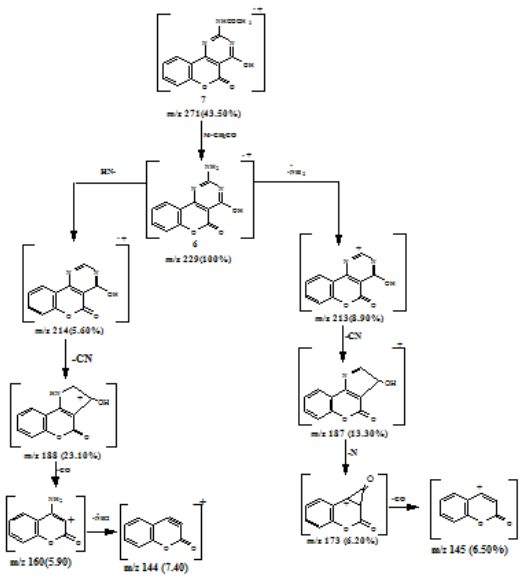


Fig. 4



Scheme 3: Main fragmentation pathway of compounds 6 and 7.

Compounds 8a and 8b

The molecular ion peaks of compounds 8a and 8b (figure 5 and 6) were observed at m/z 361 and m/z 377, corresponding to the molecular formula C20H1N3O4 and C_{2O} $H_1$5N_3O_5, respectively.

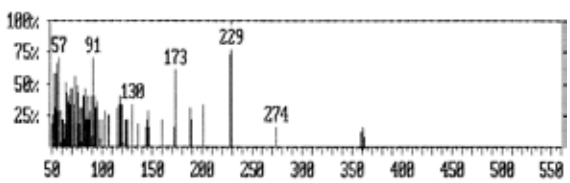


Fig. 5

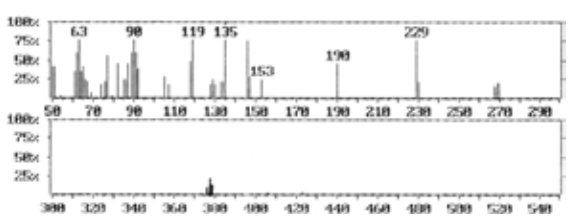


Fig. 6

The molecular ion of compounds 8a and 8b underwent fragmentations to produce stable peaks at m/z 229, corresponding to the molecular ion of compound 6. The fragmentation of m/z 229 which has further broken via pathway similar to compound 6.

Also, the molecular ion peaks at m/z 361 and m/z 377 underwent loss of 4-amino -4-hydroxy -5H-[1]- benzopyrano-[4,3-d] – pyrimidin – 5-one to give peaks at m/z 119 and m/z 135 . It further underwent loss of carbone monoxide (CO) to give peaks at m/z 91 and m12 107. The electron impact ionization of compound 8a it was found

that the base peak at m/z 229 , while the base peak of compound 8b m/z 135 .

Experimental

NMR Spectra Were recorded on a general electric QE300 instrument and chemical shifts were given with respect to TMS. IR spectra were recorded on a perkin- Elmer 1420 spectrometer and a biorld FTS7 (KBr). Mass spectra were recorded on a V G Autspec (EI and FAB+) and Hewlett Packed Ms-Engin Theromspray and ionization by electron impact at 70 eV. The accelerating voltage was 6 KV , the temperature of the ion source was ~ 200oC and the emission current was ~ 100 mA. Microanalyses were conducted using an elemental analyzer 1106. Melting points were determined on a Reichert Hot stage and were uncorrected Potassium salt of 2-mercapto – 4- hydroxyl-5H-[1]-benzopyano-[4,3-d]-pyrimidin -5-one (2) A mixture of 1 (0.01mol) , thiourea (0.01mol) , and anhydrous potassium carbonate (0.03 mol) in methanol (50 ml) was heated under reflux with stirring for 2hr. The solid formed upon hot was filtered off and dried to give 2 as pale yellow powder, yield 63%.

