



Synthesis and Characterization of 2H-Pyrrole-2-Ones of (5-Benzoyl-benzimidazol-1-yl)-acetic acid hydrazide derivatives

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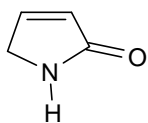
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ABSTRACT: The present study deals with the heterocyclization of Schiff bases of (5-Benzoyl-benzimidazol-1-yl)-acetic acid hydrazide [BBAH] into (2H)-Pyrrole-2-ones derivatives. One of the hydrazide i.e. 2-hydroxy benzoic acid hydrazide (salicylhydrazide) and their condensed product play a vital role in medicinal chemistry. More particularly and recently these types of compounds have been found in the treatment of T.B. and other chemotherapeutic diseases. Hence, it was thought of interest of merging of both pyrrole and benzimidazole hydrazide moieties may enhance the drug activity of compound up to some extent or might possess some biological activity. From this point of view the objective of present works to prepare new derivatives of benzimidazole hydrazide containing a pyrrole moiety. Hence The present study deals with the heterocyclization of Schiff bases of (5-Benzoyl-benzimidazol-1-yl)-acetic acid hydrazide [BBAH] into (2H)-Pyrrole-2-ones derivatives.

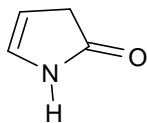
Keywords: (5-Benzoyl-benzimidazol-1-yl)-acetic acid hydrazide, Pyrrole, spectral studies.

INTRODUCTION

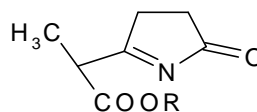
Hydrazide and their heterocyclised products find wide use in medicine, agriculture and industry. One of the hydrazide i.e. 2-hydroxy benzoic acid hydrazide (salicylhydrazide) and their condensed product play a vital role in medicinal chemistry. More particularly and recently these types of compounds have been found in the treatment of T. B. and other chemotherapeutic diseases. Hence, it was thought of interest of merging of both pyrrole and benzimidazole hydrazide moieties may enhance the drug activity of compound up to some extent or might possess some biological activity. From this point of view the objectives of present work to prepare new derivatives of benzimidazole hydrazide containing a pyrrole moiety. Hence the present study deals with the heterocyclization of Schiff bases of (5-Benzoyl-benzimidazol-1-yl)-acetic acid hydrazide [BBAH] into (2H)-Pyrrole-2-ones derivatives. The 2-carbonyl derivative of Pyrrole is known as 2H-pyrrole-2-one. It is also known as 2-hydroxypyrrole and α -hydroxy pyrrole. 2-hydroxy pyrroles are thought to exist in oxo forms such as (X) or (XI); structure (XII) illustrates a third possible oxo form¹⁴.



(X)



(XI)

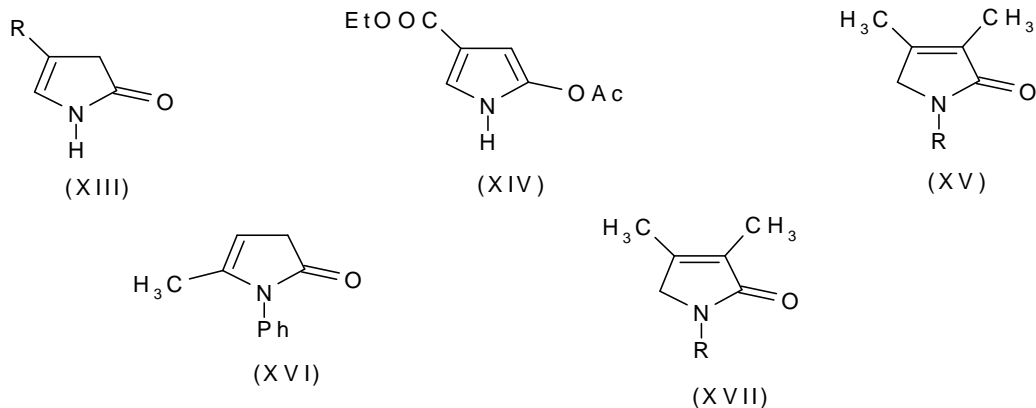


(XII)

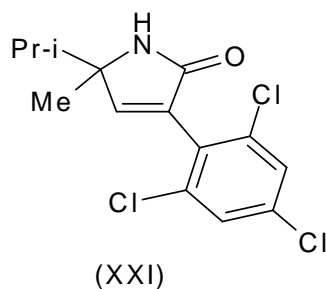
Chemical evidence for transformation in the hydroxyl pyrrole has been reviewed by Fischer and Orth¹⁵. Since 2-hydroxy pyrrole itself is unstable and rapidly resinifies, studies have been confined to some of its

more stable derivatives. The ultraviolet spectrum of (XIII) (R = COOEt) is different from that of (XIV) and (XIII) (R = COOEt) does not give a positive test with ferric chloride^{16,17}, which led to its formulation as shown.

