GOKHALE EDUCATION SOCIETY'S

ARTS, COMMERCE AND SCIENCE COLLEGE,

SHREEWARDHAN DIST RAIGAD- 402110

MINOR RESEARCH PROJECT ENTITLED

"APPLICATIONS OF SOLID SUPPORTED CATALYST IN ORGANIC SYNTHESIS"

SUBMITTED TO

UNIVERSITY GRANTS COMMISSION, (WRO),

GANESH KHIND, PUNE

BY

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DEPARTMENT OF CHEMISTRY

ARTS, COMMERCE AND SCIENCE COLLEGE SHRIWARDHAN,

DIST- RAIGAD- 402110

2013-2015

EXECUTIVE SUMMARY OF THE MINOR RESEARCH PROJECT REPORT

Brief Introduction

Dihydropyrimidinone and their derivatives have attracted considerable interest in recent years because of their important biological activities such as calcium channel blockers, antihypertensive agent and much more. Several marine sources of alkaloids containing the Dihydropyrimidinone, which also shows interesting biological properties. The simple and direct method for this multicomponent condensation reaction was first reported by Biginelli in 1893, However, in the recent years several methodologies mainly using solid supported catalyst have been reported in the literature.

In the present work substituted Dihydropyrimidinone derivatives by using Solid Support catalyst (shell powder of Crassostrea species) are synthesized from aldehyde, Ethyl acetoacetate or acetyl acetone, urea or thiourea The formed compounds have been evaluated by physical methods like melting point, thin layer chromatography elemental analysis and functional group analysis.

This is simple and environmentally-friendly method which requires mild reaction conditions. Catalyst used is easily available and can be reused. All synthesized compounds with have satisfactory yield.

Objectives of the Project

ix. To develop the research culture at the college level in rural area.

x. Develop environmentally friendly procedure and Increase the yield of product

xi. Develop a new Solid support for known reaction.

xii. Develop a new catalyst support for toxic reagents.

xiii. Develop an alternative for expensive polymeric support resins.

xiv. Minimize use of toxic solvents.

xv. Useful compounds synthesized for their diverse applications in pharmacological field.

xvi. All above objectives & applications prompted us to synthesis some new Dihydropyrimidinone derivatives.

Achievements from the Project

Following achievements were made under minor research project:-

Under this minor research project developed a new synthetic methodology for the preparation of substituted Dihydropyrimidinone derivatives by using Solid Support catalyst (shell powder of Crassostrea species. These substituted Dihydropyrimidinone derivatives are useful for the preparation of biological active compounds.

Materials and Methods:

The chemicals are used as of analytical grade i.e. aldehydes, Ethylacetoacetate, acetyl acetone, urea, thiourea, Conc. H_2SO_4 and Ethanol.

All the melting points were determined in open capillaries and are uncorrected. The purity of compounds was checked by TLC on silica gel by using aluminium sheet. The elemental analysis were carried out by chemical methods.

In reaction mixture aldehyde (1mmol), Ethyl acetoacetate or acetyl acetone (2 mmol), urea or thiourea (1.2 mmol) and catalyst (acidified Crassostrea species Shell powder) (0.2 g) was reflux using ethanol as solvent. The progress of reaction was monitored by taking TLC of reaction mixture using suitable eluent. After completion of

reaction the reaction mixture was cooled to room temperature. The product obtained was filtered and washed with ethanol and then recrystalized using ethanol.

Summary of the Findings

Dihydropyrimidinone and their derivatives have attracted considerable interest in recent years because of their important biological activities such as calcium channel blockers, antihypertensive agent and much more. Several marine sources of alkaloids containing the Dihydropyrimidinone, which also shows interesting biological properties. The simple and direct method for this multicomponent condensation reaction was first reported by Biginelli in 1893, However, in the recent years several methodologies mainly using solid supported catalyst have been reported in the literature.

