

Synthesis of Some New Schiff Bases for 5-Ethyl-5-phenyl Barbituric Acid

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Abstract

New Schiff bases have been prepared through the reaction of 5-ethyl-5-phenyl-1,3-di(acetic acid hydrazide) barbituric acid with aldehydes and ketones.

The synthesized compounds were characterized by their IR, UV spectra data and C,H,N, analyses data.

Introduction

Schiff bases have been widely reported to be biologically versatile compounds having antifungal⁽¹⁾, fungicidal⁽²⁾, herbicidal⁽³⁾ and exhibit antitubercular activity⁽⁴⁾.

The presence of imino (-N=C-) in these compounds has been regarded as being essential for the enhancement of antibacterial and antimicrobial activity⁽⁵⁾. The above observations promoted us to synthesize a new series of phenobarbital systems having the potentially active moieties.

Experimental

Melting points were recorded on a Oallen Kamp MP1-600 melting point apparatus and are uncorrected. IR spectra were recorded on KBr disc or film on a Pye Unicam SP3-1000 spectrophotometer. UV spectra were recorded on a Hitachi 2000 spectrophotometer using absolute ethanol as solvent. Elemental analysis of some compounds were carried out on analyzer type Carlo-Erba-1106.

Preparation of 5-Ethyl-5-phenyl-1,3-di(ethylacetate)barbituric acid (1)⁽⁶⁾:

To 5-ethyl-5-phenyl barbituric acid (0.03 mole) in methanol (20 ml), bromoethylacetate (0.6 mole) and Na₂CO₃ (8 g.) were added, and the reaction mixture was heated under reflux for 6 hours. Evaporation of the solvent under vacuum gave white solid, which dried. Crystallization from methanol gave white crystals of compound (1) (tables 1,3,5).

Preparation of 5-Ethyl-5-phenyl-1,3-di(acetic acid hydrazide)barbituric acid (2)⁽⁷⁾:

To a solution of compound (1) (0.001 mole) in benzene (15 ml.), 99% hydrazine hydrate (0.002 mole) in benzene (25 ml.) was added dropwise. The mixture was refluxed for 6 hours. The solvent was removed under vacuum and an oily product was obtained and purified by using column chromatography [silica gel (stationary phase)-chloroform (eluant phase)], (tables 1,3,5).

Preparation of Schiff's Bases (3-9)⁽⁸⁾:

To a stirring solution of compound (2) (0.0012 mole) in absolute ethanol (25 ml.) was added aldehydes or ketones (0.0024 mole). The mixture was refluxed for 4 hours and cooled. The precipitate was filtered and recrystallized from appropriate solvent (tables 2,4,5).

Results and Discussion

Scheme (1) summarizes all the performed reaction of 5-ethyl-5-phenyl 1,3 di(ethylacetate) barbituric acid in this work. Physical properties and spectral data of the synthesized compounds are given in tables (1-5).

The intermediate 5-ethyl-5-phenyl-1,3-di(ethylacetate) barbituric acid (1) was obtained in excellent yield by treatment of 5-ethyl-5-phenyl barbituric acid with excess of sodium carbonate to form phenobarbital salt, then two moles of bromoethylacetate were added.

The infrared spectrum of compound (1) exhibited characteristic (C=O) stretching band at 1750 cm⁻¹ and the disappearance of the (NH) stretching band that has been observed at 3360 cm⁻¹ in 5-ethyl-5-phenyl barbituric acid.

The treatment of ester (1) with hydrazine hydrate afforded 5-ethyl-5-phenyl-1,3-di(acetic acid hydrazide) barbituric acid (2).

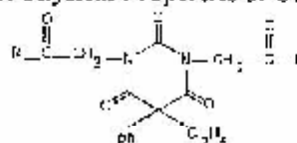
This compound has been characterized by its elemental analysis and the IR spectrum shows the appearance of characteristic bands near 3470 cm⁻¹ and 3290 cm⁻¹ due to the asymmetrical and symmetrical (N-H) stretching vibrations. Moreover the (C=O) stretching vibration of ester has been decreased from 1750 cm⁻¹ to 1680 cm⁻¹.