On the basis of their infrared (and ultraviolet) spectra, compounds (XV) (R = H)¹⁸, and (XVI)¹⁹ must exist in oxo forms since they exhibit absorption bands: (XV) (R = H) at 1695cm⁻¹ and (XV) (R = Ac) two bands at 5.87 and 5.95 μ (1904 and 1681cm⁻¹). Proton resonance spectra confirm structure (XV) (R = H). The Δ⁴- structure was assigned to (XVI) because it added water reversibly, and this is considered to be a characteristic reaction of Δ⁴- pyrrolones²⁰, whereas the Δ³- structure was assigned to (XV) (R = H) because the ultraviolet spectrum appeared to be of the crotonic acid type^[18].



Ultraviolet spectra suggested, and NMR spectra proved that (XVII) (R = H, OH) should be assigned the Δ³- structure shown²¹. Amidation of 2,4-dichloro-6-methyl phenyl acetic acid with H₂NC(Me)(i-Pr)CN via the acid chloride using SOCl₂, followed by alcoholysis of the nitrile using H₂SO₄ and MeOH quench and cyclization of the resultant ester with KOBu-tert in THF, gave title compound (XXI), and was useful as pesticides and herbicides^[22].



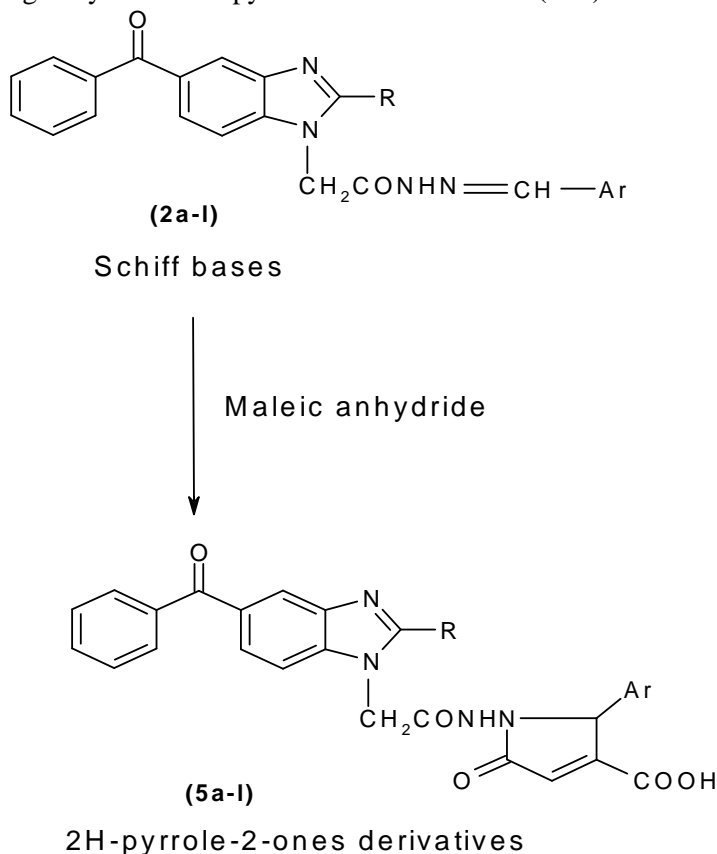
MATERIAL AND METHODS

Various Schiff bases (2a-1) on heterocyclization reactions with maleic anhydride gave the desired products 2*H*-pyrrole-2-ones (5a-1). Their structures have been characterized on the basis of their analytical and spectral data. The research work is scanned in Scheme-5.1 and the experimental procedures for the synthesis of the series of compounds have been adopted according to the reported method.

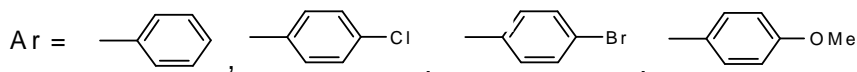
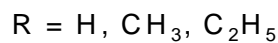
Synthesis of 1-[(5-Benzoyl-benzimidazol-1-yl)-acetyl amino]-2-oxo-5-aryl-3,5-dihydro-1*H*-pyrrole-4-carboxylic acid (5a-1): Maleic anhydride (0.1 mole) and various Schiff bases (2a-1) (0.1 mole) were heated at reflux in chloroform (30ml) for about 5 hours with TLC monitoring. After the mixture was allowed to stand for 2 days, the solid was filtered. The product thus formed was recrystallized from ethanol to give pure 1-[(5-Benzoyl-benzimidazol-1-yl)-acetyl amino]-2-oxo-5-aryl-3,5-dihydro-1*H*-pyrrole-4-carboxylic acid (5a-1) in good yield. The analytical and spectral data of the compounds (5a-1) are described.