In the present work substituted Dihydropyrimidinone derivatives by using Solid Support catalyst (shell powder of Crassostrea species) are synthesized from aldehyde, Ethyl acetoacetate or acetyl acetone, urea or thiourea The formed compounds have been evaluated by physical methods like melting point, thin layer chromatography elemental analysis and functional group analysis.

This is simple and environmentally-friendly method which requires mild reaction conditions. Catalyst used is easily available and can be reused. All synthesized compounds with have satisfactory yield.

Conclusion

In the present work Acidified Crassostrea species Shell powder has been used as a solid supported catalyst in synthesis of Dihydropyrimidinone derivatives through a one pot, three-components condensation of aldehydes, 1,3-dicarbonyl compounds and urea or

thiourea. This is simple and environmentally-friendly method which requires mild reaction conditions. Catalyst used is easily available and can be reused.

Contribution to the Society

Non-hazardous Solid Support catalyst (shell powder of Crassostrea species) is used for the preparation of Dihydropyrimidinone derivatives which is simple, green approach, simple workup, short reaction time and good to excellent yield. Synthesized compounds may have moderate to good biological activities with reference to related literature survey and might be beneficial to society.

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Synthesis of one pot Dihydropyrimidinone derivatives using acidified shell powder of Crassostrea species.

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Abstract
Dihydropyrimidinone derivatives have been synthesized using shell powder of Crassostrea species. For this one pot three components reactions of aldehydes, 1,3 dicarbonyl compounds and urea or thiourea were carried out using acidified shell powder. The reaction is carried out under reflux conditions using suitable solvent. The work-up of reaction is very simple, catalyst can be reused and it is environmentally-friendly.
Keywords: Dihydropyrimidinone, aldehydes, 1,3 dicarbonyl compounds, urea, environmentally-friendly.

Introduction

The use of solid supported reagents, catalysts and Scavengers represents a powerful approach for the synthesis of organic compounds[1-8], using both traditional and parallel solution –phase methodologies, and it has been of great interest in recent years, especially in the field of pharmaceutical research. Solid supported catalyst circumvents the need to bind the substrate to a solid support and there by allows for the reactions to be monitored with familiar analytical techniques. The advantages of this strategy have been thoroughly described in the literature[7].Solid supported Catalyst aided reactions are often very clean and high yielding, excess reagents can be employed to drive the reaction to completion, and the work-up involves only simple filtration and evaporation of the solvent. Moreover the course of the intermediates and products can be monitored using straight forward techniques[4].

Dihydropyrimidinone and their derivatives have attracted considerable interest in recent years because of their important biological activities such as calcium channel blockers, antihypertensive agent and much more[9-11]. Several marine sources of alkaloids containing the dihydropyrimidine which also shows interesting biological properties. The simple and direct method for this multicomponent condensation reaction was first reported by Biginelli in 1893, However, in the recent years several methodologies mainly using solid supported catalyst such as Lewis acids, triflates, microwave irradiations, ionic liquids, clay, silica-sulfuric acid, silica supported sodium hydrogen sulfate, Solid super acids, ion –exchange resins, trifluoroacetic acid and thiamine hydrochloride have been reported in the literature[7]. Due to much importance of Biginelli reaction products, lot of work has been done to improve yield and optimize reaction conditions. Thus, there is still a need for simple and environment friendly procedure for the synthesis of this dihydropyrimidinone under mild conditions.

