Rayat Shikshan Sanstha's

Sadguru Gadage Maharaj college, Karad

"NAAC accredited A^+ grade"

(Autonomous)

A project report on

"Synthesis, Characterization & Bio-Evaluation of Indole Containing Heterocyclic Compound."

A Project Report submitted for Partial fulfillment of the award for the degree of the

Master of Science

in

ANALYTICAL CHEMISTRY

By

Sr No.	Name of Student	Roll No.
1.	**Phadtare Swapnali Chandrakant**	92

Under the Guidance of

Mr. Khot D. S.

Assistant Professor Department of Chemistry

Report Submitted to

Sadguru Gadage Maharaj College, Karad.

(Year 2022-2023)

Rayat Shikshan Sanstha's

Sadguru Gadage Maharaj College, Karad

"NAAC accredited A+ grade"

(Autonomous College)

Department of Chemistry

CERTIFICATE

This is to certify that,

Phadtare Swapnali Chandrakant

have successfully completed the project on

"Synthesis, Characterization & Bio-Evaluation of Indole Containing Heterocyclic Compound."

For the partial fulfillment for the Master of Science in Analytical chemistry under my supervision as per rules and regulation of S.G.M. College, Karad affiliated to Shivaji university, Kolhapur, year 2020 -2021. This work presents bonafied work of the students under my guidance and satisfactory carried out and completed the project work for the degree of M.Sc. in Analytical Chemistry, they have presently submitted their project entitled.

Mr. Khot D. S.
Assistant Professor
Department of Chemistry

Head Department of Chemistry

Acknowledgement

With great pleasure, we express our deep gratitude to ***Mr. Khot D. S.*** , Department of chemistry of S.G.M. College, Karad for valuable guidance, constant inspiration and help throughout the project work.

We thankful to ***Prin. Dr. M. M. Rajmane*** and ***Prof. Mrs. Salunkhe A.S.*** (Head) Department of Chemistry, S.G.M. College, Karad for providing the required facilities and valuable advice during the completion of this project.

We also thankful to members of teaching and non-teaching staff of chemistry department for their kind co-operation and help. Also, thanks to all our friends for their good will to complete this project work.

We also acknowledge our family members for their constant support and encouragement.

Place: - Karad
Date: -

Phadtare Swapnali Chandrakant

DECLARATION

We undersigned, here by declared that the Project on 'Synthesis, Characterization & Bio-Evaluation of Indole Containing Heterocyclic Compound.' is completed under the guidance of Mr. Khot D. S., Department of Chemistry, S.G.M. college, Karad. The conclusion based on data which is collected by us, we declared that this is our work.

Yours faithfully,

Phadtare Swapnali Chandrakant

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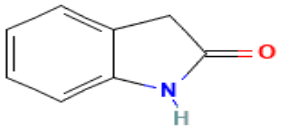
Synthesis, Characterization & Bio evaluation of Indole containing heterocyclic compounds

Abstract:-

Indole Containing compounds have shown a broad spectrum of biological effects including anti-cancer, anti-viral, anti-bacterial and anti-inflammatory.. The product 3-(7-Nitrobenzylidene)indolin-2-one synthesized by using nitrobenzaldehyde and Oxindole in presence of Na_2CO_3. These findings revealed that 3-(7-Nitrobenzylidene)indolin-2-one retains a significant anti-fungal activity against **Staphylococcus Aureus** And **Serratia Marcescens**, an important pathogen

Introduction

Initially, indoles became economically important as dyestuffs (e.g., indigo). However, they may also carry pronounced anticancer activity if appropriately substitutedStaurosporin, isolated from Streptomyces staurosporeus, served as a lead compound and blueprint for the development of kinase inhibitors. Its refinement led to promising drug candidates such as sunitinib and enzastaurin which are currently undergoing advanced clinical trials against breast cancer.



Oxindole

The duocarmycins feature DNA-targeting 5,6,7-trimethoxy-indole moieties connected to alkylating spirocyclopropylhexa dienones which bind to the minor groove of DNA via sequence-selective N3-adenine alkylation. Brassica indoles such as indole-3-carbinol (I3C) and its metabolite 3,3'-diindolylmethane (DIM) have emerged as valuable anticancer agents operating by inhibition of Akt and NF-B dependent signalling. Special formulations of DIM (e.g., BDIM, BioResponse-3,3-diindolylmethane) underwent clinical trials where they caused PSA stabilization as well as partial response in prostate cancer patients. These encouraging findings were an incentive for the development of a multitude of further indole derivatives with potential or proven anticancer activities. Indoles, oxindoles, isatins, and their derivatives are relevant nitrogen-containing heterocycles widely distributed in natural products and pharmaceutical compounds .

