International Journal of Drug Development & Research
| Jan-March 2010 | Vol. 2 | Issue 1 |
ISSN 0975-9344
Available online http://www.ijddr.com

Original Research Manuscript

GROWTH INHIBITION OF MICROORGANISM BY BIOISOSTERISM

HIREN R. PATEL*, PARTH K. PATEL, DHRUBO JYOTI SEN AND AMIT H. PATEL
Department of Pharmaceutical Chemistry, Shri Sarvajanik Pharmacy College, Hemchandracharya North Gujarat University, Arvind Baug, Mehsana-384001, Gujarat, India
Phone: 00-91-2762-247711, Fax: 00-91-2762-247712, Email: dhrubosen69@yahoo.com

Abstract: *Growth inhibition of microorganisms have been screened for synthesised compounds of variable substitutions (R: electron withdrawing group and electron donating group) by zone of inhibition study on gram-positive and gram-negative microbes. Incubation for 6 hours the zone of electron donating groups becomes equal to the zone for electron withdrawing groups. The synthesized molecule has three units: Fused ring heterocyclic having three nitrogen + Fused ring nonheterocyclic + Fused ring heterocyclic having two nitrogen. All three units have fused pentacyclic ring in which nitrogen atom is bioisosteric with hydrocarbon which inhibits the bacterial growth from 500µg/ml which is the MIC level. Experimental result for the individual unit: Benztriazole, Benzimidazole and Indanone acetic acid showed no inhibition for microbial growth but the combined units of these three by Schiff base with homologous ethylene chain showed a remarkable result in bacteriostatic action.*

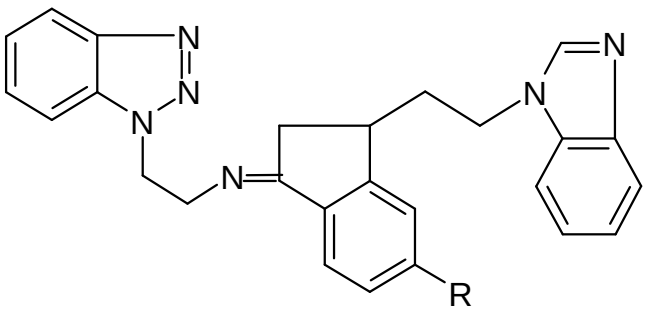
Keywords: Benztriazole, Benzimidazole, Indanone, Schiff's base, Zone of inhibition.

INTRODUCTION:

CHEMISTRY PART:

Two fused heterocyclic rings (benztriazole and benzimidazole) and one fused non-heterocyclic ring (indanone) have been synthesized and joined by Schiff base to get the desired product in which R is the variable group having electron donating (OH, Cl and NH_2) as well as electron withdrawing moiety (NO_2 and COOH) and characterization by spectral and elemental microanalysis by CHN% [1-3].

