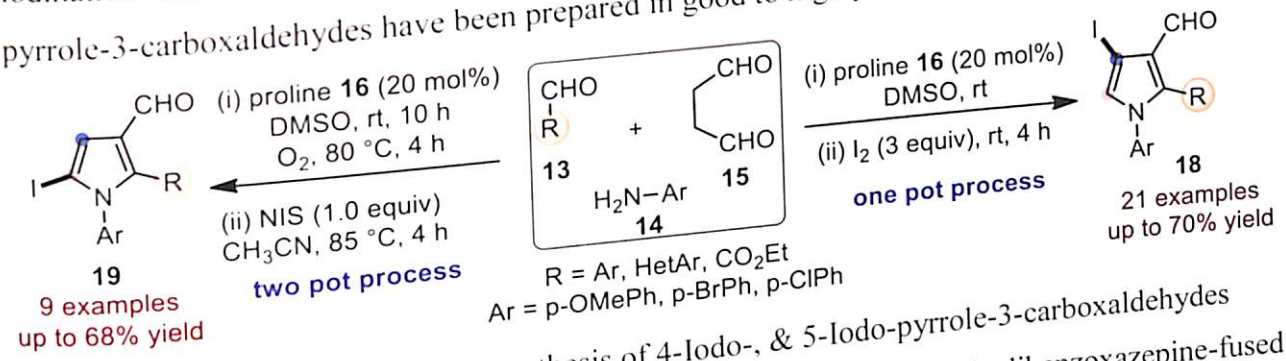
Chapter - 6

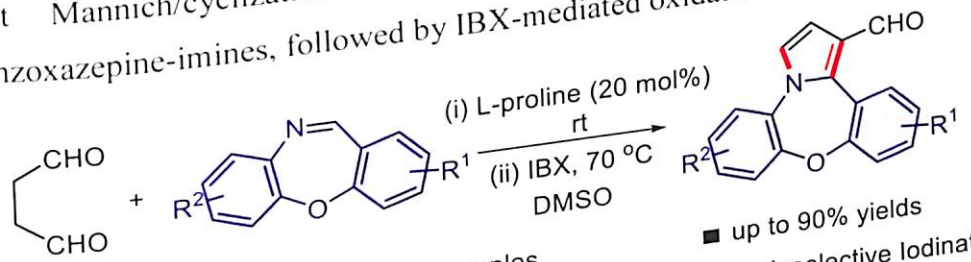
Overall conclusion and future scope

Reversely, 5-iodo-pyrrole-3-carboxaldehydes have been prepared in a two-step process, in which iodination was carried out after the pyrrole synthesis using NIS. A series of 4-iodo- and 5-iodo-pyrrole-3-carboxaldehydes have been prepared in good to high yields.



Scheme 6.2 proline-catalyzed synthesis of 4-Iodo-, & 5-Iodo-pyrrole-3-carboxaldehydes

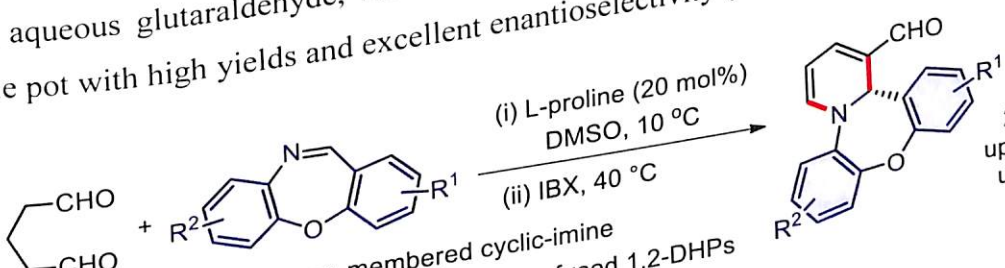
Chapter IV: This chapter demonstrated the rapid synthesis of tetracyclic dibenzoxazepine-fused pyrroles. High to excellent yields of polycyclic pyrroles were obtained through proline-catalyzed direct Mannich/cyclization sequence between succinaldehyde and seven-membered dibenzoxazepine-imines, followed by IBX-mediated oxidative aromatization in the same pot.



- one-pot protocol
- gram-scale synthesis
- 24 examples
- mild reaction conditions
- up to 90% yields
- regioselective Iodination of products

Scheme 6.3 One-pot synthesis of fused pyrroles

Chapter V: This chapter described the amine-catalyzed asymmetric synthesis of dibenzoxazepine fused-1,2-dihydropyridines (DHPs). This one-pot operation was developed through L-proline catalyzed direct Mannich/cyclization sequence between seven-membered dibenzoxazepine-imines and aqueous glutaraldehyde, followed by IBX-mediated site-selective dehydrogenative in the same pot with high yields and excellent enantioselectivity (>99:1 er).



