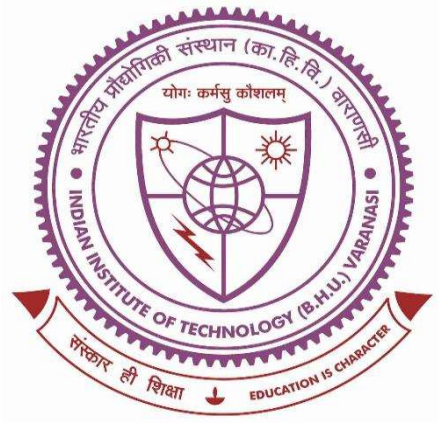
Synthesis of Some Biologically Active Barbituric Acid Derivatives



Thesis submitted in partial fulfilment for the Award of Degree

Doctor of Philosophy

BY

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SUMMARY AND CONCLUSIONS

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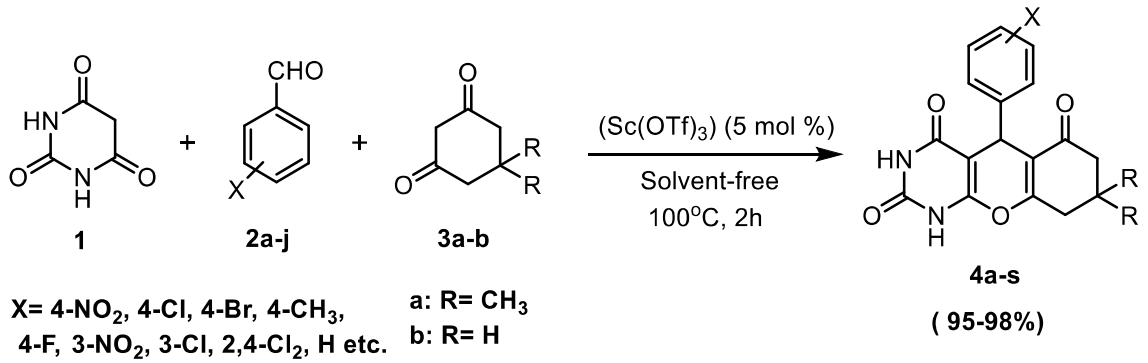
The thesis entitled, "**Synthesis of Some Biologically Active Barbituric Acid Derivatives**," described the efficient synthesis of biologically significant barbituric acid derivatives. The contents of the thesis have been divided into five chapters.

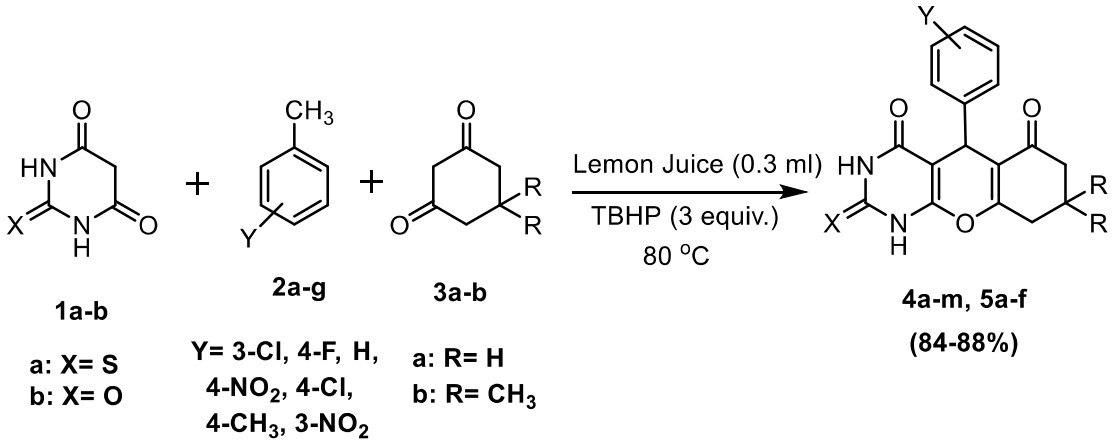
Chapter 1 gave a general overview of barbituric acid such as synthesis of barbituric acid, biological importance, as well as physical and chemical properties. In addition, various synthetic applications of barbituric acid, i.e., synthesis of condensation products, synthesis of oxygen containing and nitrogen containing heterocyclic compounds have been elaborated.

Chapter 2 described a facile and proficient one-pot multicomponent synthesis of a series of chromeno[2,3-*d*]pyrimidine-trione derivatives via the reaction of barbituric acid, dimedone / cyclohexane-1,3-dione and aromatic aldehydes under solvent-free condition. This method exploited $Sc(OTf)_3$ as a resourceful catalyst in organic synthesis and offers many rewards such as excellent products yield, easy work-up procedure without column chromatography, low catalyst loading and absence of side-products (**Scheme A**).