Synthesized molecule: R=H, OH, NH_2, NO_2, Cl, COOH

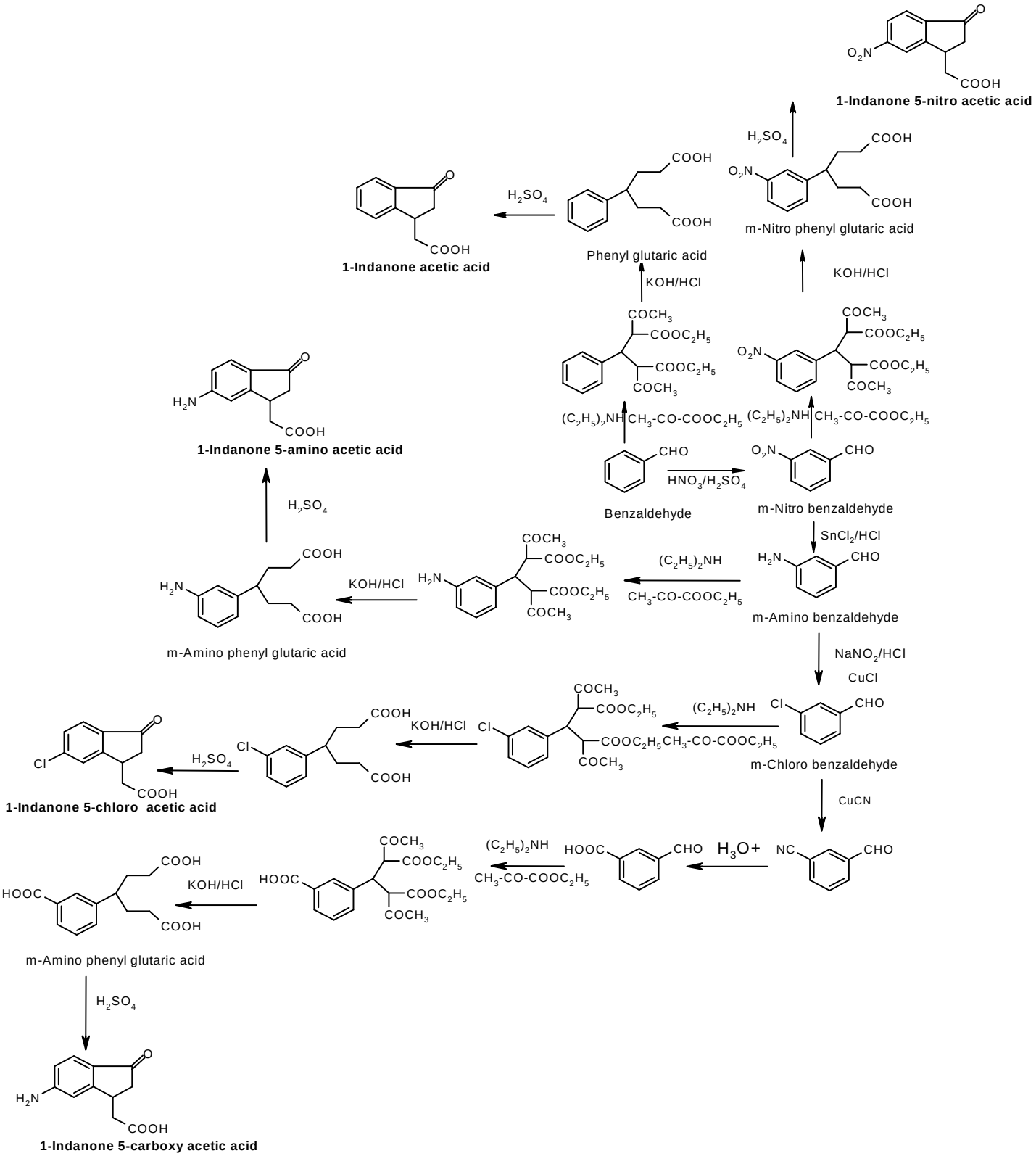


Biological Part

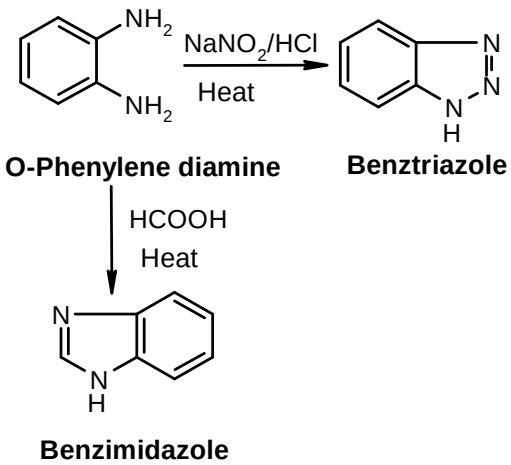
Antimicrobial assay by zone of inhibition study of the synthesized molecules on Gram-Positive and Gram-Negative microorganisms.

