Ain Shams University
Faculty of Science
Department of Chemistry

Studies on the construction of some heterocyclic systems of synthetic and biological importance

A Thesis Submitted for the Degree of Doctor of philosophy in Science (Organic Chemistry)

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Abstract

The original work of this thesis can be classified into three parts:

Part 1: In this part, 2-Chloroquinoline-3-carboxaldehyde and 1,3-diphenylpyrazole-4-carboxaldehyde were condensed with thiocarbohydrazide and malonohydrazide derivatives. The condensation products obtained were converted into pyrazolidinoquinoline, pyrazoloquinoline, pyrrazolyltetrazine and thiazolidinone derivatives.

Part 2: In this part, A 2(5*H*)-furanone bearing two furyl rings was synthesized. The behavior of this furanone towards some nitrogen nucleophiles. The acid hydrazide synthesized was allowed to react with some carbonyl compounds to form pyrrole, pyrazole and pyrazolo-pyridazine ring systems bearing two furyl groups.

Part 3: In this part : a pyrrole derivative namely 4,5-diphenyl – 2 – thioxo-2,5-dihydro-1*H*-pyrrole-3-carbo-nitrile was used as a component of a composite for wastewater remediation from some organic dyes and microbial pollutants . The results obtained in this part indicate that the prepared nanocomposite has a double function : it is effective in removing the dyes(CV,MB and MO) from wastewater , also, it has enhanced antimicrobial activity.

English Summary

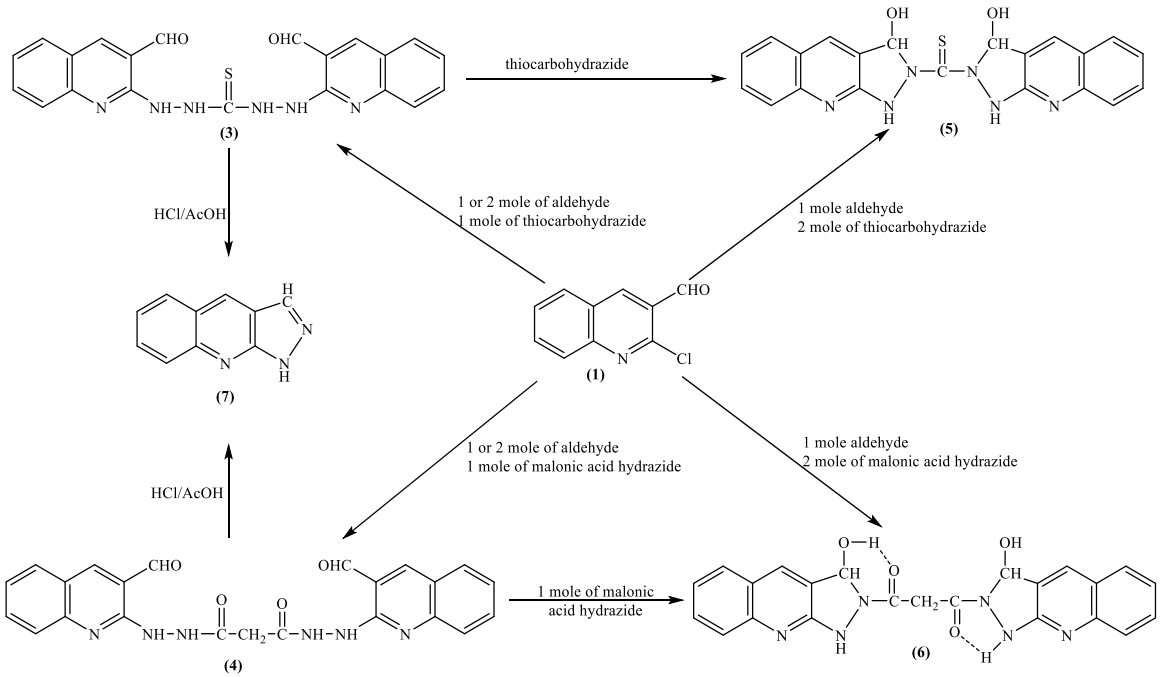
The nitrogen containing heterocyclic compounds are used extensively as important synthons in organic synthesis. Also they have wide spread potential biological activities in medicinal and pesticide chemistry.