- utilizing seven-membered cyclic-imine
- new chiral tetracyclic oxazepine-fused 1,2-DHPs
- gram-scale access to both enantiomers

Scheme 6.4 Proline-catalyzed asymmetric synthesis of dibenzoxazepine-fused 1,2-DHPs

6.1 General Conclusions

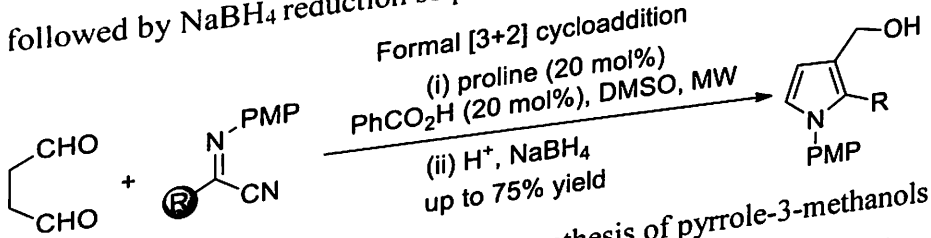
The work discussed in this thesis entitled "**Organocatalytic approach towards the synthesis of some nitrogen-containing heterocycles**" covered the synthesis of five and six-membered N-heterocycles and related polycyclic compounds. The main theme of our work is following the tandem sequence between linear dialdehydes such as succinaldehyde and glutaraldehyde, and either acyclic or cyclic-imines for overall [3+2]/[4+2] annulation. The overall work presented in the thesis deals with the synthesis of pyrroles, substituted 4-iodo-, and 5-iodo-pyrrole-3-carboxaldehydes, tetracyclic oxazepine-fused pyrroles, tetracyclic chiral oxazepine-fused 1,2-dihydropyridines (DHPs).

6.2 Specific Conclusions

The work mentioned in this thesis is divided into six chapters.

Chapter I: This chapter described organocatalysis, in particular, amine catalysis and its applications for the development of various transformations such as direct Mannich reaction to achieve the synthesis of natural and non-natural compounds with varying selectivity. In addition, the utilization of linear dialdehydes such as succinaldehyde and glutaraldehyde for amine-catalyzed transformations to access various carbo-, and heterocyclic compounds was also briefly discussed.

Chapter II: This chapter described the synthesis of substituted pyrrole-3-methanols under microwave conditions. This one-pot protocol was developed through involves proline-catalyzed direct Mannich reaction-cyclization and dehydrocyanation between succinaldehyde and α-iminonitriles followed by $NaBH_4$ reduction sequence with good yields.

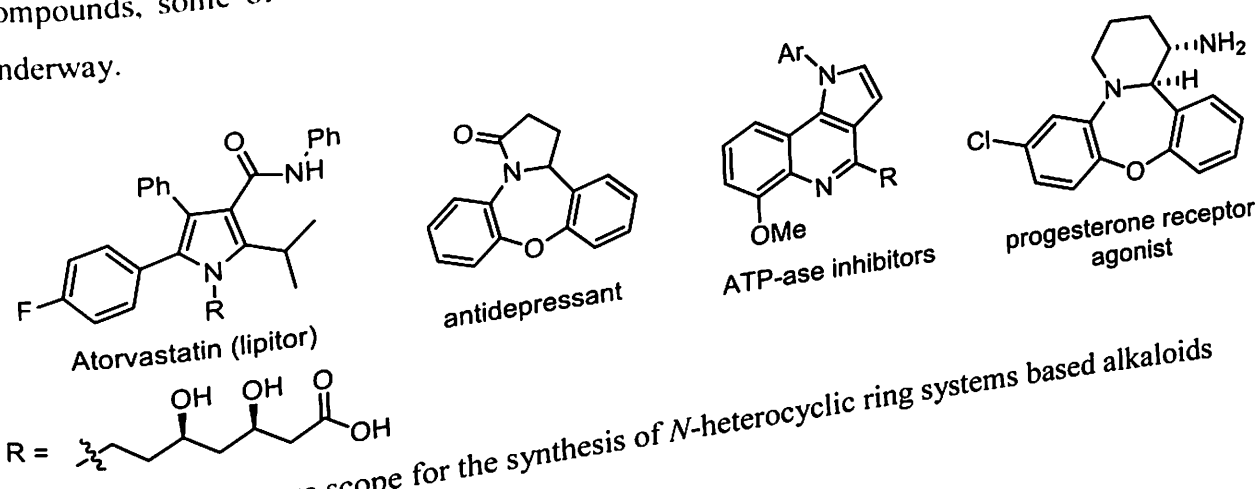


Scheme 6.1 proline-catalyzed one-pot synthesis of pyrrole-3-methanols

Chapter III: This chapter demonstrated the regioselective synthesis of 4-iodo-, and 5-iodo-pyrrolecarbaldehyde from the common starting material by switching the reacting conditions. This site-selective synthesis of 4-iodo-pyrrole-3-carboxaldehydes was achieved through one-pot proline-catalyzed direct Mannich reaction-cyclization sequence between in situ generated imines and succinaldehyde, followed by selective iodination and aromatization using molecular I_2.

6.3 Future Scope of the research work

The thesis was mainly focused on covalent-activation of carbonyls using direct amine-catalyzed transformations especially the direct Mannich reaction in combination with domino oxidative or reductive sequence cyclizations to access five-, and six-membered nitrogen heterocycles such as pyrroles, and 1,2-dihydropyridines (DHPs). Some of the synthesized polycyclic heterocycles may have interesting applications in medicinal chemistry as well as in biological sciences. Using the developed protocol from easily available starting materials and under a mild condition, the synthesis of various other *N*-fused heterocyclic compounds can be achieved and this set the tone for the future scope of the existing work. Next, our efforts to synthesize important *N*-heterocyclic compounds, some of them are shown below in Scheme 6.5. using our developed protocol is underway.



Scheme 6.5 Future scope for the synthesis of *N*-heterocyclic ring systems based alkaloids