By using green chemistry formation of barbituric acid derivatives with aromatic aldehyde followed by grinding method

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Abstract : Barbituric acid is the parental composite of barbiturate drugs, while barbituric acid pharmacologically is not active. Adolf von Baeyer was the first one who synthesized these compounds. and can be involved in Knoevenagel type condensation reaction. Barbituric acid used as a reactant to from a large class of barbiturate drugs which are used as hypnotics, sedatives, anesthetics and as central nervous system. Due to applications of barbiturates exploration of new focus for the synthesis of these compounds is axiomatic. Thus we selected way of green chemistry followed by grinding method along with aryl aldehyde treating with barbituric acid to get product.

Keywords: barbituric acid, aryl aldehyde, grinding.

I. INTRODUCTION

Barbituric acid is a strong acid in aqueous medium with an active methylene group and it can be implicated in Knoevenagel type condensation reaction. Barbituric acid is a cyclic amide used as the parent compound to produce barbiturates that act as central nervous system depressants. Barbituric acid itself does not give sedative and hypnotic effects but the substituted derivatives with alkyl or aryl group at position 5 provide effects. The derivatives of barbituric acid have special place in pharmaceutical chemistry. The derivatives of barbituric acid (2, 4, 6-trioxypyrimidine) (1) are known as barbiturates. They are a class of drugs that have diverse applications such as sedatives, hypnotics and anticonvulsants under a variety of conditions and are also employed for anesthesia.[1, 2]

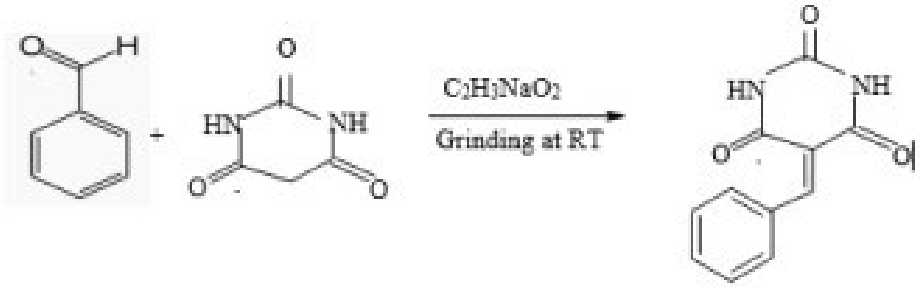
There are various methods have been reported for the synthesis of 5-arylidine barbituric acid derivatives some of them are as follows:

1. By catalyzing NH2SO3H with Grinding technique [3]
2. By using infra-red in absence of solvent [4]
3. By reaction of microwave irradiation [5]
4. With the help of catalytic Knoevenagel condensation by Ni–SiO2 [6]
5. Knoevenagel Condensation Catalysed by KF–Al2O3 [7]
6. natural phosphate [(NP)/KF or NP/NaNO3] [8]
7. By using synthetic phosphate (Na2CaP2O7) [9]
8. Knoevenagel condensation catalyzed by K2NiP2O7 [10]
9. By using acidic clay catalysts with dry condensation [11]
10. By using Ni nanoparticles [12]
11. By using microwave irradiation [13]

Reason for approaching green chemistry: In most of the organic experiments, it has been found that they produce high amounts of harmful and poisonous solvents. Eco-friendly reactions are the need of today's world. Reactions in an aqueous condition are definitely area of interest of many analysts and are the main viewpoints of green chemistry. Organic solvents are predictably used in organic synthesis and in industrial processes on a huge amount. Less/no use of organic solvents can be resulted into reduce the generation of waste, which is a requirement of one of the values of green chemistry.

