Syntheses of some Indophenazines

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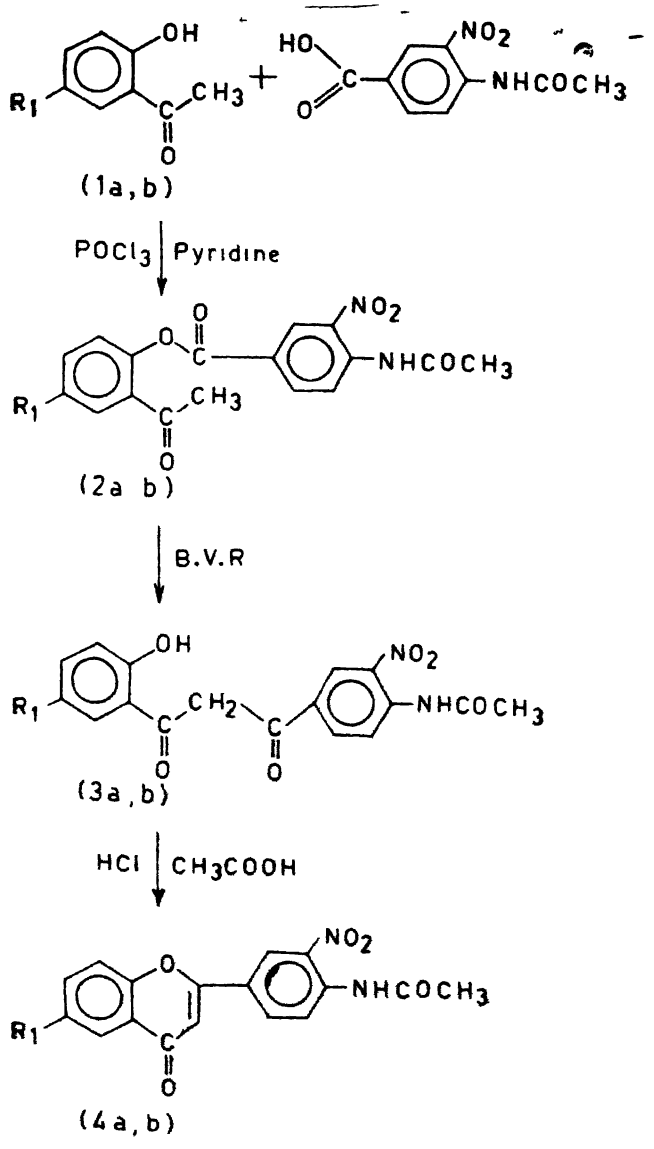
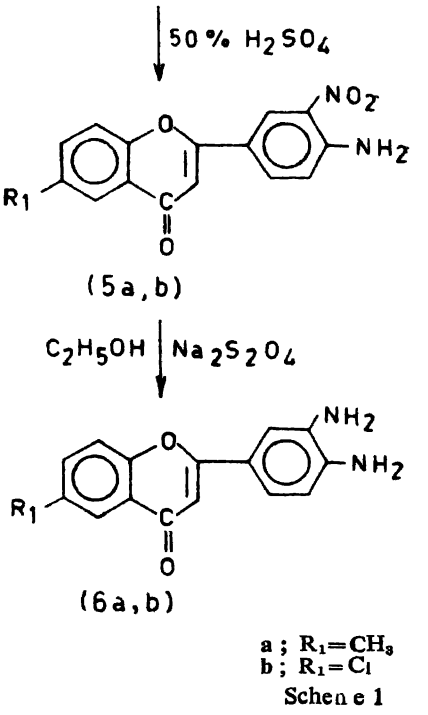
The flavones[1] and isatins[2] possess various biological activities. It was thus thought that worthwhile to synthesise compounds containing both the moieties producing a new class of indophenazine which may be called as flavonoindophenazines.

The ester (**2a,b**) were obtained by using the usual procedure[3]. Baker-Venkataraman rearrangement of the esters (**2**) gave the β-diketone (**3**) (Scheme 1). The diketones (**3**) were cyclodehydrated to the flavone (**4**). The flavones (**4**) on hydrolysis gave



(*contd.*)



a ; R_1=CH_3
b ; R_1=Cl

Scheme 1

the 4'-amino-3'-nitroflavone (**5**), which on reduction with sodium dithionite gave the respective diamines. The course of the reduction can be visualised by observing the change of colour.

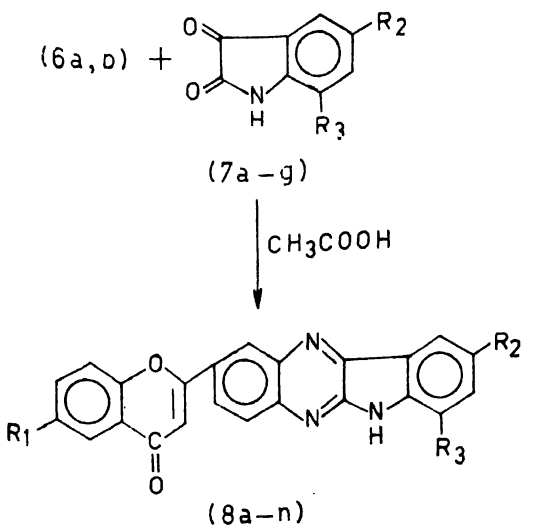
The condensation of the diaminoflavones with isatin and its derivatives produced the desired indophenazines (Scheme 2).