3-(p-substituted phemyle) , benzopyrano-[4,3-d] – thiazolo – [2,3-b] – pyrimidin- 4,5-diones (3a,b) A mixture of 2 (0.01 mol) and alkyl halides (namely . 4-methylphenacyl bromide and 4-methoxy phenacyl bromide) (0.01 mol) was fused in an oil bath at 130oC for 2 H and then was cooled and poured into water . The solid obtained was filtered off , washed with water , dried and purified by recrystallization (ethanol) to give 3.

3-(p_methylphenyle) –[1]- benzopyrano-[4,3-d] – thiazolo-[2,3-d] pyrimidin -4,5- dione (3a) as orange crystals , yield 67 % , m.p. 95oC IR (KBr) : 1743 , 1695 (C=O),1625 (C=N) , 1605,1585 (C=C) , 1110, 1072 (C-O) cm-1. δH (DMSO-d6) : 2.35 (S, 3H,CH3) , 7.13-8.12 (m,9H, Ar-H and thiazol-H) ppm. MS: m/z (%) = 362 (M++2, 3.60), 348(3.10) , 345(8.70) , 344(8.20), 343 (7.20), 336(3.10), 335(4.10), 333(3.60), 331(4.10) , 322(4.10) , 320(3.60) , 309(4.60) , 305(6.70) , 304(6.70) , 293(5.10) , 292 (4.10) , 277(7.20) , 276(3.60) , 275(4.10) , 261(5.60) , 250(6.70) , 249(4.60) , 241(3.60) , 234(5.60) , 233(6.70) , 229(4.10) , 222(6.20) , 221(8.20) , 217(6.20) , 216(5.60) 204(5.60) , 203(7.70) , 202(5.60) , 192(3.10) , 190(15.90) , 189(6.20) , 188(6.70) , 178(5.10) , 175(6.70) , 174(6.70) , 166(3.60) , 163(5.10) , 161(4.60) , 160(6.70) , 159(7.70) , 148(9.70) , 147(18.50) , 140(3.60) , 139(7.20) , 138(3.60) , 135(3.60) , 134(11.80) , 133(6.70) , 120(6.20) , 119(100) , 118(23.60) 117(8.70) 115(8.20) 114(8.70) , 103(6.70) , 102(5.60) , 96(7.70) , 91(46.70) , 79(4.60) , 77(4.60) 76(10.30) , 65(21.00) , 64(16.40) , 63(5.10).

Anal. C2oH12N2O3S for calcd : C , 66.66 ; H,3.33; N, 7.77; N,8.88. Found : C,66.36 ; H, 3.13 ; N,7.47 ; S,8.44.

3-(p-methoxyphenyl) – [1] –benzopyrano [4,3-d] – thiazolo-[2,3-b] – pyrimidin-4,5-dione(36) as yellow crystals, yield 63% , m.p. 98OC . IR (KBr) : 1742 , 1689 (C=O) , 1623(C=N), 16.5, 1589 (C=C) , 1120 , 1083 , 1030 (C-O) cm -1 . δH (DMSO-d6) : 3.83 (S,3H,OCH3) , 7.12-8.12 (m,9H, ArH and thiazole –H) ppm. Ms : m/z (%) = 377 (m++1,1.30) , 376(M+,2.30) , 361(33.30) , 344(27-80) , 343(38.90) , 293(27.80) , 206(33.30) , 190(50.00) , 148(33.30) , 147(5.60) , 146(38.90) , 145(33.30) , 137(22.20) , 136(50.00) 122(33.30) , 121(33.30) , 120(33.30) , 119(83.30) , 118(50.00) , 117(66.70) , 116(22.20) , 93(27.80) , 91(100) , 90(27.20) , 89(88.90) 88(83.30) , 83(27.80) , 82(44.40) , 81(88.90) 80(55.60) , 79(66.70) . 78(50.00), 77(5.60) , 75(5.60) 71(33.30) , 69(50.00) , 66(22.20) , 65(50.00) , 64(16.70) , 62(16.70) , 60(38.90) , 59(11.10) , 57(16.70) , 54(44.40) , 52(55.60) 50(11.10) , Anal. C20H12N2O4S for Calcd : C, 63.83 ; H,3.19 ; N, 7.44 ; S,8.51 . Found :C, 63.63 ; H,3.03 ; N,7.23 ; S.8.31.