RESULTS AND DISCUSSION

As we know that the Schiff bases are the crucial material for the preparation of heterocyclic compounds like 2H-pyrrole-2-ones, 2-pyrrolidinones, etc. These Schiff bases (2a-1) on cyclo condensation reaction with maleic anhydride afford the biologically active 2H-pyrrole-2-one derivatives (5a-1).



Where,



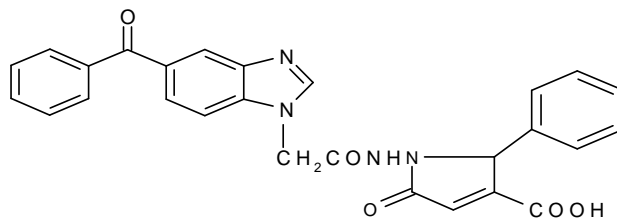
Their structures were confirmed by analytical and spectral data. The C, H and N contents of the prepared compounds were consistent with their predicted structures as shown in Scheme-5.1. The infrared spectra show the band in the region $1680\text{-}1710\text{ cm}^{-1}$ for carbonyl ($>\text{C}=\text{O}$) group, which is the characteristic band for the cyclic 2H-pyrrole-2-one ring.

The proton magnetic resonance spectra of the prepared compounds (5a-1) show singlet at 5.15 for CH proton at position-5 in the 2H-pyrrole-2-one ring. All other signals are at their respective positions in the PMR spectrum.

The Mass spectrum of 5a (Fig. 5.13) indicates that the molecular mass of 5a (i.e. 480 gm/mole) agreed with the peak obtained.

The analytical and spectral data for all the compounds (5a-1) are shown. The IR, PMR and ^{13}C NMR spectra are scanned in Figures-5.1-5.12 for selective compounds.

Compound-5a:



1-[(5-Benzoyl-benzimidazol-1-yl)-acetylamino]-2-oxo-5-phenyl-3,5-dihydro-1H-pyrrole-4-carboxylic acid

Table 1: Elemental analysis and Infrared spectral, PMR spectral & CMR spectra features of 1-[(5-Benzoyl-benzimidazol-1-yl)-acetylamino]-2-oxo-5-phenyl-3,5-dihydro-1H-pyrrole-4-carboxylic acid

Elemental Analysis					
Molecular	Formula:	Calculated	%	%H	%N
C ₂₇ H ₂₀ N ₄ O ₅		Found	67.50	4.16	11.66
			67.4	4.1	11.5
Molecular Weight: 480 gm/mole					
Melting Point: 175-76°C (uncorrected)					
Yield: 72%					
Infrared Spectral Features cm ⁻¹					
3054, 1600, 1532:		Aromatic C-H			
1667:		C=O of COOH			
1717:		C=O of pyrrole-2-one			
Other bands same as parent Schiff bases					
PMR spectral Features (δ,Ppm)					
6.15-8.13:		(multiplet aromatic + NH of CONH)			
4.7:		(H, s, C ₅ H)			
5.15:		(H, s, C ₃ H)			
12.92:		(H, s, COOH)			
2.65:		(2H of -CH ₂ CONH-)			
CMR spectral Features (δ,Ppm)					
102-131:		Benzene			
165:		C=O of COOH			
166:		C=O			
142:		C=O of CONH			
36:		CH ₂			