Condensation of the carboxylic acid hydrazide (2) with aromatic aldehydes or ketones by refluxing in ethanol for 4 hours resulted in the formation of new schiff bases (3-9). The IR spectrum of compound (4) shows the appearance of a stretching band (C=N) at 1640 cm⁻¹ and the disappearance of the

(NH₂) stretching band. In addition to this, compound (4) exhibits an absorption band at 780 cm⁻¹ belonged to (C-Cl) function. Moreover, other characteristic absorption bands occur at 1710 cm⁻¹ for (C=O) of original acid, and at 1680 cm⁻¹ for (CONH) function.

The physical properties of these schiff bases (3-9) are recorded in table (2) and their structures have been deduced according to their UV, IR analysis, table (1).

Table (1) Some Physical Properties of Compounds (1-2)



Comp. No.	Name of Compound	R	Colour	Yield %	M.P. (°C)	Molecular Formula	Purification Solvent
1	S-ethyl-S-phenyl-1,3-di(acetic acid) barbituric acid	-O-C ₂ H ₅	White	90	90-93	C ₁₅ H ₁₆ N ₂ O ₇	Methanol
2	S-ethyl-S-phenyl-1,3-di(acetic acid hydrazide) barbituric acid	-NH-NH ₂	Brown	65	Oily	C ₁₅ H ₂₀ N ₄ O ₂	Chloroform*

* Column Chromatography

Table (2) Some Physical Properties of Compounds (3-9)

Comp. No.	Name of Compound	R	Colour	Yield %	M.P. (°C)	Molecular Formula	Purification Solvent
3	S-ethyl-S-phenyl-1,3-di(acetic acid) barbituric acid		Yellowish	55	166-168	C ₃₂ H ₂₈ N ₂ O ₇	Aceton-Water
4	S-ethyl-S-phenyl-1,3-di(acetic acid hydrazide) barbituric acid		Yellow Crystal	45	201-203	C ₂₅ H ₂₁ Cl ₂ N ₄ O ₂	Acetone-Water
5	S-ethyl-S-phenyl-1,3-di[N(2-Methoxy benzaldir)hydrazinyl] barbituric acid		Brown	60	138-140	C ₃₂ H ₂₈ N ₄ O ₇	Ethanol
6	S-ethyl-S-phenyl-1,3-di[N(2-Nitro benzaldir)hydrazinyl] barbituric acid		Yellow	50	200-203	C ₃₂ H ₂₅ N ₄ O ₇	Ethanol-Water
7	S-ethyl-S-phenyl-1,3-di[N(3-Nitro benzaldir)hydrazinyl] barbituric acid		Yellow	40	185-188	C ₃₂ H ₂₅ N ₄ O ₇	Ethanol-Water
8	S-ethyl-S-phenyl-1,3-di[N(2-Iodo benzaldir)hydrazinyl] barbituric acid		Orange	30	150-152	C ₃₄ H ₂₇ N ₄ O ₇	Ethanol
9	S-ethyl-S-phenyl-1,3-di[N(2-Chloro benzaldir)hydrazinyl] barbituric acid		Brown	30	198-200	C ₃₀ H ₂₄ Cl ₂ N ₄ O ₂	Ethanol

Table (3) UV and IR Spectral Data of Compounds (1-2)