Correspondence: Prof. Dr Dhrubo Jyoti Sen
dhrubosen69@yahoo.com

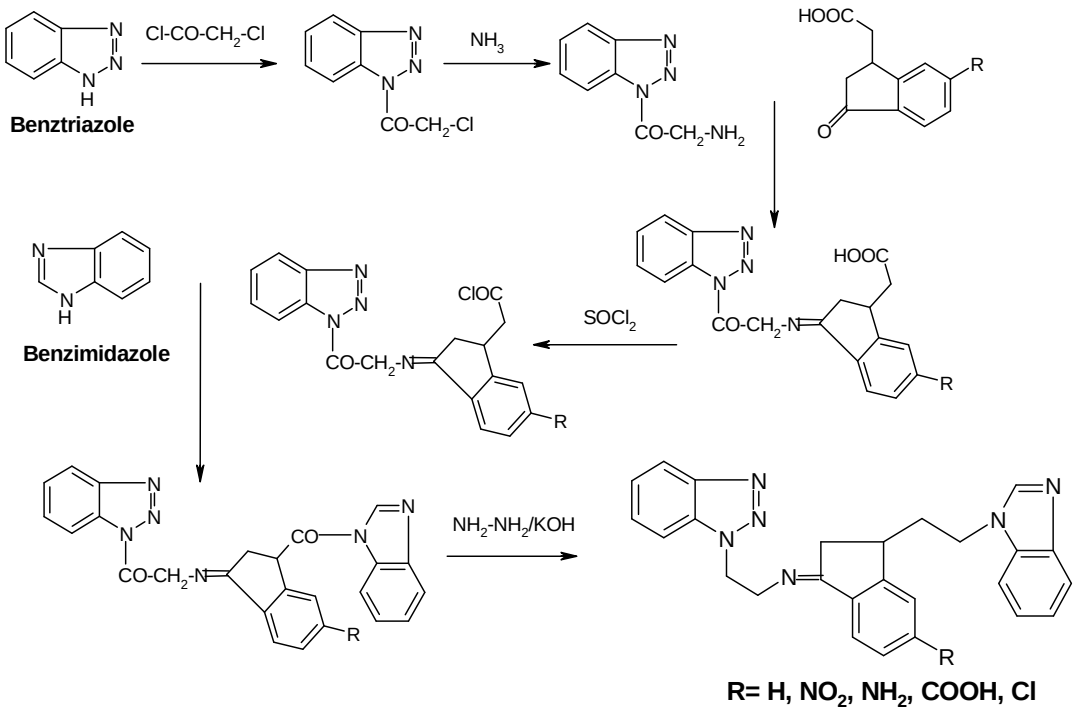
SCHEME-I


1-Indanone 5-nitro acetic acid
m-Nitro phenyl glutaric acid
Phenyl glutaric acid
1-Indanone acetic acid
1-Indanone 5-amino acetic acid
m-Nitro benzaldehyde
Benzaldehyde
m-Amino benzaldehyde
m-Amino phenyl glutaric acid
m-Chloro benzaldehyde
1-Indanone 5-chloro acetic acid
m-Amino phenyl glutaric acid
1-Indanone 5-carboxy acetic acid
H2SO4
KOH/HCl
HNO3/H2SO4
SnCl2/HCl
NaNO2/HCl
CuCl
CuCN
H3O+
(C2H5)2NH
CH3-CO-COOC2H5

SCHEME-II



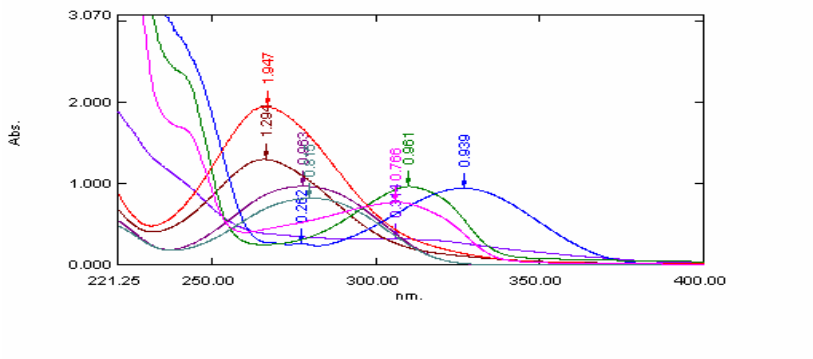
SCHEME-III



PHYSICOCHEMICAL PARAMETERS:

Compounds	% Yield	M.P. °C	Polarity	Molecular Formula	N% Calculated	N% Found
OH	77.37%	123-125	Semi polar	$C_{26}H_{21}N_6O$	19.39	19.40
Cl	68.33%	141-143	Semi polar	$C_{26}H_{22}N_6Cl$	18.54	18.21
NH_2	82.48%	136-138	Polar	$C_{26}H_{24}N_7$	22.58	22.47
NO_2	56.66%	150-152	Semi polar	$C_{26}H_{23}N_7O_2$	19.35	19.28
COOH	80.29%	160-162	Polar	$C_{27}H_{24}N_6O_2$	18.42	18.67
H	48.33%	144-146	Semi polar	$C_{26}H_{24}N_6$	20.00	22.12