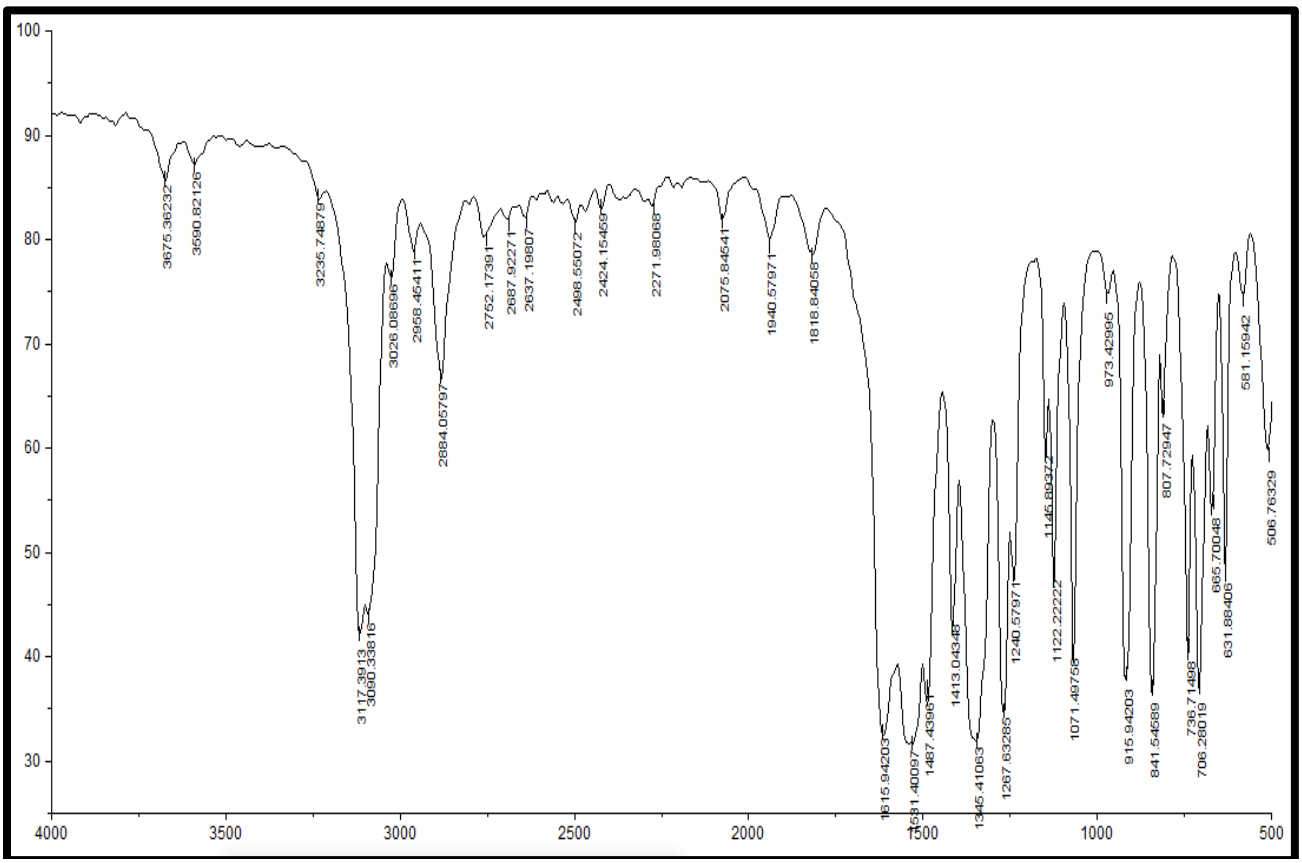
The important keys of Green chemistry are instant reactions, higher yields and uncontaminated reaction, we have focused on these points and which make this process more suitable for preparation of Barbituric acid derivatives. To start with the experimentation part all the chemicals and solvents were used without any kind of alteration in them. Experiment part was done without any special conditions. To prepare 5-Arylidene Barbituric Acids aromatic aldehyde (25 mmol) was mixed with barbituric acid (25 mmol) and catalyst sodium acetate (25 mmol) after addition of all these chemicals were grinded at room temperature just one precaution was taken that this mixture was not supposed to absorb air moisture. To monitor the reaction TLC was performed with the help of solvent system- [N-hexane + Ethyl acetate + Ethanol] further derivatives were recrystallized with the help of Ethanol