The original work of this thesis can be classified into three parts:

Part (I): Synthesis and spectroscopic characterization of some novel pyazoloquinoline, pyrazolyltetrazine and thiazolidinone derivatives

The key starting materials for these syntheses were obtained from the reactions of two aldehydes namely 2-chloroquinoline-3-carboxaldehyde **1** and 1,3-diphenyl-pyrazole-4-carboxaldehyde **2** with carbothiohydrazide and malonohydrazide. Thus, when the quinolinealdehyde **1** was allowed to react with thiocarbohydrazide and/or malonohydrazide in different ratios, bis-formyl quinolinylcarbothiohydrazide **3** and/or malonohydrazide **4** derivatives were isolated, respectively, as the sole products. The formation of **3** and **4** clearly reveals the high reactivity of chlorine atom in position-2 towards the nucleophilic reagents used. So, substitution of this chlorine is more favored than addition of nucleophile to the aldehydic group. Treatment of **3** and/or **4** with another mole of the previous hydrazide derivatives led to the formation of the

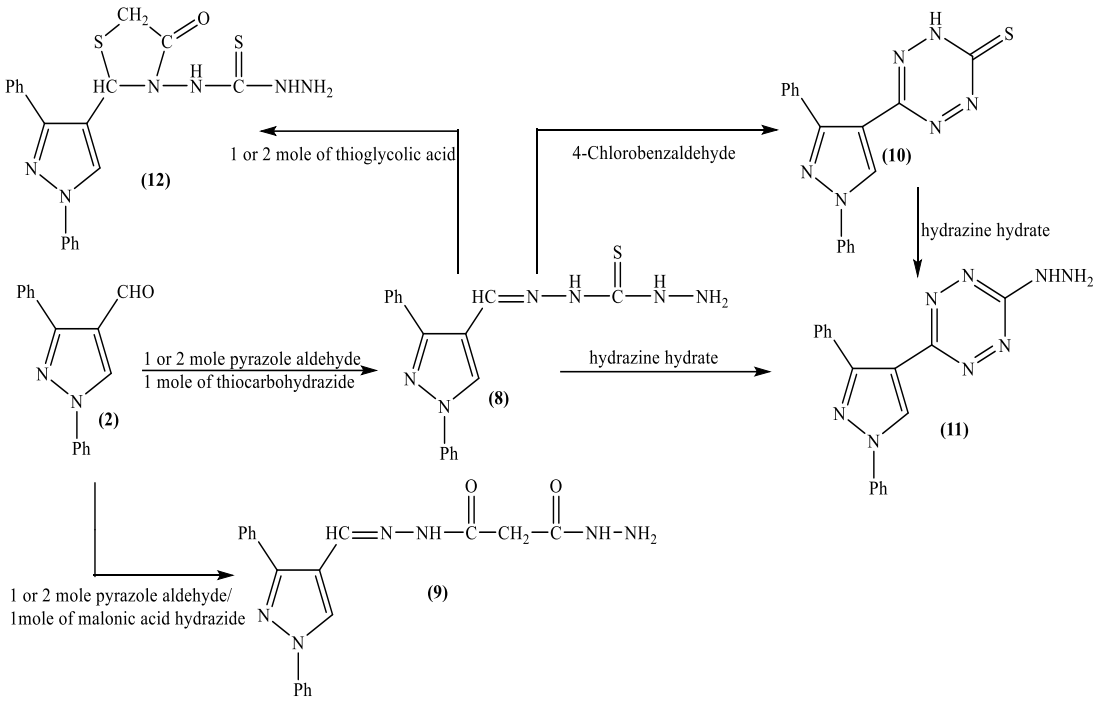
dipyrazolidinoquinoline derivatives **5** and/or **6** respectively. hydrolysis of **3** and/or **4** by using HCl/AcOH mixture gave the pyrazoloquinoline derivatives **7** (**Scheme 1).**



Scheme 1(Reaction of quinolinealdehydewiththiocarbohydrazide and malonohydrazidederivatives)