UV SPECTRAS



BIOLOGICAL PART:

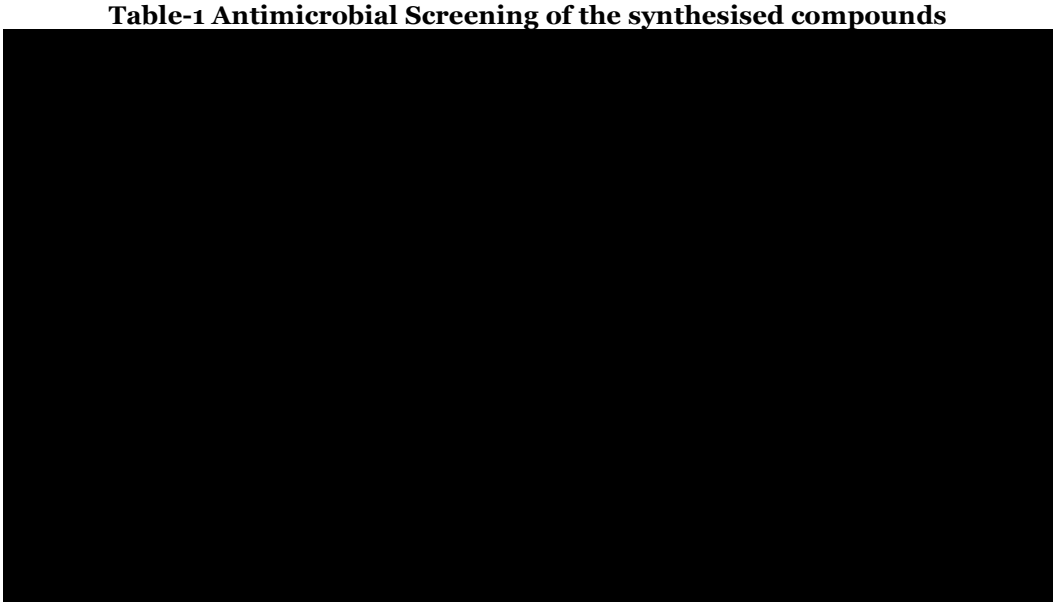
The microbiologal assay of the compounds was done by zone of inhibition studies on agar plate drained by the suspension of gram-positive microorganisms:

Bacillus subtilis, Staphylococcus aureus and Micrococcus luteus and gram-negative microorganisms:

Escherichia coli, *Pseudomonas aeruginosa* and *Salmonella typhi*. The incubation period for 3 hours showed a good result on inhibition of bacterial growth for the R-substitution: OH, Cl and NH_2 which are electron donating groups whereas for the R-substitution: NO_2, COOH and H the inhibition was not satisfactory at 3 hours incubation for 500µg/ml concentration [4].

R	Incubation Time: Hours	Zone Diameter: mm	Incubation Time: Hours	Zone Diameter: mm
OH	3	23	6	23
Cl	3	22	6	25
NH_2	3	24	6	25
NO_2	3	03	6	24
COOH	3	04	6	25
H	3	04	6	25
Benztriazole	3	00	6	00
Benzimidazole	3	00	6	00
Indanone acetic acid	3	00	6	00

