SYNTHESIS AND SPECTRAL CHARACTERIZATION OF 2-AZITIDINONE DERIVATIVES

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Abstract

Azitidinone commonly called β-lacrams and it is well known heterocyclic compound. In the present work efficient and rapid synthesis of novel β-lactams has been established in good yields starting from aromatic carbonyl and aromatic amine. The Schiff base obtain from the aromatic carbonyl compound and aromatic amine in ethyl alcohol, then in situ ketene formed from acetyl chloride and triethyl amine, then ketene and Schiff base form 2-azitidinone. After synthesis we characterize the structure of 4-thiazolidinone derivative on the basis if IR and H^1 NMR. The purity of the synthesized compound was confirmed by TLC.

Keyword: β-Lactam, 2-Azitidinone, Schiff's base.

Introduction:

β-Lactams, was first synthesized in 1907 by Staudinger[1], by ketene-imine [2+2] cycloaddion ,this included synthesis of series of Schiff's bases and which reacted with ketene[2-3] have always attracted a enormous amount of interest, in particular since the innovation of penicillin in 1928 by Fleming and cephalosporin in 1945 by Brotzu[3].There is nemours method for the synthesis β-lactam[2], However, other notable methods are sometimes employed, including photoinduced rearrangements,[4] and radical cyclizations.[5] The present work deals with the synthesis & characterization of some β-lactam derivatives. This is derived from aromatic aldehyde & aromatic amine. A series of β-lactam is synthesized in satisfactory to excellent yield via the cyclization process. The 2-azitidinone derivative is obtained in the presence of 1,4-dioxane as a solvent. The triethyl amine was used as base which forms the ketene with the acetyl chloride.

Materials and Method:

The chemicals and solvent used in the present work are of synthetic grade, Merck company ltd. The products were characterized by 1HNMR and IR. The melting point were determined by open capillary method and is uncorrected. The IR spectra were recorded on Perkin-Elmer spectrum-One FTIR instrument in the form of KBr pallet. ^{1}HNMR spectra were recorded in $CDCl_3$ on a Bruker Avance II 400 NMR spectrometer using TMS as an internal standard. The reaction progress was monitored on thin layer chromatography and solvent system for mobile phase was chloroform/methanol in the ratio 9:1. The crude products were recrystallized from 10% ethanol.

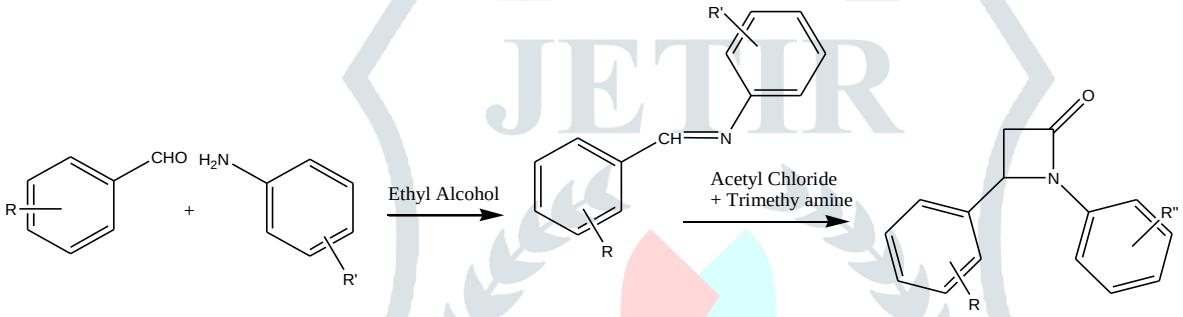
Present Work

I. Preparation of Schiff base :

A mixture of alcohol (15 ml) and benzaldehyde (0.01 mol) was taken into a 250 ml R.B flask. The mixture was stirred until a homogeneous solution was obtained. Amine (0.01mol) was added with stirring. (As the reaction is exothermic it should be carried out by placing R.B flask in a freezing mixture). Reaction mass is stirred for another 45 min. the Schiff base was precipitated out. Cool the reaction mass with stirring. The isolated crude product is purified by the washing in acetone.