General reaction for preparation of 5-Arylidene Barbituric acid

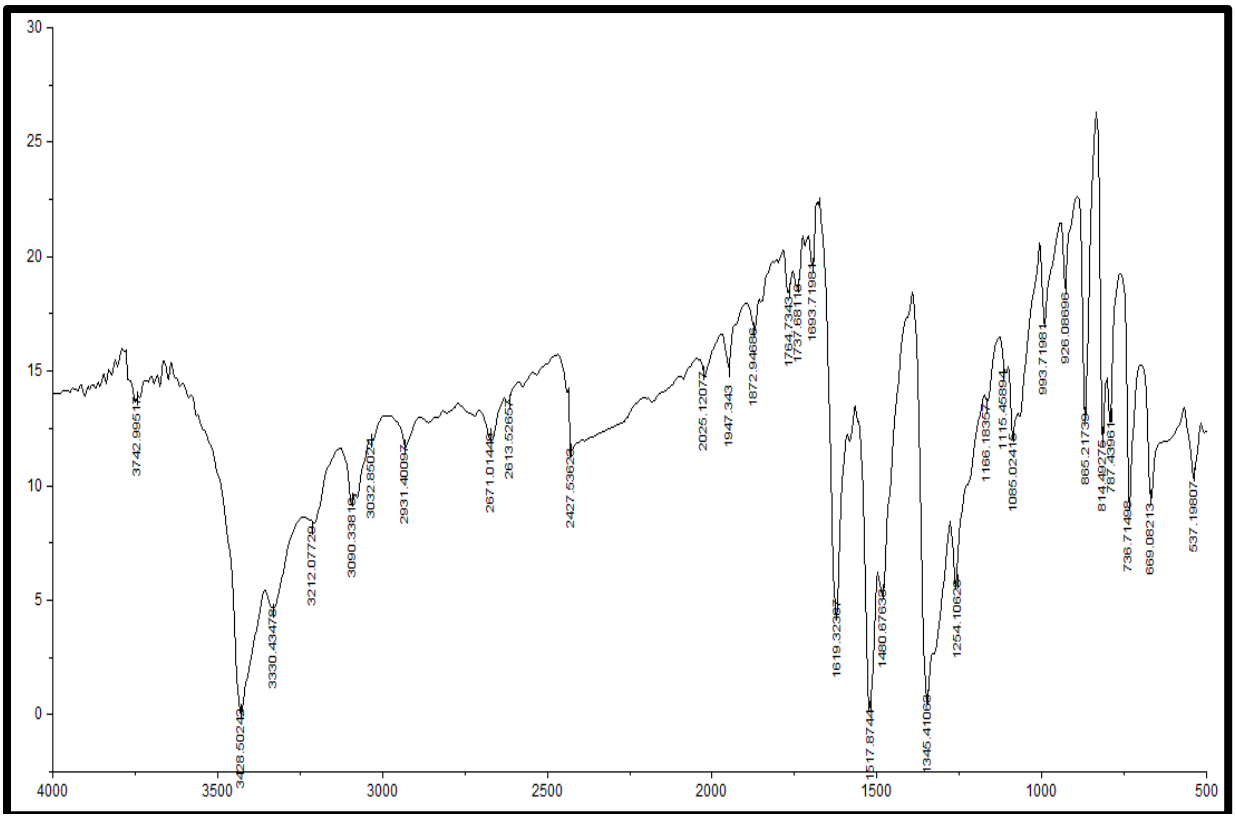


In this experiment, we have tried to synthesize 3 derivatives by 3 different aromatic aldehydes by grinding with Barbituric acid. To ensure about vibrations of atoms, and based on this it is possible to determine the functional groups we also run the IR spectroscopy, we are including IR spectra's as follows:

