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Synthesis, Characterization and Biological Study of Hydantoin Derivatives

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ABSTRACT: Various hydantoin derivatives were synthesized in moderate to excellent yield. Aurone derivatives and urea dissolved in ethanol then 10% KOH was added, shake well & reflux for 3 hrs. Allow the reaction mixture to cool. It was then decomposed in acedified dil HCl with constant stirring, solid thus obtained was washed with $NaHCO_3$ dried and recrystalised from ethanol to get hydantoin derivative. To check purity of compound Thin Layer Chromatography was used. The synthesized aurane derivatives were characterized by IR Spectroscopy, 1H NMR Spectroscopy and elemental analysis. All Newly synthesized derivatives of hydantoin were screened for their biological study i.e. antifungal and antimicrobial study and all newly synthesized substituted hydantoin shows an excellent antifungal and antimicrobial activity.

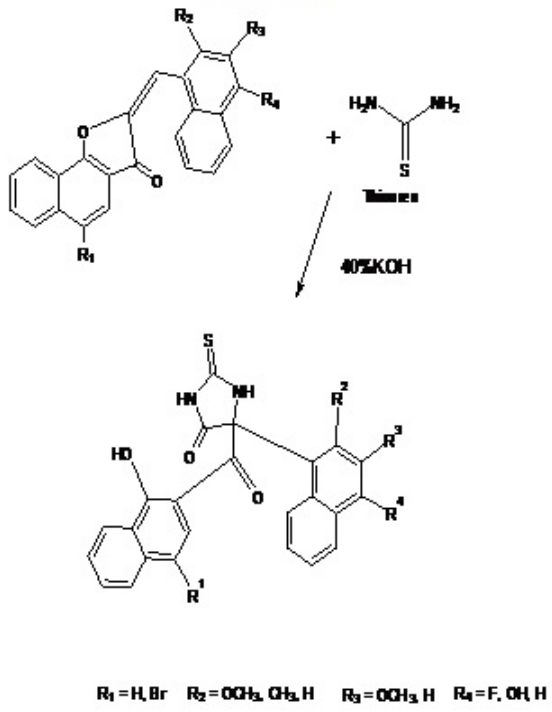
Keywords: Antimicrobial Activities; antifungal Activities; biological study; characterization; hydantoin derivatives and synthesis.

INTRODUCTION: Hydantoins are also known phenytoin or imidazolidine-2,4-diones and are important structural moiety found in several natural products Hydantoins was introduced in 1938, and though having significant toxic and teratological effects, still it is broadly used anticonvulsant for treatment of epilepsy. Hydantoins, originally observed as undesired by-products in the synthesis of peptides [1-3] Hydantoin derivatives are synthetically valuable[4-7]. Activity of hydantoin derivatives depends on the nature of substitution on hydantoin ring[8]. They possesses a broad range of activities such as antiarrhytmic[9], anticonvulsant[10], antitumor[11], andantiandrogenic [12] antiviral activities[13,14], antidepressant[15] antibacterial[16,17], antifungal[18,19] calcium-channel-blocker[20] anticancer[21,22], etc. Due to this vital role it was thought to synthesize hydantoin derivatives and study their biological activities.

MATERIAL AND METHODS: : Aurone derivative 0.01 M and urea 0.01M dissolved in ethanol then 10% KOH(10 ml) was added , shek well & reflux for 3 hrs. Allow the reaction mixture to cool. It was then decomposed in acidified dil HCl with constant stirring, solid thus obtained was washed with NaHCO3 dried and recrystalised from ethanol to get hydantoin derivative.

All the chemicals used for the synthesis were purified. The melting points of synthesized compounds were noted in a hot paraffin bath. IR spectra was recorded with Perkin Elmer spectrometer. 1H NMR spectra was recorded on Bruker-AC-300 F spectrometer using Tetra methyl silane as a standard solvent.

SCHEME



R_1 = H, Br R_2 = OCH_3, CH_3, H R_3 = OCH_3, H R_4 = F, OH, H

RESULTS AND DISCUSSION:

Table 1: Physical Properties.

Compound No	Molecular formula	R^1	R^2	R^3	R^4	Melting Point °C	% Yield	% Nitrogen		R. F. Value
								Found	Calculated	
1	$C_{24}H_{15}FN_2O_4$	H	H	H	F	175^0C	54%	6.75	6.76	0.59
2	$C_{24}H_{16}N_2O_5$	H	H	H	OH	155^0C	61%	6.77	6.79	0.62
3	$C_{25}H_{18}N_2O_5$	H	OCH_3	H	H	121^0C	43%	6.55	6.57	0.56
4	$C_{26}H_{20}N_2O_6$	H	OCH_3	OCH_3	H	158^0C	47%	6.13	6.14	0.64
5	$C_{25}H_{18}FN_2O_4$	H	CH_3	H	H	147^0C	48%	6.51	6.52	0.54
6	$C_{24}H_{14}BrFN_2O_4$	Br	H	H	F	201^0C	55%	5.67	5.68	0.58
7	$C_{24}H_{15}BrN_2O_5$	Br	H	H	OH	192^0C	49%	5.68	5.70	0.52
8	$C_{25}H_{17}BrN_2O_5$	Br	OCH_3	H	H	143^0C	52%	5.52	5.54	0.54
9	$C_{26}H_{19}BrN_2O_6$	Br	OCH_3	OCH_3	H	165^0C	48%	5.22	5.23	0.58

Compound No. 2 : IR Analysis (cm-1): 3357(OH, str) , 3351 (OH, str) 3152(NH, str) 3258 (NH, str) 1723 (C=O, str) 1732 (C=O, str) , 1652 (C=O, str).
NMR (δ ppm): 5.39 (s, 3H, OH), 5.34 (s, 3H, OH), 6.96 (s, 1H, CH), 6.47- 8.25 (m, 12Ar-H) , 7.91 (s, 1H, NH), 10.05 (s, 1H, NH),

Molecular weight determined for the above compounds by Rast's method matches with calculated values. All peaks in IR and 1H NMR spectra are appear at expected values which confirms the formation of hydantoin derivatives. Screening of the above compounds was carried out against the microbes Bacillus subtilis, Klebsiella pneumoniae, Proteus vulgaris & Pseudomonas aeruginosa and fungai Candida albicans and Aspergillus niger. Most of these compounds were found active against Bacillus subtilis, Klebsiella pneumoniae, Proteus vulgaris & Pseudomonas aeruginosa and fungai Candida albicans and Aspergillus niger.

CONCLUSION: Synthesised hydantoin derivatives can be easily used for the treatment of diseases caused due to test pathogens if they do not have toxic and other side effects.

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