Oxindole and other related ring systems, have several interesting biological activities. According to the literature survey, 1-substituted aminomethyl-3-cyclohexylthiosemicarbazone-2-indolinones have shown significant antifungal, antibacterial and antiviral activities both in vivo and in vitro. The new 1,3-dihydro-3-hydroxy-3-[2-hydroxyimino-2-(substituted phenyl)ethyl]-2H-indol-2-ones were synthesized and tested for antimicrobial activity and majority of the compounds were found to exhibit promising antibacterial and antifungal activities. 3-amino-1-hydroxy-oxindole and related compounds have found to show significant antimicrobial activity. Oxindole and related indole derivatives have also been found to show very good antioxidant activity.Sulfonamide based drugs are known for their antimicrobial activities.

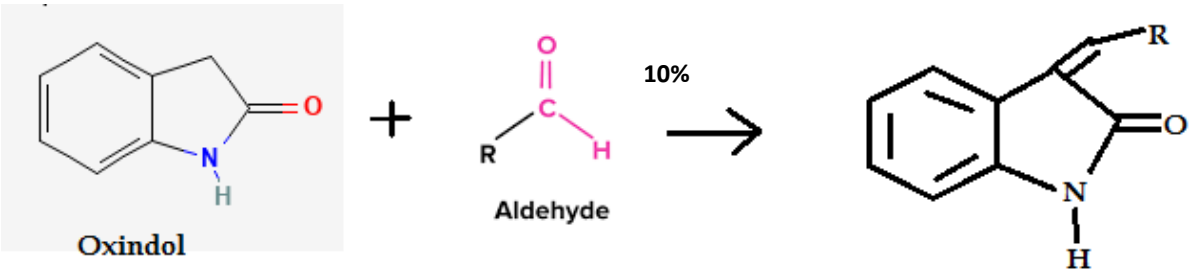
Experimental Procedure:-

Reagents	Mol. Wt.	m MOl.	E qui.	Wt.	Density	Vol.
Oxindole	133gm	0.1	1	0.0133 gm	-	-
p-Nitrobenzaldehyde	151gm	0.1	1	0.0151 gm	-	-
Catalyst	105.98 gm	10 %	-	-	-	-
Solvent (EtOH)	-	-	-	-	-	10 mL

Procedure:-

1. Take a 10mL of Ethanol In 100ml round bottom flask. Insert magnetic needle in it.
2. Weigh 0.0133gm of Oxindole and dissolve in solvent on magnetic stirrer.
3. Weigh 0.0151gm p-Nitrobenzaldehyde and add it in round bottom flask. Start stirring on magnetic stirrer.
4. After few minutes add 0.1 mL 10% Na_2CO_3 . Start stopwatch after each 5 min add 0.1 mL 10% Na_2CO_3 with the help of graduated micro syringe.
5. Add it for three times after each 5 min. Take TLC check completion of reaction.
6. After Completion Of reaction pour it in alcohol and separate it. After isolation filter it and recrystallize.
7. **Recrystallization:-** The solvent chosen for recrystallization is mixture of Acetone and water and recrystallized in pure form Of compound.

Reactions:-



Photos After Each 5 Min of Addition of 10%Na_2CO_3:-

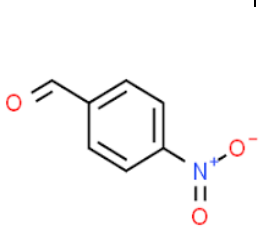
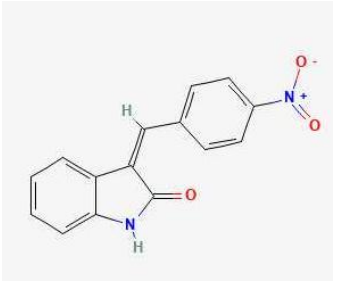
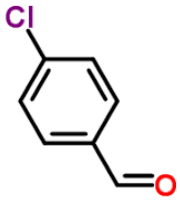
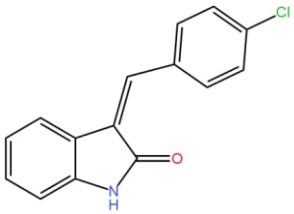
At Starting Point

