

بسم الله الرحمن الرحيم





شبكة المعلومات الجامعية التوثيق الالكتروني والميكروفيلم



جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

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**Synthesis and Characterization of Some New Fused
Heterocyclic Derivatives Containing Nitrogen and / or
Sulfur**

By

Doaa Abdallah Zaki Ismail

This thesis has been approved for submission by the supervisor:

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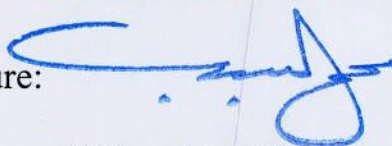
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Prof. Dr. Mohamed Ahmed Badawy

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Chairman of Chemistry Department
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Abstract

Name: Doaa Abdallah Zaki Ismail

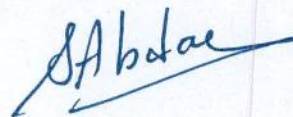
Title: "Synthesis and Characterization of Some New Fused Heterocyclic Derivatives Containing Nitrogen and / or Sulfur"

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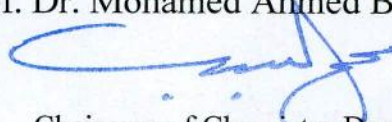
This work has been carried out to investigate the chemical reactivity and synthetic potentiality of 2-thioxohydropyridines *via* their reactions with several active halogenated compounds to afford the corresponding 2-S-alkyl pyridine derivatives and thieno[2,3-*b*]pyridine derivatives. The synthetic potential of several thieno[2,3-*b*]pyridine derivatives was investigated *via* their reactions with several reagents aiming to build up a new ring on the thienopyridine skeleton. Structures of all newly synthesized heterocyclic compounds were established by considering the data of both spectroscopic and elemental analyses.

KeyWords: Pyridine-2(1H)-thiones, Thienopyridines, Pyrazolopyridines, Pyrido-thienopyrimidines, Coumarin derivatives.

Supervisor: Prof. Dr. Sadek Elsayed abdou



Prof. Dr. Mohamed Ahmed Badawy



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M. Sc. Courses studied by the candidate

Beside the work carried out in this thesis, the candidate had attended and successfully passed a final examination of M. Sc. Courses (2009) in organic chemistry covering the following topics:

- 1- Applied spectroscopy.
- 2- Advanced physical organic chemistry.
- 3- Petrochemicals.
- 4- Additives in plastic Technology.
- 5- Textile dyes.
- 6- Photochemistry.
- 7- Biochemistry.
- 8- Macro Molecules Compounds.
- 9- Polymer chemistry.
- 10- Molecular Structure.
- 11- Organo metallic chemistry.
- 12- Green Chemistry.
- 13- Catalysis of organic Reactions.
- 14- Selected Topics.
- 15- Foreign language (German).

Prof. Dr. Mohamed Ahmed Badawy

Chairman of Chemistry Department
Faculty of Science, Cairo University

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I would like to say thanks a lot for my Friends and for everyone who offered me any help advice or even a smile during my work.

Doaa Abdallah Zaki Ismail

Aim of the present work

The present work was aimed and designed to satisfy and fulfill the following objectives:

- 1- Continuation of the effort done by this group of research at the Chemistry Department, Faculty of Science, Cairo University in the field of synthesis of heterocyclic derivatives with expected biological and pharmaceutical activities.
- 2- Synthesis of several new heterocyclic derivatives containing nitrogen and/or sulfur using the readily available reagents.
- 3- Establishment of the structures of the newly synthesized heterocyclic derivatives using elemental analyses and spectral data.
- 4- Synthesis of the newly obtained heterocyclic derivatives *via* alternative routes whenever possible as a further proof of their structures.
- 5- Study of the most probable mechanistic pathways leading to the formation of the obtained heterocyclic derivatives.
- 6- Study of the possible biological activities of the newly synthesized heterocyclic derivatives against some selected bacteria and fungi

CONTENTS

Title	Page No.
SUMMARY OF THE ORIGINAL WORK	I
INTRODUCTION	1
Synthesis of 2-thioxopyridine-3-carbonitrile derivatives using 2-cyanoethanethioamide (1)	1
1- By the reaction with carbonyl compounds	1
a- By the reaction with 2-(aminothioxomethyl)prop-2-enitrile (3)	1
b- By the one pot reactions	11
2- By the reaction with 1,3-dione compounds	22
3- By the reaction with α,β -unsaturated carbonyl compounds	25
4- By the reaction with α,β -unsaturated nitrile compounds	43
5- By the reaction with formamide acetal compounds	51
6- By the reaction with the ester of dicarboxylic acids	54
7- By the action of bases	55
8- By the reaction with distyryl ketones	56
9- By the reaction with arylidenemalononitriles	57
Biological activity of Coumarins	58
ORIGINAL WORK	62
EXPERIMENTAL	93
REFERENCES	117
ARABIC SUMMARY	Next

