Objective
OBJECTIVE

Heterocyclic compounds play a vital role in synthetic organic and pharmaceutical chemistry due to their wide occurrence in nature and their use in chemotherapy. They have attained considerable importance because of their therapeutic value, varied structure and chemical properties. The objective of the present work is

(i) to derive novel routes to synthesise 2,2-dimethyl-2H-pyrano[2,3-b] quinolines and 2-isopropylfuro[2,3-b]quinolines,
(ii) to synthesise novel dimeric heterocyclic system,
(iii) to synthesise new quinoline derivatives,
(iv) to synthesise benzocarbazole derivatives,
(v) to synthesise 2,2-dimethyl-2H-pyranocarbazole derivatives,
(vi) to study reactivity of 1-oxo-1,2,3,4-tetrahydrocarbazole structure for further synthesis of therapeutically potential compounds viz., 3-acetyl-2-hydroxy-1-N,N-diacetylaminocarbazole derivatives and oxazolo[4,5-a] carbazoles,
(vii) to synthesise pyrazino[3,2,1-j,k]carbazole and pyrazolo[3,4-a]carbazole derivatives and
(viii) phytochemical investigation of cassia Obtus plant.

The proposed thesis is presented in the form of three parts, part-I, part -II and part-III.

Part I

The plant family Rutaceae is known to be a prolific source of pyrano[2,3-b] quinoline (eg. Khaplofoline, Flindersine) and furo[2,3-b]quinoline (eg. Lunacrine,
Platydesmine) alkaloids\textsuperscript{1,2}. These alkaloids have been reported to be associated with interesting pharmacological as well as biological properties and have been constructed by several methods\textsuperscript{3-6}.

Many of the synthetic methodologies of these compounds invariably involved through by building the quinoline moiety with properly substituted side chain like 3-methylbut-2-enyl, 3-methylbut-1-enyl, ethoxy ethanolic and allyl groups at C-3 position and employing suitable reagents to construct the appropriately substituted pyran and furan moieties\textsuperscript{7-10}.

The synthetic method for the preparation of the pyrano quinoline system is
based on either oxidative cyclisation of 4-hydroxy-3-(3'-methylbut-1'-enyl)-2-quinolinones (2) or the Prevost reaction of 3-prenyl-2-quinolinones. Though these methods have proved to be fairly satisfactory, the overall yield of the alkaloids was only 15-35%, because the routes to obtain the precursor prenylquinolines 2 gave low yields and often were attended by unexpected side reactions. Therefore, these methods led to a mixture of products and involved tedious separation procedures.

The aim of the present investigation is to evolve a convenient method for the synthesis of pyrano[2,3-b]quinolines (10) or 2-isopropylfuro[2,3-b]quinolines (11) with improved one pot route as mentioned below.

Method 1:

\[
\begin{align*}
R^1 & = R^2 = R^3 = R^4 = H, CH, C_6H_5 \\
\end{align*}
\]

Method 2:

\[
\begin{align*}
R^1 & = R^2 = R^3 = R^4 = H, CH, C_6H_5 \\
\end{align*}
\]
Method 3: Furo[2,3-b]quinolines (21):

Method 4: Pyrano[2,3-b]-, Pyrano[3,2-c]-quinolines (25 & 26) and Furo[2,3-b]- and Furo[3,2-c]-quinolines (27 & 28).
Method 5:

A better and still more attractive approach to the quinoline alkaloids appears to be via 4-hydroxy-3-(3'-methyl-1'-oxo-2'-butenyl)quinolin-2-ones (24), which we hoped to derive from substituted aniline derivatives (22) with diethyl 2-(3'-methyl-1'-oxo-but-2'-enyl)malonate (23). The interesting outcome of such a reaction we have encountered is discussed in Part I, section 1.9.

\[
\begin{align*}
\text{phenyl} & + \text{COOEt} \text{CH} \text{COOEt} \\
\text{22} & \rightarrow \text{24}
\end{align*}
\]

The first part of thesis deals with our efforts to synthesise various quinoline derivatives and the results derived therefrom. The literature survey pertinent to this work is reviewed in the beginning of the Part I.

Part II

Carbazole derivatives\textsuperscript{11-18} such as pyranocarbazoles (29,30) (mukonine
isomers), pyridocarbazoles (31), pyrazinocarbazoles (32), carbazolyloxyp propaneamines (33,34) and indolo[3,2-h]coumarins (35) have attained considerable importance because of their physiological activities and therapeutic values. 8-Methyl-3H-pyrazino[3,2,1-j,k] carbazole has been found to possess antidepressant properties\textsuperscript{19,20}.

The Part II of the thesis has been divided into five chapters. In Chapter 1, some interesting features and pharmacological activities of carbazole alkaloids are reviewed. The next chapter describes a facile and convenient synthesis of 6,11-dihydro-6-oxo-5H-benzo[b]carbazoles (36) and the study of their antimicrobial potency. The effect of substituent variation upon the antimicrobial action are also discussed. Chapter 3 deals with the synthesis of hitherto unknown 3-acetyl-2-hydroxy-1-N,N-diacetylamino carbazoles (38) and novel oxazolo[4,5-a] carbazole derivatives (39) from the 1-hydroxyiminotetrahydrocarbazoles 37. The proposed mechanism for the said reaction and the antimicrobial screening of 38 are also presented. Chapter 4 describes a facile one step synthesis of 2,2-dimethyl-2H-pyrano[2,3-a]carbazole
derivatives (40). Chapter 5 deals with the synthesis of pyrazino[3,2,1-j,k]carbazole derivatives (41) and pyrazolo[3,4-a]carbazole derivatives (42).

The outcome of our synthetic investigation on various reactions mentioned above and the plausible mechanisms would form the subject matter of the present discussion. The background material related to our synthetic investigation, results achieved and the experimental counts are also dealt with in detail in the respective chapters.

Part III

While making continuous search on some medicinal plants for the phytochemical investigation, we came across an interesting report on the isolation of anthraquinone derivatives\(^{21-30}\) from Cassia. In the next phase of our study, new anthraquinone derivatives have been isolated and characterised. A brief review on the chemistry of Cassia and the results of the isolation have been described in the concluding part.

REFERENCES