After First Addition of Na_2CO_3

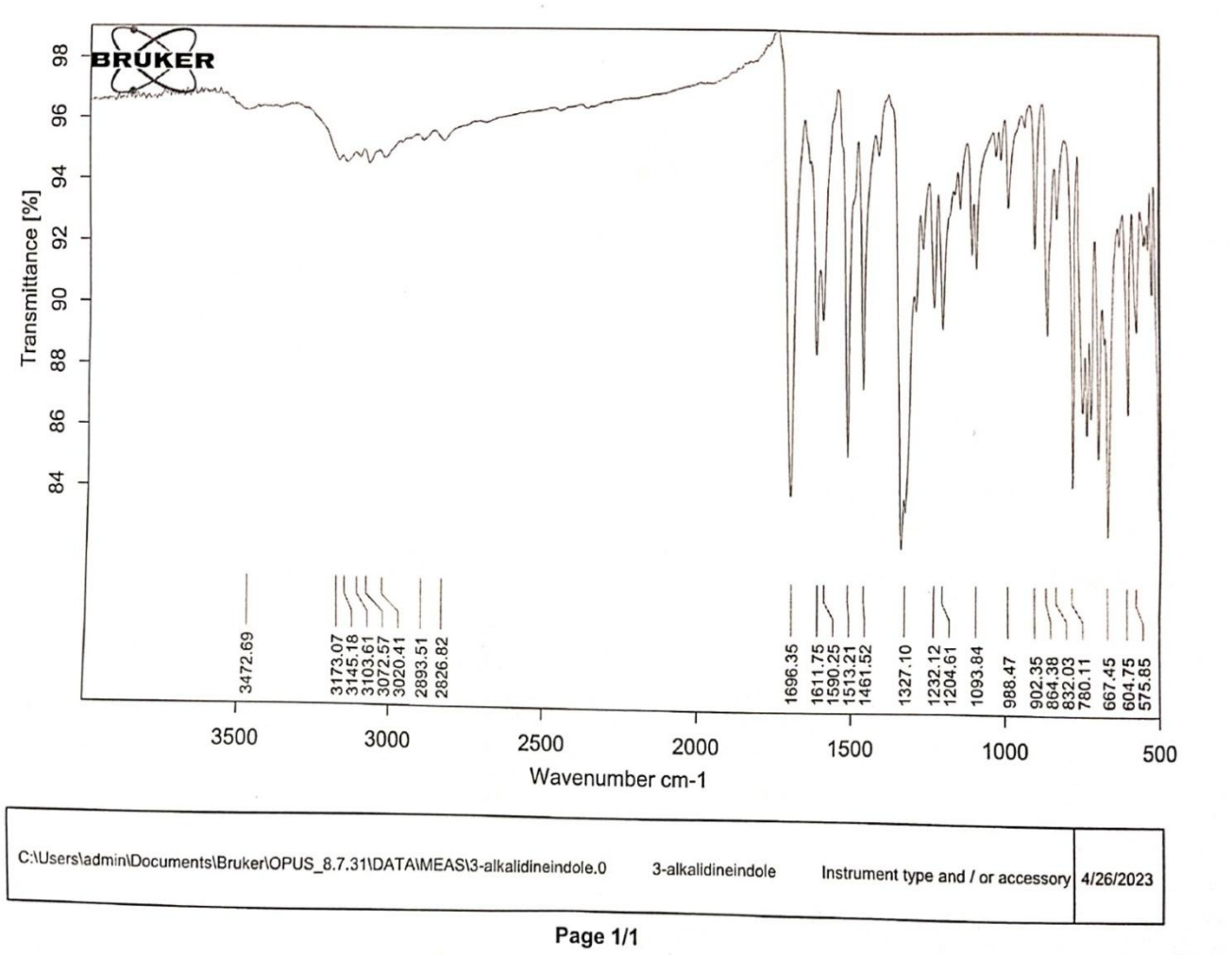
After 5 min of stirring

After 10 min of Stirring

Table :-

Entry	Aldehyde	Product	Yield	Time
1.			68%	40
2.			56%	44

Characterization by IR- Spectroscopy:-

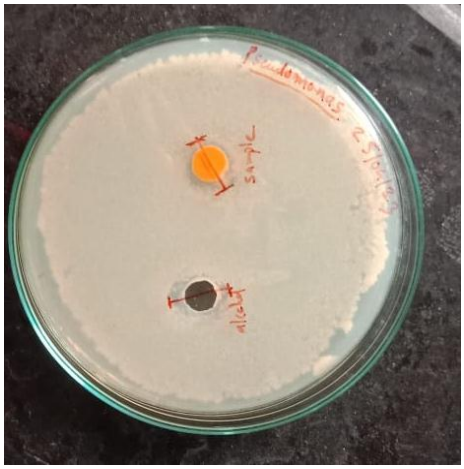


Sr. No.	Groups	Peak Frequencies
1.	Carbonyl Group	1696.35 cm^{-}
2.	-NO2	1513.21 cm^{-}
3.	Secondary –NH	3472.69 cm^{-}