**SUMMARY OF THE
ORIGINAL WORK**

Summary of the original work

REACTIONS WITH PYRIDINE-2(H)-THIONES: SYNTHESIS AND CHARACTERIZATION OF SEVERAL NEW PYRIDINE AND ANNULATED PYRIDINE DERIVATIVES AND THEIR BIOLOGICAL EVALUATION

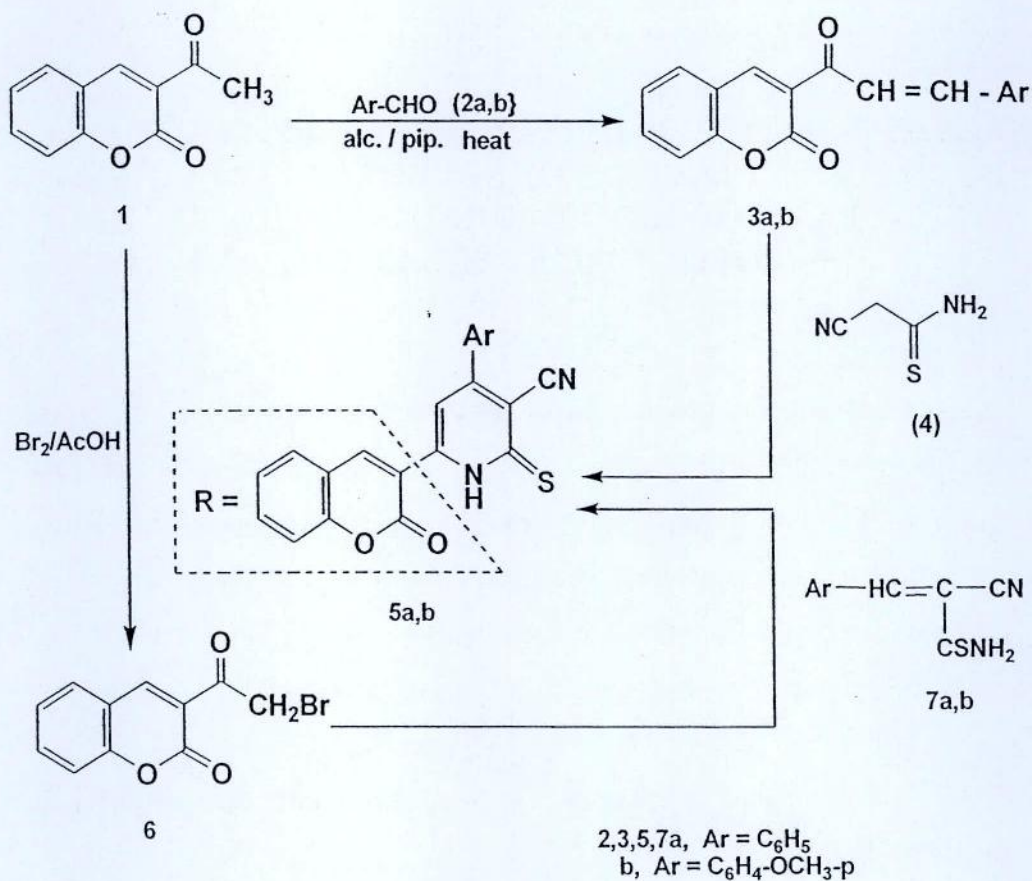
Synthesis and characterization of nitrogenous heterocyclic derivatives became the main target of this research group at Cairo University for more than three decades. From the numerous prepared heterocycles, the pyridine and fused azolo-, azino- and thienopyridines constituted the main and bulk derivatives. This is because of the fact that these derivatives possess diverse biological activities and are widely used in pharmaceutical and medicinal preparations.

The work included in the present thesis was primarily planned to fulfill the following objectives:

- a- Continuation of the effort done by this group of research in the field of chemistry of Pyridine -2(1H) -thiones.
- b- Synthesis of additional new heterocyclic derivatives of this ring system utilizing the readily available reagents and starting materials.

The following is a summary of the work investigated and included in the present thesis:

- 1- Compounds **5a,b** were prepared and taken as the starting materials for the present study (Scheme I). The synthetic potential of compounds **5a,b** was explored *via* their reactions with a variety of reagents and chemicals.