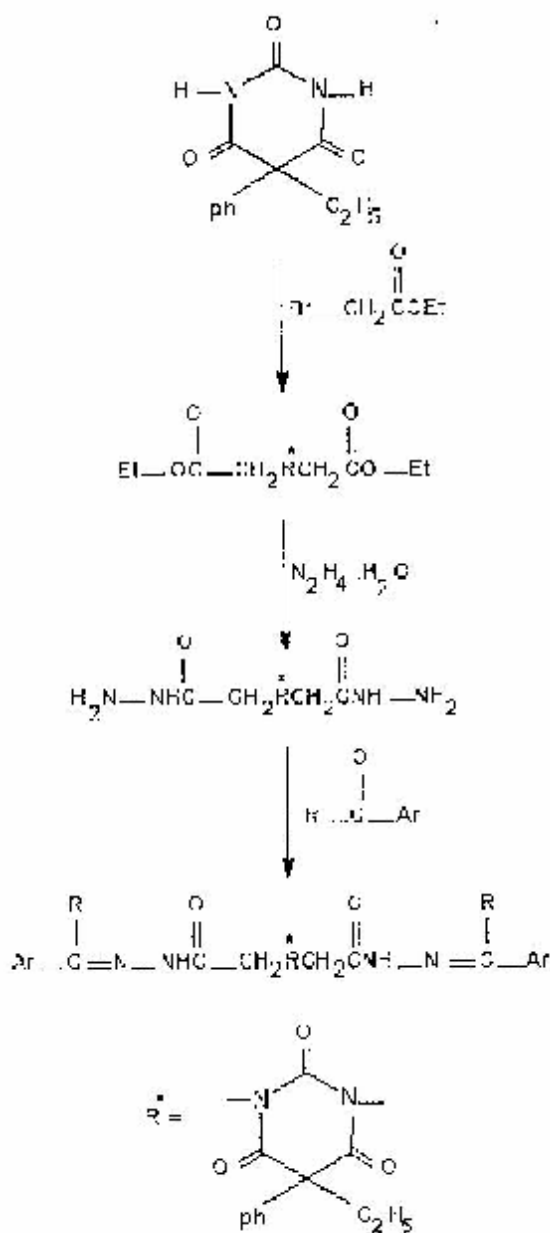
No.	UV Spectrum		Characteristics Bands of IR Spectrum						Others
	λ_{max} (nm.)	ϵ_{max} (cm ² .g.)	$\nu_{C=O_1}$ (cm ⁻¹)	$\nu_{C=O_2}$ (cm ⁻¹)	ν_{C-H, sp^2} (cm ⁻¹)	ν_{C-O_1} (cm ⁻¹)	ν_{C-O_2} (cm ⁻¹)	ν_{C-O_3} (cm ⁻¹)	
1	312 240	9×10^4 2×10^5	1750 est. 1690 barb.	2890-2990	3080	1240	1210 interference with (C-O)	1610 1500	-
2	277.2 240.2	29×10^4 18×10^4	1680 amid 1700 barb.	2850-2970	3050	-	1240	1600 1500	ν_{N-H} (3420-3220) ν_{N-H} (3110)

Table (4) UV and IR Spectral Data of Compounds (3-9)

No.	UV Spectrum		Characteristics Bands of IR Spectrum						Others
	λ_{max} (nm.)	ϵ_{max} (cm ² .g.)	$\nu_{C=O_1}$ (cm ⁻¹)	$\nu_{C=O_2}$ (cm ⁻¹)	ν_{C-H, sp^2} (cm ⁻¹)	ν_{C-O_1} (cm ⁻¹)	ν_{C-O_2} (cm ⁻¹)	ν_{C-O_3} (cm ⁻¹)	
3	323.2 275.0 256.0	32×10^5 19×10^5 7×10^5	1690 amid 1700 barb.	2880-2950	3050	1240	1240	1600 1500	ν_{OH} (3400) $\nu_{C=O}$ (1630)
4	390.8 370.0 286.0	28×10^5 19×10^5 9×10^5	1680 1710	2860-2955	3060	/	1230	1515 1610	ν_{OH} (780) $\nu_{C=O}$ (1640)
5	321.6 223.2	19×10^5 18×10^5	1660 1680	2850-2900	3010	/	1355	1520 1600	ν_{N-H} (1620) $\nu_{C=O}$ (1550)
6	325.6 257.6	28×10^5 7×10^5	1675 1690	2890-2980	3100	/	1220	1530 1610	$\nu_{C=O}$ (1640) ν_{N-H} (1490-1500) as (1350-1470)s
7	-	-	1680 1710	2850-2940	3080	/	1245	1510 1610	$\nu_{C=O}$ (1630) ν_{N-H} (1450-1550) as (1350-1455)s
8	416 320.8 263.6	14×10^5 9×10^5 6×10^5	1690 1710	2820-2950	3070	/	1240	1580 1610	$\nu_{C=O}$ (1650) ν_{OH} (3250)
9	-	-	1675 1690	2880-2900	3080	/	1250	1590 1600	$\nu_{C=O}$ (620) $\nu_{C=O}$ (1620)

Table (5) C,H,N, analysis of Some Prepared Compounds

Compound No.	C,H,N, Analysis		
	C%	H%	N%
1	59.0 (58.5)	5.9 (5.7)	6.9 (6.6)
2	51.0 (50.3)	5.2 (5.1)	22.0 (21.2)
3	61.6 (61.0)	4.5 (4.5)	11.3 (11.1)
8	40.30 (40.34)	7.60 (7.58)	8.2 (8.1)



Scheme (I)

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الخلاصة

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