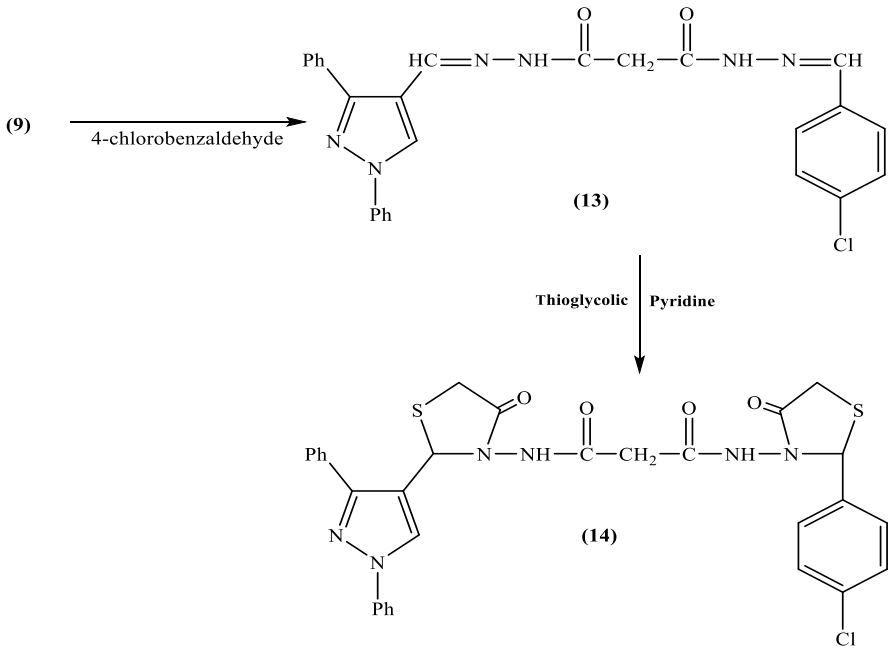
On the other hand, the pyrazolylhydrazone derivatives **8** and **9** were afforded upon treatment the pyrazole aldehyde **2** in different ratios with thiocarbohydrazide and/or malonohydrazide, respectively. Condensation of the pyrazolylthiohydrazone derivative **8** with 4-chloro benzaldehyde led to the ring closure of **8** and the formation of the pyrazolyltetrazinethione derivative **10.**

Hydrazinolysis of **8** and/or **10** gave the same product hydrazino derivative **11**.The thiazolidinone derivative **12** was obtained upon treatment **8** with thioglycolic acid **(Scheme 2).**



Scheme 2

The condensation product **13** was isolated by the reaction of pyrazolylmalonohydrazone derivative **9** with 4-chlorobenzaldehyde. The reaction of one and/or two moles of thioglycolic acid with **13** gave the dithiazolidinone derivative **14 (Scheme 3).**



(Scheme3)

Part (II): Synthesis and reactions of a 2(5*H*)-furanone bearing two furyl substituents.

2(5*H*)-furanones represent a group of heterocyclic compounds of synthetic and biological importance. The 2(5*H*)-furanone nucleus is present in a wide variety of biologically active natural products. Some of these derivatives have medicinal importance.

In this part a 2(5*H*)-furanone, namely, 3-cyano-4,5-di(furyl-2-yl)-2(5*H*)-furanone **2b** was formed as the only isolable product, without the formation of its 2(3*H*)-isomeric product when the furoin1bwas allowed to react with ethylcyanoacetatein sod. ethoxide/ethanol mixture.

The study was extended to explore the behavior of the synthesized 2(5*H*)-furanone **2b** towards some nitrogen nucleophiles. Thus, when the 2(5*H*)-furanone **2b** was refluxed with hydrazine hydrate in ethanol, the acid hydrazide derivative **4** was obtained . On the other hand, the reaction of the furanone **2b** with benzylamine in refluxing ethanol gave the benzylamide derivative **5**. On fusion of the furanone **2b** with benzylaminein neat, the pyrrolone derivative **6** was obtained as the only isolable product. The reaction of the furanone **2b** with ammonium acetate was also tried. On refluxing **2b** with ammonium acetate in acetic acid, the reaction gave the hydroxypyrrole