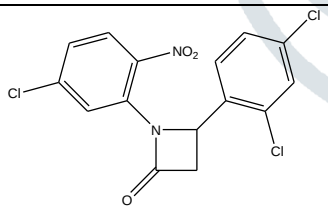
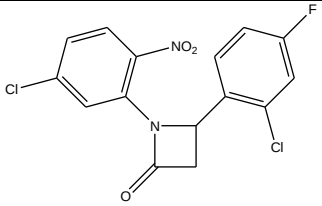
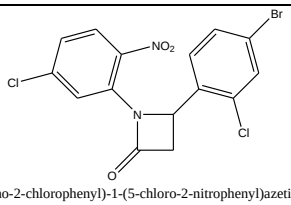
II. Preparation of β- Lactam :

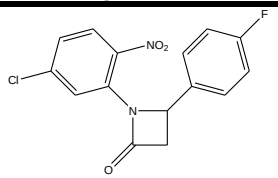
The solution of Schiff base acetyl chloride was taken in round bottom flask. To this few drops of triethyl amine and 1,4 dioxane was added and heated for two hours. The solid cake formed was filtered and the concentration of the filtrate was carried out to obtain solid residue which was purified by crystallization from ethyl alcohol. Similar technique is used for obtaining remaining compounds. TLC technique is used to confirm the purity; mobile phase used was benzene and alcohol.



Scheme I

Table I

Sr. No.	Structure & Name of product	Physical Constant	Color of product	Yield
1.	 1-(5-chloro-2-nitrophenyl)-4-(2,4-dichlorophenyl)azetidin-2-one	234°C	Reddish Brown	68.83%
2.	 1-(5-chloro-2-nitrophenyl)-4-(2-chloro-4-fluorophenyl)azetidin-2-one	265°C	Yellow	55.06%
3.	 4-(4-bromo-2-chlorophenyl)-1-(5-chloro-2-nitrophenyl)azetidin-2-one	190°C	Greenish yellow	59.33%

4.	 1-(5-chloro-2-nitrophenyl)-4-(4-fluorophenyl)azetidin-2-one	160°C	Yellowish White	63.44%

1) 1(5-Chloro 2-Nitrophenyl)-4-(2,4-dichloro phenyl)azitidin-2-one :- M.P.234°C

FT-IR 770 cm^{-1} for aromatic C-C stretching, 1190 cm^{-1} for $–NO_2$ for stretching 1630 cm^{-1} for C=O stretching , 1090 cm^{-1} for C-N stretching.

NMR δ 3.2,d for 2H, δ3.9 t for 1H, δ 6.6 to 8.0 m for 6H.

2) **1(5-chloro-2-nitrophenyl)-4-(2-chloro-4-flouro phenyl)azitidin-2-one:- M.P.265°C.**

FT-IR 754cm^{-1} for aromatic C-C stretching, 1230cm^{-1} for $–NO_2$ for stretching 1690 cm^{-1} for C=O stretching ,1160 cm^{-1} for C-N stretching.

NMR δ 3.8d, for 2H, δ 4.3 d, for 1H, δ 7.6 to 8.4 m for 6H.

3) **4(4-Bromo 2-phenylphenyl)-1-(5-chloro-2-nitro phenyl) azitidin-2-one:-M.P.190°C.**

FT-IR 765cm^{-1} for aromatic C-C stretching, 1247cm^{-1} for –NO2 for stretching 1608cm^{-1} for C=O stretching ,1107 cm^{-1} for C-N stretching, 1174 cm^{-1} for C-S stretching

NMR δ 3.9,d for 2H, δ 4.5 t, for 2H, δ 7.7 to 8.7 m for 6H.

4) **1-(5-Chloro-2-nitrophenyl)-4-(4-Fluorophenyl) azetidin-2-one:- M.P.160°c**

IR 769cm^{-1} for Ar C-C stretching 1290 cm^{-1} for $–NO_2$ for stretching 1675cm^{-1} for C=O tretching ,1115 cm^{-1} for C-N stretching

NMR δ 3.7,d for 2H, δ4.5 t for 1H, δ 6.7 to 8.1 m for 7H.

Result and Discussion:

In the present work, by convenient method 2-azetidineone derivatives was prepared according to reaction Scheme-1 in good yield. The procedure involves synthesis of Schiff bases followed by cycloaddition of ketene obtained from acetyl chloride and triethyl amine. The present study may be useful in pharmaceutical industries and agriculture field.

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