2-Hydrazino -4-hydroxy-5H-[1]-benzyrano-[4,3-d]-pyrimidin-5-one(4).

A solution of 2 (0.01 mol) in hydrazine hydrate (15 ml) was heated under reflux at 130OC for 25-30 min . The solid formed on hot was filtered off and washed with ethanol , dried and purified by recrystallization with dimethyl formamide to give 4 as pale orange crystals , yield 71% , m.p . 360OC. IR (KBr): 3430-2560(br.oH), 3336, 3175(NH2), 3251(NH), 1718(C=O), 1616(C=N) , 16.3, 1589(C=C) , 1125, 1045(C-O) cm -1 . δH(DMSO-d6) : 4.36(S,2H,NH2) , 7.29—7.78(m,4H,,Ar-H) , 8.83 (br.S, 1H , OH) ,9.35(S,1H,NH)ppm. MS : m/z(%) = 246(M++2,11.5) , 245(M++1,11.20) , 244(100) 230(23.50) , 229(25.80) , 228(10.60) , 216(11.20) , 215(69.70) , 214(16.90) 213(16.90) , 197(13.70) , 188(26.40) , 187(7.70) , 186(11.50) , 160(7.90) , 158(12.80) , 145(9.80) , 144(5.60) , 130(7.00) , 129(7.00) , 126(8.60) , 119(18.60) , 116(15.00) 103(23.40) , 102(24.00) , 89(20.60) , 88(20.90) , 87(10.30) , 92(19.50) , 91(26.60) , 90(17.00) , 77(18.70) 76(24.30) , 51(16.40) . Anal C11H8N4O3 for Calcd : C, 54.10; H, 3.30; N,22.93. Found : C 53.97;H,3.19;N,22.71.

2- Alkylhydrazino-4- hydroxyl -5H-[1]-benzopyrano-[4,3d]-pyrimidin-5-ones(5a,b).

A mixture of 4 (0.01 mol) and a reagent such as 4-methyl bromide and 4- methoxy phenacyl bromide (0.01mol) in dimethyl formaide (30 ml) was heated under reflux for 2hr , then cooled and poured into water . The deposited solid was filtered off , washed with water , dried and purified by recrystallization with ethanol to give 5.

2-(p-methylbenzoylmethyl) hydrazino– 4 – hydroxyl – 5H – [1] – benzopyrano –[4,3-d] – pyrimidin -5- one (5a) as yellow crystals , yield 65% , m.p. 205OC . IR (KBr) : 3225 (NH) , 3401-2820(br.OH), 1741 , 1703 (C=O) , 1623 (C=N) , 16.5,1589 (C=C),1125, 1081 (C-O) cm-1 . δH (DMSO-d6) : 2.41 (S,3H,CH3) < 3.81 (S,2H,NHCH2CO) , 7.1-7.81(m.8H,Ar-H), 8.31(br.S,1H,OH) , 9.02(S,1H,NH) , 11.10(S,1H,NH)ppm. MS: M/z (%) = 377 (M++1,2.3) , 376(M+,9.80), 329(35.70) , 328(35.70) , 241(7.10) , 147(71.40) , 146(78.60) , 136(28.60) , 135(35.70) , 130(28.60) , 119(78.60) , 92(21.40) , 91(35.70) , 67(28.60) , 66(50.00) , 63(100) .

Anal. C20H16N4O4 For Calcd: C, 63.83; H, 4.25; N, 14.89. Found : C,63.63;H,14.69.

2-(4-methoxybenzoylmethyl) hydrazine – 4 – hydroxy -5H-[1]-benzopyrano-[4,3-d] – pyrimidin -5-one(5b) as yellow crystals , yield 63% , m.p. 240OC . IR(KBr) : 3390-2850(br-oH), 3287(NH), 1741, 1703 (C=O) , 1622(C=N), 1606, 1589(C=C) , 1125, 1081, 1030 (C-O) Cm -1 .