Experimental

The m.ps. were recorded in open capillary and are uncorrected. Ir spectra were recorded on a Perkin-Elmer spectrophotometer and pmr spectra (90 MHz) in $CDCl_3$.

4'-Acetamido-3'-nitrobenzoyloxy acetophenoens (**1a,b**)*:* A mixture of *o*-hydroxyacetophenone (0.0065 mol) and 4-acetamido-3-nitrobenzoic acid (0.007 mol) dissolved in pyridine (5—10 ml) was treated with $POCl_3$ (0.03 ml) with stirring at room temperature. The solid obtained on acidification was washed successively with water, dilute $NaHCO_3$, NaOH solutions and then water, and crystallised from ethanol : **1a** (75%), m.p. 150—51°; **1b** (78%), 168–69°.

2-Hydroxy-ω-(4'-acetamido-3'-nitrobenzoyl) aceto phenones (**3a,d**)*:* A solution of the ester (**2** ; 0.01



8a/n ; R_1=CH_3/Cl, R_2=H, R_3=H
b/i ; R_1=CH_3/Cl, R_2=Cl, R_3=H
c/j ; R_1=CH_3/Cl, R_2=Cl, R_3=NO_2
d/k ; R_1=CH_3/Cl, R_2=Br, R_3=H
e/l ; R_1=CH_3/Cl, R_2=Br, R_3=Br
f/m ; R_1=CH_3/Cl, R_2=Br, R_3=NO_2
g/n ; R_1=CH_3/Cl, R_2=I, R_3=H

Scheme 2

0,01 mol) in dry pyridine was stirred for 2 h with powdered KOH) 0.3 mol) at 60—80° and then cooled and decomposed with ice-sulphuric acid solution. The resulting yellow solid was washed with water and crystallised from suitable solvent : **3a** (85%), m.p. 210° (EtOH) ; **3b** (85%), 198—200° (EtOAc).

2-(4'-Acetamido-3'-nitrophenyl)flavones (**4a,b**) : The β-diketone (**3** ; 0.001 mole) was refluxed in glacial acetic acid for 2 h with catalytic amount of concentrated HCl and worked up to obtain the products : **4a** (90%), m.p. 274—75° (AcOH) ; ν_{max} 1 650 (C=O), 1 570 (C=C), 1 235 (C—O—C) and 750 cm^{-1} (NHCOCH$_3$) ; **4b** (93%), m.p. 286—87° (AcOH) ; ν_{max} 1 645 (C=O), 1 580 (C=C), 1 240 (C—O—C) and 755 cm^{-1} (NHCOCH$_3$).

2-(4'-Amino-3'-nitrophenyl)flavones (**5a,b**) : Compound **4** dissolved in hot 50% H_2SO_4 was refluxed for 4 h. The mixture was then cooled and poured on crushed ice and liquor ammonia and stirred. The resulting solid was washed with water and crystallised from suitable solvent : **5a** (85%), m.p. 225—26° (EtOH) ; **5b** (83%), 273—75° (pyridine).

2-(3',4'-Diaminophenyl)flavones (**7a,b**) : Compound **5** (0.02 mol) was refluxed in aqueous ethanol (2 : 1, v/v ; 300 ml) and sodium dithionite was gradually added to it till the compound dissolved almost completely to give an orange coloured solution and then of excess dithionite (1 g) was added. The mixture was refluxed for 2 h and worked up to yield brown coloured products : **7a**, $C_{15}H_{14}N_2O_2$.HCl (80%), m.p. 258°d ; $C_{15}H_{11}ClN_2O_2$.HCl (85 %), 242° d.

Indophenazines (**8a – n**) : The isatin (0.001 mol) was dissolved in refluxing glacial acetic acid (20 ml) and the diaminoflavone (0.001 mol) was added to it when the colour of the solution changed to deep brown. The solution was refluxed further for 1 h and cooled. The products were crystallised from suitable solveuts : **8a** (50%), m.p. 143° (AcOH) ; **b** (80%), 190—91° (AcOH), δ 6.75 (1H, s, C-3 of benzopyrone), 2.5 (3H, s, CH_3), 7.2—8.0 (10H, m. **c**) (63%), 270° (pyridine) ; **d** (55%), 245—46° (pyridine) ; **e** (58%), 240° (AcOH), δ 6.7 (1H, s, C-3 of benzopyrone), 2.4 (3H, s, CH_3), 7.2 – 8.5 (9H, m) ; **f** (45%), 265° (pyridine) ; **g** (50%), 240° (AcOH) ; **h** (52%), 175° (AcOH) ; **i** (65%), 210—11° (AcOH), δ 6.7 (1H, s, C-3 of benzopyrone), 7.2—8.5 (10H, m) ; **j** (60%), 285° (pyridine) ; **k** (60%), 250—51° (pyridine) ; **l** (45%), 255° (pyridine) ; **m** (52%), 273° (AcOH), δ 6.8 (1H, s, C-3 of benzopyrone), 7.1—8.4 (10H, m) ; **n** (58%), 245° (AcOH).

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