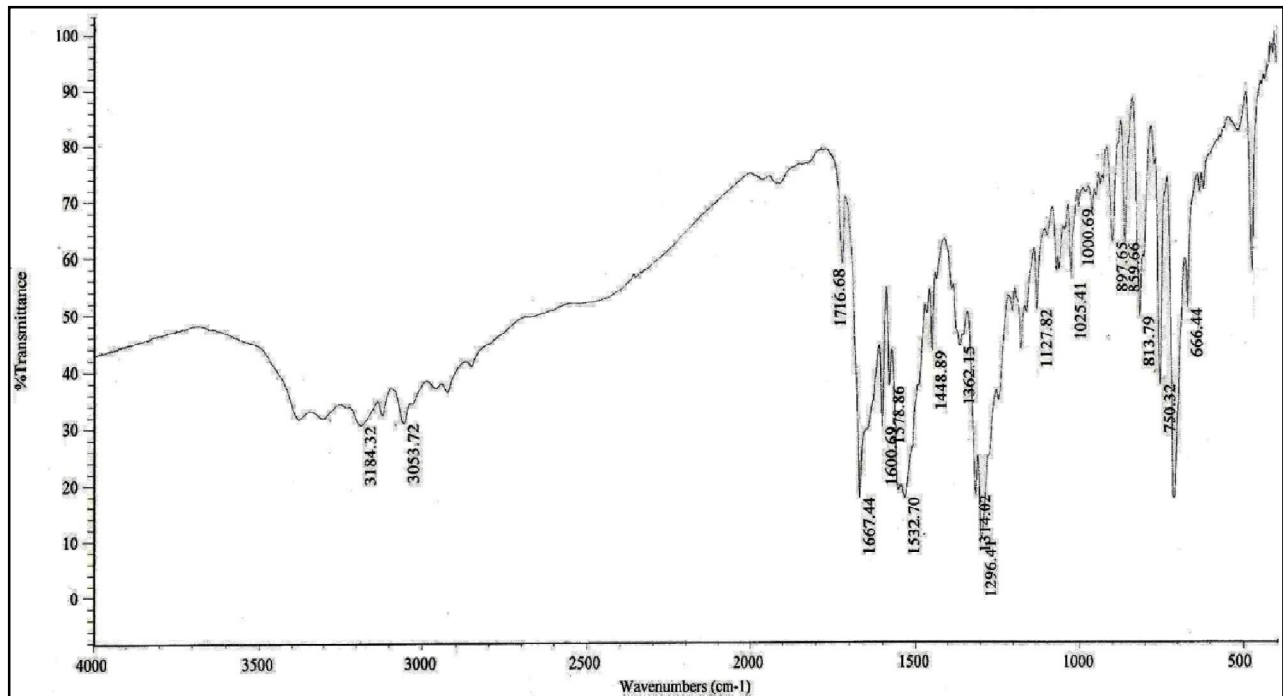


Figure 1: IR Spectrum of Compound 5a.