δH(DMSO-d6):3.61(S,3H,OCH3),3.85(S,2H,NHCH2 CO),7.13-7.81(m,8H,Ar-H),8.31(br.S,1H,OH), 9.10(S,1H,NH) ,11.02 (S,1H,NH)ppm.MS: m/z(%)= 393(M++1,11.20), 392(M+,13.20) , 256(14.30) , 255(17.90) , 254(28.60), 241(28.60), 229(82.10), 228(28.60), 185(17.90), 184(21.40), 162(21.40), 161(25.00), 160(21.40), 152(32.10), 137(25.00), 136(21.40), 135(14.30), 134(39.30), 119(78.60), 118(14.30), 144(25.00), 113(17.90), 107(21.40), 103(21.40), 102(28.60), 101(25.00), 99(25.50), 95(21.40), 92(75.00), 91(39.30), 90(21.40), 83(32.10), 77(14.80), 76(46.40), 75(28.60), 73(60.70), 65(25.00), 64(35.70), 63(67.90), 56(64.30), 55(100), 54(71.40), 53(57.10), 51(32.10) Anal. C2H16N4O5 for Calcd : C, 61.22: H,4.08; N,14.28. Found: C, 61.01; H, 3.98; N, 14.03.

2- Amino- 4 – hydroxyl-5H-[1]- benzopyrano [4,3-d] – pyrimidin-5-one (6).

A mixture of 2 (0.01) and ammonium acetate (0.05 mol) or formamide (15 ml) was fused on oil- bath at 130OC for 2hr, then cooled and poured into water. The solid obtained was filtered off, washed with water, dried and purified by recrystallization with butanol to give 6 as pale yellow crystals, m.p. 386 C. IR(KBr) : 3405-2810(br.oH), 3312,3185(NH2) , 1725(C-O), 1628(C=N), 1603,1591(C=C), 1213, 1085(C-O) cm -1 .δH(DMSO-d6): 5.21(S,2H,NH2), 7.21-7.78(m,4H,ArH), 8.53(br.S,1H,OH) ppon. MS:m/z(%) = 229(M+,43.50), 228(M+-1,26.10), 149(30.40), 148(17.40), 147(26.10), 146(21.70), 120(26.10), 119(52.20), 118(21.70) 91(26.10), 85(39.10), 82(21.70), 81(21.70), 76(21.70), 73(65.20),

72(21.70), 71(17.40), 69(21.70), 64(43.50), 63(26.10), 62(13.00), 60(65.20), 59(26.10), 56(47.8), 55(100).

Anal. C11H7N3O3 for calcd: C, 57.64; H, 3.06, N, 18.34. Found: c, 57.46; H, 2-96; N, 18.3.

2-(acetyl)amino-4-hydroxy-5H-[1]- benzopyrano-[4,3-d]-pyrimidin-4-one(7).

A solution of 6 (0.01 mol) in acetic anhydride (20ml) was heated under reflux for 2hr. then cooled and poured onto crushed ice-water. The product formed was collected by filtration , washed with water , dried and crystallized (ethanol) to give 7 as yellow crystals , yield 67% , m.p. 285 C.

IR(KBr) : 3380-2851(br.oH), 3225(NH), 1728,1705(C=O), 1621(C=N), 1607,1588(C=C), 1210, 1083 (C-O) cm-1 δH (DMSO-d6): 2.51(S,3H,COCH3), 7.12-7.28(m,4H,Ar-H), 8.74(S,1H,OH),12.10(S,1H,NH) ppm . MS: m/z (%) = 272(M++1,7.40), 271(M+,43.50), 230(14.20),229(100), 228(37.60), 227(10.90), 214(5.60), 213(8.90), 212(9.20), 201(13.30), 189(5.90), 188(23.10), 187(13.30), 186(3.60), 173(6.20), 172(3.80), 160(5.90), 159(6.50) 158(6.50), 146(3.80), 145(6.50), 144(7.40), 143(3.80), 131(3.60) 130(4.40) 129(5.90), 120(3.80), 119(18.30), 118(7.70), 117(2.70), 116(6.50), 115(7.40), 114(6.80), 104(4.70), 103(13.60), 102(14.8), 101(8.30), 91(17.20), 90(10.90), 89(8.00), 77(9.20), 76(13.60), 75(8.60), 69(24.00), 68(8.90), 65(6.20), 64(12.40), 63(13.30), 53(7.70), 52(6.80), 51(10.40), 50(7.70) .