Table-1 Antimicrobial Screening of the synthesised compounds



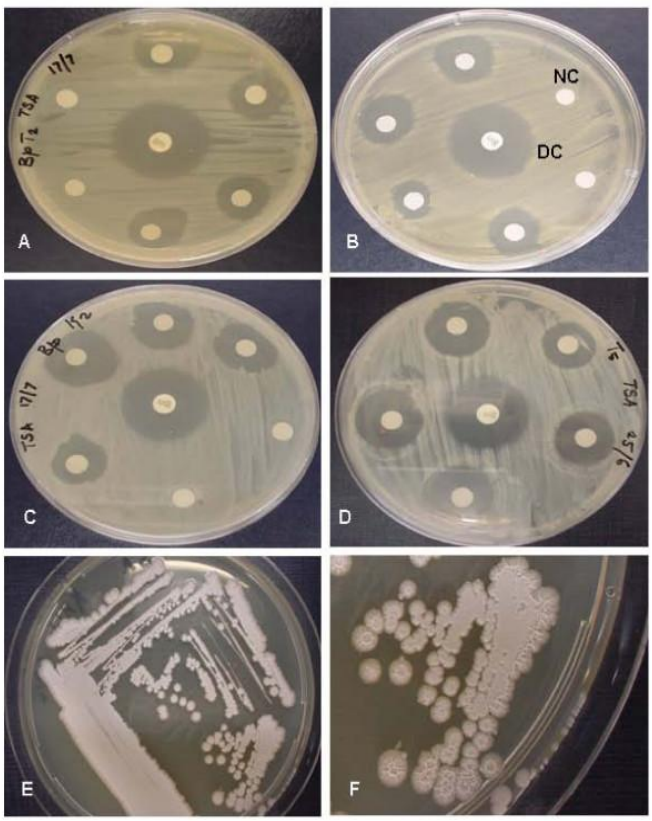
500µg/ml concentration

500µg/ml concentration

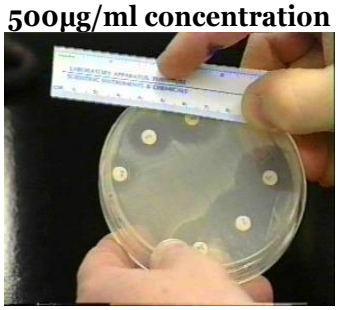
500µg/ml concentration

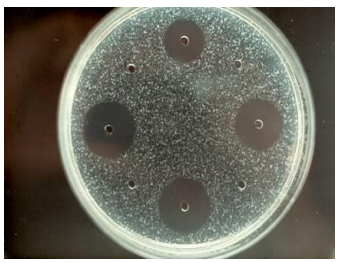
500µg/ml concentration

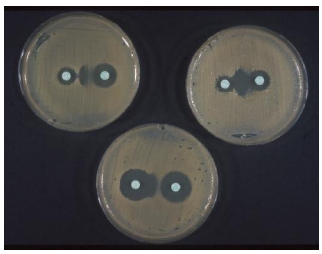
PHOTOGRAPHS OF BACTERIOSTATIC ACTIVITY OF COMPOUNDS
500µg/ml concentration



500µg/ml concentration







ZONE OF INHIBITION OF COMPOUNDS

CONCLUSION

Incubation for 6 hours the zone of electron donating groups becomes equal to the zone for electron withdrawing groups. The synthesized molecule has three units: Fused ring heterocyclic having three nitrogen + Fused ring nonheterocyclic + Fused ring heterocyclic having two nitrogen. All three units have fused pentacyclic ring in which nitrogen atom is bioisosteric with hydrocarbon which inhibits the bacterial growth from 500µg/ml which is the MIC level. Experimental result for the individual unit: Benztriazole, Benzimidazole and Indanone acetic acid showed no inhibition for microbial growth but the combined units of these three by Schiff base with homologous ethylene chain showed a remarkable result in bacteriostatic action [5].

ACKNOWLEDGEMENT:

The author Hiren R. Patel (M.Pharm.) is thankful to the Co-Researchers Parth K. Patel (B.Pharm.) and Amit H. Patel (B.Pharm.) and special thanks to the project guide Prof. (Dr.) Dhrubo Jyoti Sen, Department of Pharmaceutical and Medicinal Chemistry and the staff members of Shri Sarvajanik Pharmacy College, Mehsana, Gujarat, India to fulfill the project work successfully. One of the author Mr. Parth K. Patel has presented this work in the **International Conference** on **9th Annual Florida Heterocyclic IUPAC-Sponsored Conference** at University of Florida, Gainesville, United States of America, **9-12 March 2008**.

Reference:

1. Vogel A I, Textbook of Practical Organic Chemistry, 3rd ed., (Longmans, Green and Co., Ltd.), 1956, 403.

2. Blicke F F, Organic Reactions Vol-I, 6th ed., (John Wiley and Sons, Inc., London), 1957, 303-341.

3. Maxwell Charles E, Org Syn Coll Vol-III, 3rd ed., 1955, 305.

4. Sen D J, PhD Thesis, Jadavpur University, Kolkata, 2000.

5. Kavanagh F, Analytical Microbiology: Vol-I and II, (Academic Press, London), 1963, 1972.

Article History:----------

Date of Submission: 28-01-10

Date of Acceptance: 05-03-10

Conflict of Interest: NIL

Source of support: NONE