In the present work an attempt has been made to synthesize Dihydropyrimidinone derivatives using shell powder of Crassostrea species. For this one pot three components reactions of aldehydes, 1,3 dicarbonyl compounds and urea or thiourea were carried out using acidified shell powder. The work-up of reaction is very simple, catalyst can be reused and it is environmentally-friendly

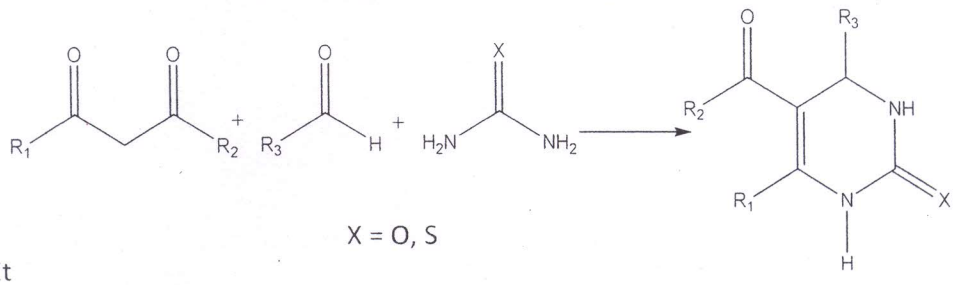
Experimental

Chemical were purchased from Sd fine-chem. And Merck chemical companies and directly used without further purification. The Progress of reaction was monitored by thin layer chromatography (TLC) run on Aluminium sheets TLC silica gel $60F_{254}$. Melting points were determined in open

capillaries. All the Products are known compounds and identified by their melting points with literature values.

In reaction mixture aldehyde (1mmol), Ethyl acetoacetate or acetyl acetone (2 mmol), urea or thiourea (1.2 mmol) and catalyst (acidified Crassostrea species Shell powder) (0.2 g) was reflux using ethanol as solvent. The progress of reaction was monitored by taking TLC of reaction mixture using suitable eluent. After completion of reaction the reaction mixture was cooled to room temperature. The product obtained was filtered and washed with ethanol and then recrystalized using ethanol.

Scheme 1. Acidified Crassostrea sp. Shell powder Catalyzed Biginelli reaction.



R_1 = Me X = O, S

R_2 = Me, OEt

R_3 = Aryl, Alkyl

Results and Discussion

Table 1. Synthesis of Dihyrdopyrimidinone in presence of Acidified Crassostrea species Shell powder.

Entry	R_1	R_2	R_3	X	Time (Min)	Yield, %	m.p.(°C)
1	Me	OEt	C_6H_5-	O	80	90	199-201[201-202]
2	Me	Me	C_6H_5-	O	60	86	234-236[236-237]
3	Me	OEt	C_6H_5-	S	90	75	210-212[208-209]
4	Me	OEt	4-Cl-Ph	O	70	82	207-209[206-208]
5	Me	OEt	2-OH-Ph	O	60	80	203-205[202-204]
6	Me	OEt	4-OH-Ph	S	110	72	204-206[202-203]
7	Me	Me	4-Cl-Ph	O	75	70	223-224[224-226]
8	Me	OEt	4-Meo-Ph	O	80	78	206-208[207-208]
9	Me	OEt	4-Meo-Ph	S	95	65	151-153[149-151]
10	Me	Me	4-Meo-Ph	O	50	82	167-169[169-171]
11	Me	Me	2-OH-Ph	S	60	85	240-242[242-243]
12	Me	Me	4-Me-Ph	O	50	86	231-233[230-231]
13	Me	OEt	4-OH-Ph	S	95	72	204-206[202-203]
14	Me	Me	Me-Ph	S	85	80	230-232[232-233]
15	Me	OEt	4-O_2N-Ph	O	115	65	205-207[206-208]

All products were characterized by m.p. and TLC. Yield refers to pure isolated products. Value in parenthesis indicates literature m.p.[12-13]

Conclusion

In the present work Acidified Crassostrea species Shell powder has been used as a solid supported catalyst in synthesis of Dihydropyrimidinone derivatives through a one pot, three-components condensation of aldehydes, 1,3-dicarbonyl compounds and urea or thiourea. This is simple and environmentally-friendly method which requires mild reaction conditions. Catalyst used is easily available and can be reused.

Acknowledgement

The author gratefully acknowledges the funding support received for this minor research project from the University Grants Commission and also thankful to Principal Dr. M. R. Meshram for providing laboratory facility.

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