Anal. C13H9N3O4 for Calcd : C, 57.56; H,3.32,; N,15.49 . Found : C, 57.33 ; H, 3.17; N, 15.28.

2- (alkyl) amino- 4 – hydroxyl – 5H – [1] – benzopyrano- [4,3-d] – pyrimidin- 5- ones (8a,b).

A mixture of 6 (0.01 mol) and alkyl halides (namely , 4 –methyl phenacyl bromide and 4-methoxy phenacyl bromide) (0.01 mol) in dimethyl formamide (30ml) was heated under reflux for 3hr . The solid obtained after cooling was filtered off , washed with water , dried and recrystallized (ethanol) to give 8.

2- (p-methulobenzoylmethyl) amino- 4- hydroxyl -5H-[1] benzopyrano –[4,3-d] – pyrimidin – 5-one(8a) as pale yellow crystals , yield 68% , m.p : 210 OC. IR(KBr) : 3390-2810 (br.OH), 3223(NH), 1725, 1689(C=O), 16199(C=N), 1605,1588(C=C), 1210, 1087(C-O) cm-1 .δH(DMSO-d6) ; 2.34(S,3H,), 3.58(S,2HNCH2CO), 7.12-7.83(m,8H,ArH), 8.73(S,1H,OH), 10.35(S,1H,NH) ppm .

MS: m/z(%) = 362(M++1, 2.30), 361(M+,13.20), 229(100), 228(72.70), 201(33.30), 189(21.20), 188(30.30), 173(60.60), 172(15.20), 160(21.20), 147(15.20), 146(27.30), 145(21.20), 144(15.20), 136(18.20), 130(33.30), 125(21.20), 124(21.20), 123(21.20), 120(33.30), 119(39.40), 118(39.40), 117(33.30), 115(30.30), 107(24.20), 106(24.20), 103(27.30), 100(21.20), 97(21.20), 95(36.40), 92(39.40), 91(69.70), 90(9.10), 89(39.40), 88(27.30), 86(39.40), 83(45.50), 82(39.40), 77(18.20), 76(42.20), 75(48.50), 73(54.50), 72(33.30), 70(45.50), 69(45.50), 65(42.40), 64(51.50), 63(18.20), 57(69.70), 55(66.70), 54(57.60), 52(57.60), 51(24.20). Anal. C20H15N3O4 for Calcd : C,66.48; H, 4.15 ; N,11.63. Found : C,66.24 ; H, 4.03 ; N, 11.52 .

2- (4- methoxy benzoylmethyl) amino – 4 – hydroxyl –H- [1] benzopyrano –[4,3-d] – pyrimidin-5-one (8b) as yellow crystals , yield 69 % , m.p : 145OC . IR (KBr): 3398-2950(br-OH), 3229(NH), 1725, 1693(C=O), 1623(C=O), 1610, 1589(C=C), 1210,1085,1035(C-O) cm-1 . δH(DMSO-d6) : 3.63 (S,2H,NHCH2CO), 3.85(S,3H,OCH3), 7.12-7.83(m,8H,ArH), 8.71(S,1H,OH), 10.36(S,1H,NH) ppm. MS: m/z (%) = 378(M++1,1.70), 377(3.20), 230(20.70), 229(79.30), 190(44.80), 153(24.10), 147(27.60), 146(75.90), 135(100), 134(20.70), 133(20.70), 130(17.20), 129(24.10), 128(17.20), 119(89.70), 118(48.30), 107(17.20), 105(27.60), 92(37.90), 91(58.60), 90(82.80), 89(58.60), 87(44.80), 86(24.10), 85(24.10), 82(44.80), 77(55.20), 76(20.70), 74(17.20), 67(20.70), 66(24.10), 65(41.40), 64(34.50), 63(79.30), 62(58.60), 61(34.50), 51(41.40), 50(41.40).

Anal. C20H15N3O5 for Calcd : C,63.66; H,3.97 ; N,11.14. Found : C,63.43 ; H, 3.78; N, 11.02.

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