Scheme I

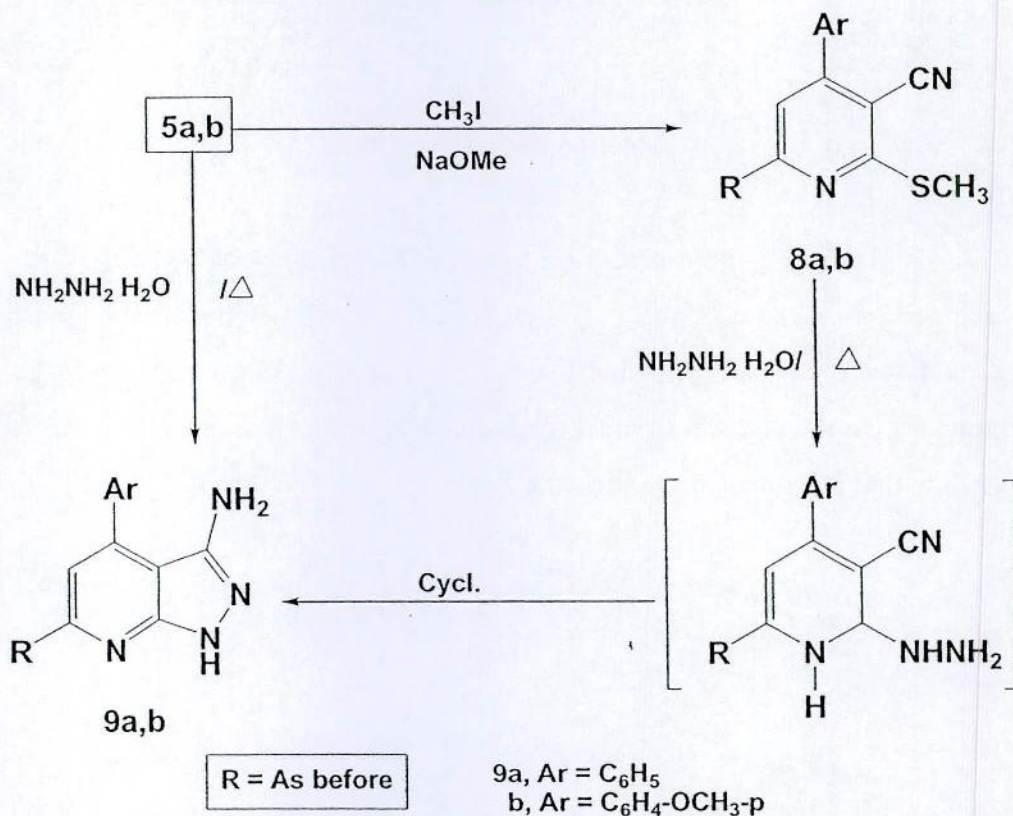
2- Compound **5a,b** reacted with iodomethane in methanolic sodium methoxide solution to afford the corresponding 2-(methylsulfanyl)-pyridine-3-carbonitrile derivatives **8a,b** respectively (Scheme II).

3- Compound **8a, b** reacted with hydrazine hydrate in pyridine under reflux to afford the corresponding 3,6-diamino-1*H*-pyrazolo[3,4-*b*]pyridine-5-carbonitrile derivative **9a,b** (Scheme II).

4- Compounds **5a,b** reacted with a variety of active halogenated reagents **10a-f** in ethanol containing a catalytic amount of anhydrous sodium acetate under reflux or in methanolic sodium methoxide under stirring to afford the corresponding 2-*S*-alkyl pyridine derivatives **11a-l** respectively which were

cyclized into the corresponding thieno[2,3-*b*]-pyridine derivatives **12a-l** respectively *via* boiling in ethanolic sodium ethoxide or potassium hydroxide solution under reflux. Compounds **12a-l** were authenticated on performing the reaction between **5a,b** and **10a-f** in boiling ethanolic sodium ethoxide solution under reflux (Scheme III).

- 5- 3-Aminothieno[2,3-*b*]pyridine-2-carbohydrazide derivatives **13a,b** were prepared *via* the reaction of 3-aminothieno[2,3-*b*]pyridine-2-carboxylate derivatives **12c,i** and hydrazine hydrate. Compounds **13a,b** could also be prepared *via* the reaction of ethyl ([pyridin-2-yl]sulfanyl) acetate derivatives **11c,i** with hydrazine hydrate (Scheme IV).



Scheme II