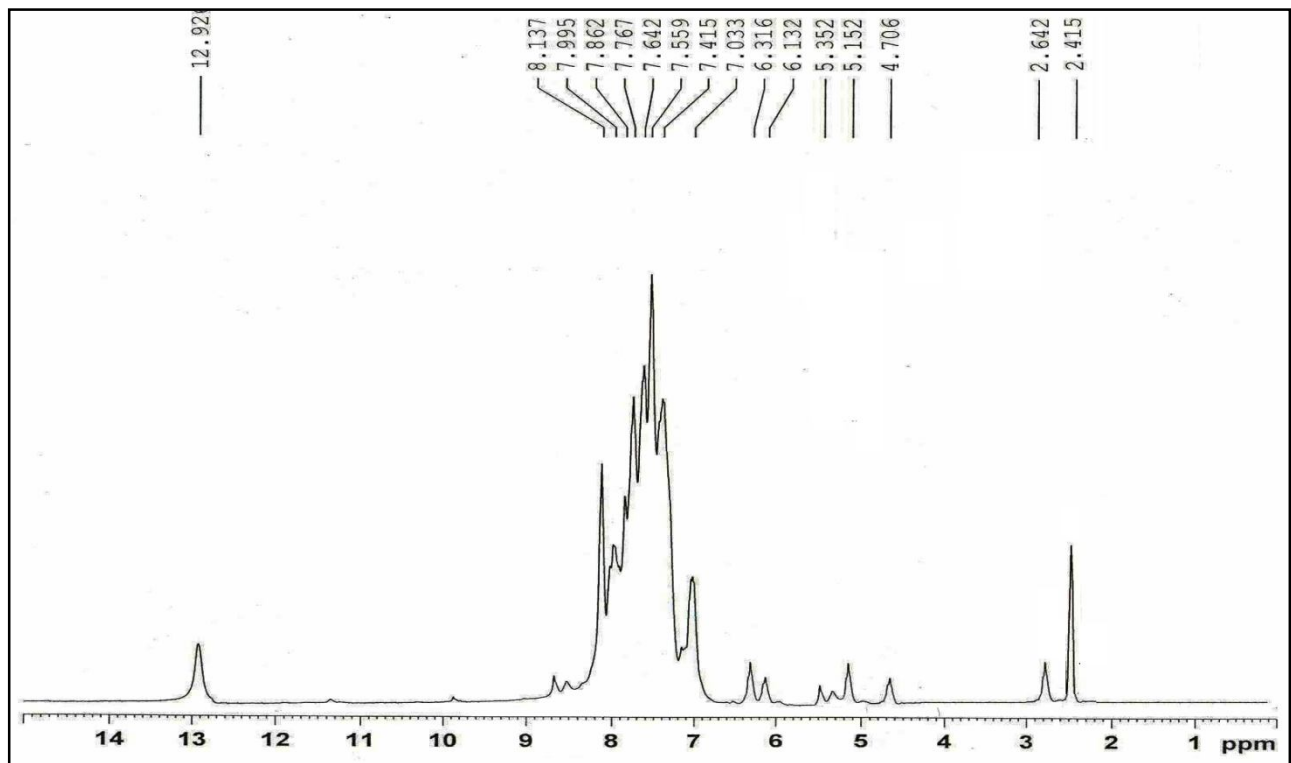


Figure 2: NMR Spectrum of Compound 5a.

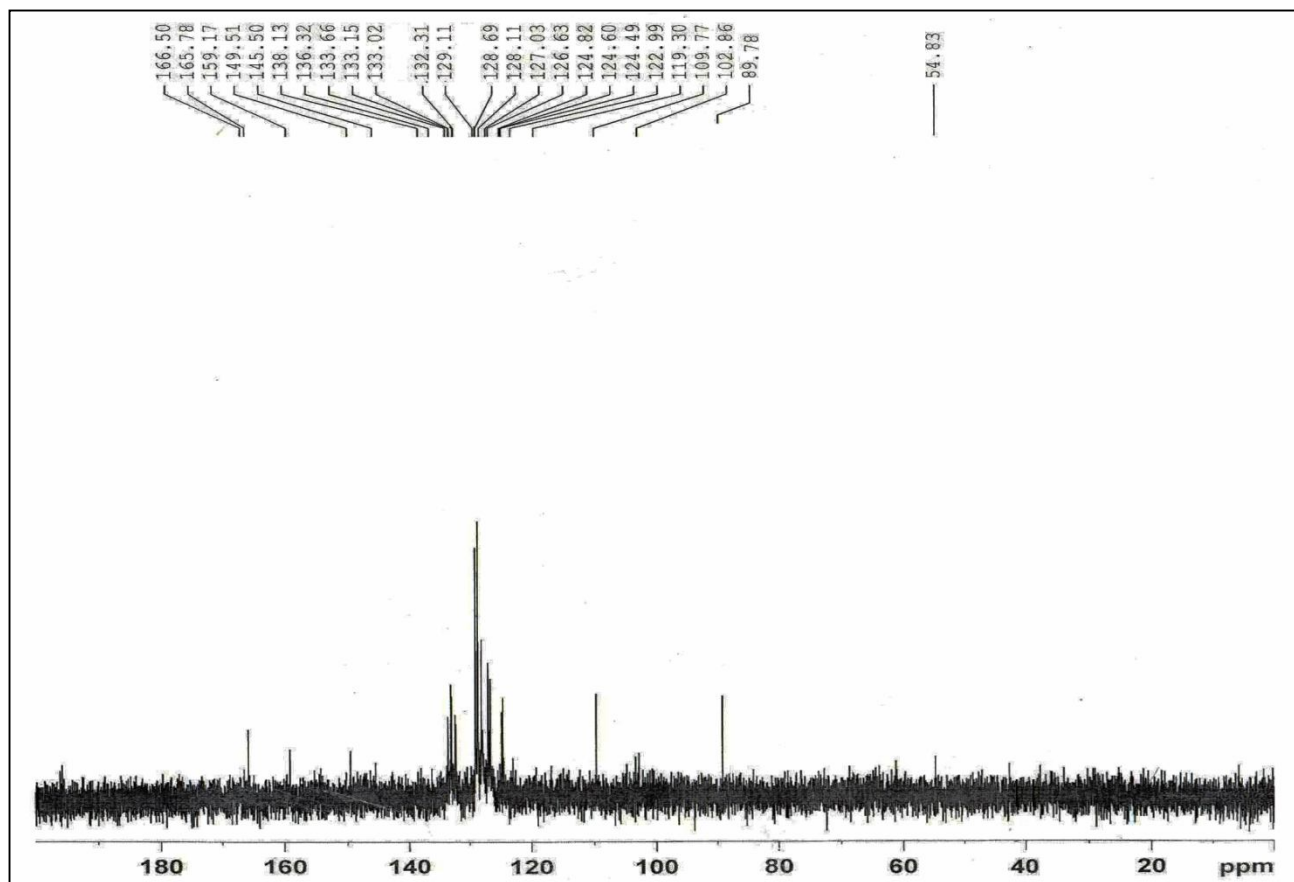


Figure 3: CMR Spectrum of Compound 5a

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