Synthesis of 2-acyl- and 2-benzoylindoles†

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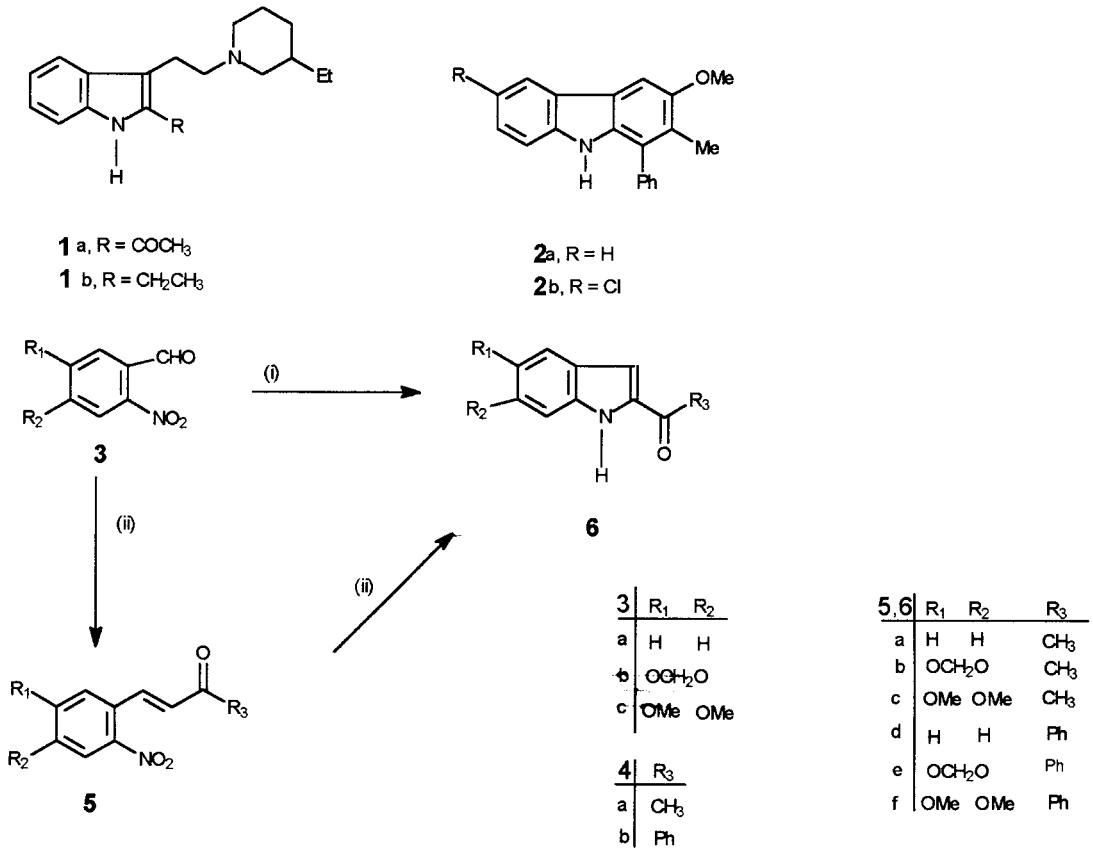
2-Nitrobenzaldehydes (**3a–c**) on reaction with phosphoranes (**4a** and **4b**), and triphenyl phosphine in refluxing diphenylether provide 2-acylindoles (**6a–c**) and 2-benzoylindoles (**6d–f**). Alternatively 2-nitrobenzaldeydes (**3a–c**) on reaction with phosphoranes (**4a** and **4b**) give nitroketones (**5a–f**) which on refluxing with triphenyl phosphine in refluxing diphenyl ether furnish 2-acyl- and 2-benzoylindoles (**6a–f**).

2-Acyl and 2-benzoylindoles are valuable intermediates for the synthesis of carbazoles and pyridocarbazoles. A few 2-acylindoles like Crooksidine (**1a**) and indole alkaloids like **1b** have been isolated[9] from *Halophyton crooksii*. 2-Benzoylindoles have also been used for the synthesis of carbazole alkaloids like hyellazole (**2a**) and 6-chlorohyellazole (**2b**). In recent years we have initiated our efforts on the development of newer methods for the synthesis of carbazole and pyridocarbazole alkaloids. For this purpose we required sizable amounts of 2-acyl- and 2-benzoylindoles. Although various procedures are available for the synthesis of 3-acyl- and 3-benzoylindoles very few methods[11–18] are known for 2-acyl- and 2-benzoylindoles. One of the routes makes use of deoxygenation approach and provides 2-acylindoles in low yields along with other products[19].

Earlier we had reported[20] synthesis of indole-2-carboxylates and now we report herein a useful, general approach (Scheme 1) for the synthesis of 2-acylindoles (**6a–c**) and 2-benzoylindoles (**6d–f**) starting from 2-nitrobenzaldehydes (**3a–c**). In our approach a mixture of 2-nitrobenzaldehyde (**3a**), phosphorane (**4a**) and triphenyl phosphine in diphenyl ether solution was refluxed for 2h, to obtain 2-acylindole (**6a**) in 48% yield. The 2-nitrobenzaldehydes (**3b** and **3c**) on similar reaction with phosphorane (**4a**) provided the 2-acylindoles (**6b** and **6c**). The nitroaldehydes (**3a–c**) when reacted with phosphorane (**4b**) in the presence of triphenyl phosphine in refluxing diphenyl ether gave the 2-benzoylindoles (**6d–f**). In this one pot approach, developed for the synthesis of 2-acyl- and 2-benzoylindoles (**6a–f**), four reactions, namely Wittig reaction, generation of nitrene, addition of nitrene to carbon-carbon double bond, opening up of aziridine ring and formation of indoles, occur in tandem manner.

In an alternative approach the 2-acyl- and 2-benzoylindoles (**6a–f**) have been synthesised from 2-nitrobenzaldehydes (**3a–c**) via the intermediacy of nitroketones (**5a–f**). 2-Nitrobenzaldehydes (**3a–c**) when reacted with phosphoranes



Scheme 1 Reagents and conditions (i) $Ph_3P{=}CHCOR_3$ (**4**); Ph_3P, Ph_2O, reflux (ii) (**4**), MeOH, heat; (iii) Ph_3P, Ph_2O, 180°C

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(**4a** and **4b**) in refluxing methanol provided the nitroketones (**5a–f**) in 62-90% yield. The nitroketones (**5a–f**) on reaction with triphenyl phosphine in diphenyl ether at 180°C gave the 2-acyl- and 2-benzoylindoles (**6a–f**) in 42-57% yield.

The present approach developed for the synthesis of 2-acyl- and 2-benzoylindoles from 2-nitrobenzaldehydes appear to be better than the reported methods[1] and would be useful to a large number of synthetic chemists working in this field.

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