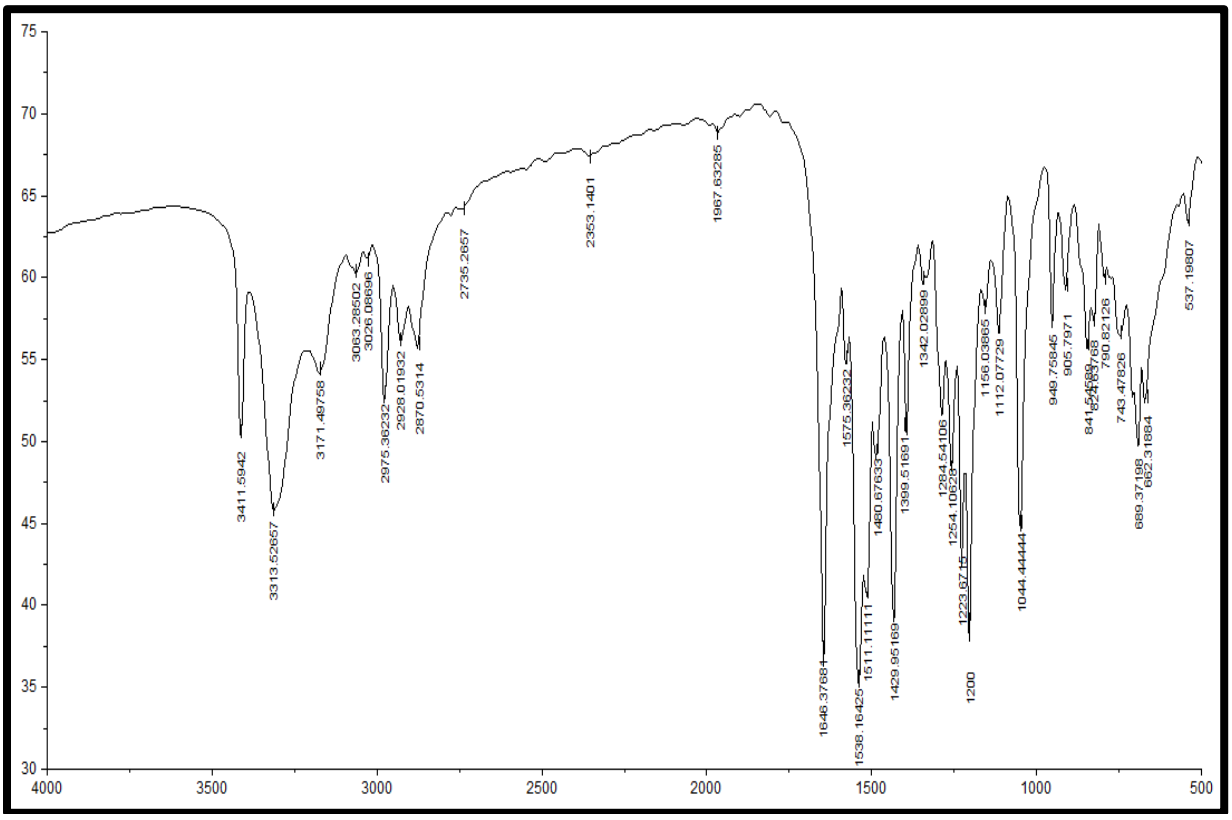
Derivative1- showed the relatively weak bands absorption in the frequency range 3117−2958 cm-1 are recognized to the ν(NH) vibrations of the amine and C−H stretching vibrations of the alkyl group of the Derivative. ν(C=N) peaks are found around 1615 cm -1; For the three carbonyl groups ν(CO) bands between 1531 and 1413 cm -1 and one weak band at 1782 cm-1 were observed. The bands with strong intensity between 1345 and 1240 cm-1 correspond to the C-N+ C-O twist vibrations.



Derivative2 showed the relatively strong bands absorption in the frequency range 3428−3032 cm-1 are recognized to the ν(NH) vibrations of the amine and C−H stretching vibrations of the alkyl group of the Derivative. ν(C=N) peaks are found around 1619 cm -1; For the three carbonyl groups ν(CO) bands between 1517 and 1345 cm -1 and one weak band at 1166 cm-1 were observed. The bands with strong intensity between 1085 and 865 cm-1 correspond to the C-N+ C-O twist vibrations.



Derivative3 showed the relatively band absorption in the frequency range 3411-2975 cm-1 are recognized to the ν(NH) vibrations of the amine and C−H stretching vibrations of the alkyl group of the Derivative. ν(C=N) peaks are found around 1704 cm -1; For the three carbonyl groups ν(CO) bands between 1692 and 1646 cm -1 and one weak band at 1575 cm-1 were observed. The bands with strong intensity between 1429 and 1200 cm-1 correspond to the C-N+C-O twist vibrations.



RESULT AND CONCLUSION:

The aim of this experiment to develop an effectual and modest method for the synthesis of new barbituric acid derivatives. 5-Arylidine Barbituric acid derivatives are having clinically importance. There are various methods have been demonstrated till now and grinding was also one of them, this method is really best method over others as no special condition is required and this makes it more efficient over other described methods.

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