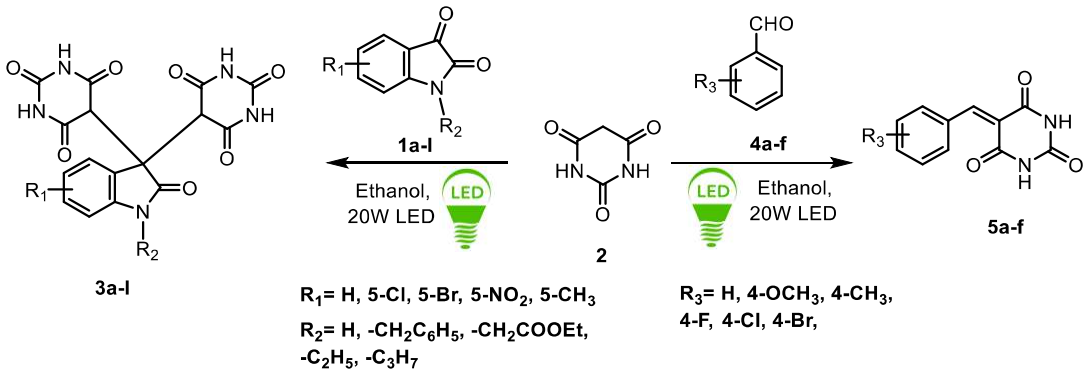
Scheme A Synthesis of chromeno[2,3-*d*]pyrimidine-trione derivatives.

Chapter 3 presented an efficient and economical use of lemon juice as a natural and biodegradable catalyst for a convenient, rapid, and benign synthesis of chromenonopyrimidines in good yield (84-88%) via one-pot, three-component reaction of thiobarbituric acid/ barbituric acid, methylarenes and dimedone/ 1, 3-cyclohexanedione using TBHP as an oxidant at 80 ºC. This transformation involved metal-free C-C bond formation via C-H activation of methylarenes under mild reaction conditions (**Scheme B**).



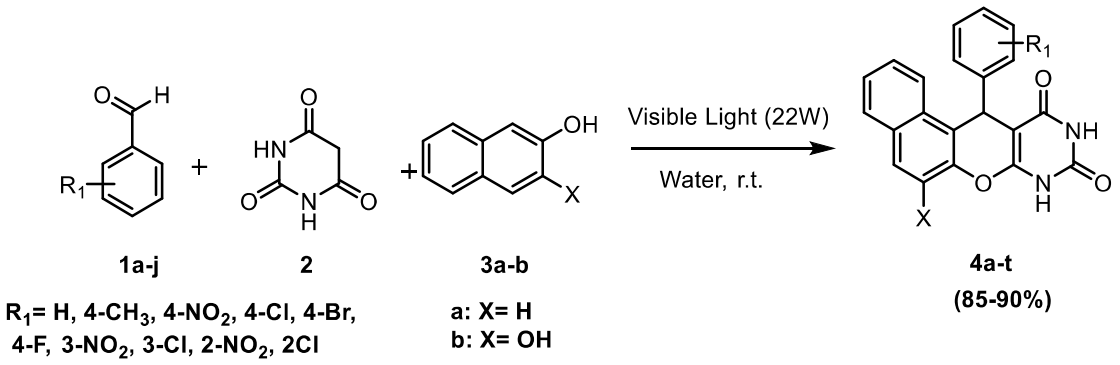
Scheme B Synthesis of chromenonopyrimidines.

Chapter 4 explained a practical and environmentally benign procedure for the preparation of biologically active dibarbiturates of oxindole and arylidene barbituric acid derivatives via condensation of carbonyl compounds i.e., isatin/aryl aldehyde with barbituric acid under catalyst-free condition. Visible light has been exploited as a green, inexpensive, and environment friendly energy source and products were obtained in high yields by using readily available starting materials without any chromatographic purification (**Scheme C**).



Scheme C Synthesis of dibarbiturates of oxindole and arylidene barbituric acid derivatives.

Chapter 5 illustrated a highly effective visible light-mediated, multi-component synthesis of biologically significant naphthopyranopyrimidines by the reaction of *β*-naphthol/ 2,3-dihydroxynaphthalene, barbituric acid and aromatic aldehydes. The reaction proceeded under additive- and photocatalyst-free conditions to form the desired products in good to excellent yields with wide range of substrate scope. This method offers advantages in terms of easy workup, operational simplicity, and short reaction time (**Scheme D**).



Scheme D Synthesis of naphthopyranopyrimidines.

Conclusions

1. We have developed a simple and efficient one-pot multicomponent synthesis of chromeno[2,3-*d*]pyrimidine-trione derivatives under solvent-free conditions using recyclable $Sc(OTf)_3$ catalyst.

2. We have demonstrated a facile and efficient one-pot methodology for the synthesis of chromenopyrimidines by utilizing methylarenes as sustainable surrogates of aryl aldehydes. The method explored the catalytic potential of lemon juice as an inexpensive, easily available, air and moisture-stable catalyst.

3. We have reported visible light-mediated synthesis of dibarbiturates of oxindole and arylidene barbituric acid derivatives via condensation of carbonyl compounds with barbituric acid under mild reaction conditions at room temperature.

4. We have explained the synthesis of naphthopyranopyrimidine derivatives by the reaction of *β*-naphthol/ 2,3-dihydroxynaphthalene, barbituric acid and aromatic aldehydes under visible light irradiation which offers many advantages viz. operational simplicity, easy work-up and high yield of products.

Scope for Further Work

1. The synthesized compounds chromenopyrimidines, naphthopyranopyrimidines, dibarbiturates of oxindole and arylidene barbituric acid derivatives may be used for biological activities such as anti-inflammatory, antimicrobial, antiviral, antibacterial, etc.

2. Further, explore the methylarenes as a surrogate for the construction of some privileged heterocycles.

3. Development of different methodologies like metal-free, solvent-free reactions and visible light irradiation to synthesize *N*- and *O*-containing heterocyclic scaffold and biologically active compounds.