4.	**Aromatic Ring**	1696.35 cm^{-}

Bio-Evaluation Results With Photos:-

Name of Organism	Diameter Of Inhibitory Zone	
	Sample	**Solvent**
Pseudomonas	2	1.5
Staphylococcus aureus	1.4	1.2
Serratia marcescens	1.3	1.1
Bacillus subtilis	1.7	1.4



Pseudomonas:-

When sample of 3-(7-Nitrobenzylidene)indolin-2-one is applied on pseudomonas containing bacterial plate with taking solvent as a reference. The Zone of inhibition of bacteria is greater than reference Solvent. It indicates that 3-(7-Nitrobenzylidene)indolin-2-one is affects on bacteria **Excllent**.

Staphylococcus aureus:-

When sample of 3-(7-Nitrobenzylidene)indolin-2-one is applied on Staphylococcus Aureus containing bacterial plate with taking solvent as a reference. The Zone of inhibition of bacteria is greater than reference Solvent. It indicates that from result table is 3-(7-Nitrobenzylidene)indolin-2-one is affects on bacteria **Moderate** .

Serratia marcescens:-

3-(7-Nitrobenzylidene)indolin-2-one is applied on Serratia Marcescens containing bacterial plate with taking solvent as a reference. The Zone of inhibition of bacteria is greater than reference Solvent. It indicates that from result table is 3-(7-

Nitrobenzylidene)indolin-2-one is affects on bacteria **Moderate**.

Bacillus subtilis:-

When sample of 3-(7-Nitrobenzylidene)indolin-2-one is applied on Bacillus Subtilis containing bacterial plate with taking solvent as a reference. The Zone of inhibition of bacteria is greater than reference Solvent. It indicates that from result table is 3-(7-Nitrobenzylidene)indolin-2-one is affects on bacteria **Moderate**.

Results:-

The product 3-(7-Nitrobenzylidene)indolin-2-one synthesized by using nitrobenzaldehyde and Oxindole in presence of Na_2CO_3 and FTIR spectra confirmed the formation of 3-(7-Nitrobenzylidene)indolin-2-one . The mean Zones of Inhibition (ZOI) against **pseudomonas** for compound 3-(7-Nitrobenzylidene)indolin-2-one and the positive control **Bacillus Subtilis** were 5.0±0 mm, and 3.0±0.5 mm, respectively. The mean ZOI against **Staphylococcus Aureus,** of compound A1 and the **Serratia Marcescens** were 2.0±0 mm, and 2.0±0 mm, respectively. Compound 3-(7-Nitrobenzylidene)indolin-2-one show anti-fungal activity against both **Staphylococcus Aureus** And **Serratia Marcescens** in Equal.

Conclusion:-

These findings revealed that 3-(7-Nitrobenzylidene)indolin-2-one retains a significant anti-fungal activity against **Staphylococcus Aureus** And **Serratia Marcescens**, an important pathogen. N-H functionality of 3-(7-Nitrobenzylidene)indolin-2-one is essential for its anti-fungal activity and the structural characteristics we found here may contribute future development of novel therapeutic agents.

Reference:-

1. **Selective C3 – alkenylation of oxindole with aldehydes using heterogeneous CeO_2 catalyst**

   Md. Nurnobi Rashed, Abeda Sultana Touchy, Chandan Chudari, Jaewan Jeon, S. M. A. Hakim Siddiki, Takashi Toyao, Ken-ichi Shimizu.

2. **Journal of Molecular Structure**

   Volume 1285, 5 August 2023, 135530

3. **Synthesis, biological evaluation and molecular docking study of oxindole based chalcone analogues as potent anti-Alzheimer agents**

   Muhammad Taha a, Haleema Sadia b, Fazal Rahim b, Mohammad Imran Khan c d, Shawkat Hayat b, Naveed Iqbal e, Faisal Nawaz f, Hayat Ullah g, Hussan Zada b, Syed Adnan Ali Shah h i, Abdul Wadood j, Rai Khalid Farooq k, Khalid Mohammed Khan