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A REVIEW OF RECENT SYNTHETIC DEVELOPMENTS FOR FUNCTIONALIZED PYRANS

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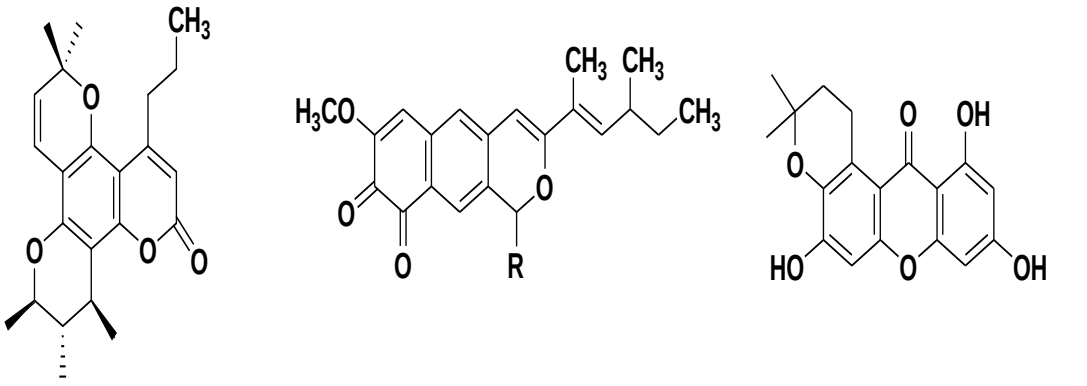
ABSTRACT
The review explored here various synthetic strategies to functionalized pyran analogues and their biological significance. It provides a platform for future developments by giving instant references of previous reported work.

KEYWORDS: Pyrans, Medicinal Scaffolds, Synthetic Developments.

INTRODUCTION

Benzo[b]pyrans annulated molecules occur frequently in many natural products.[1] These potentially active scaffolds are having broad spectrum of physiological activities.[2,3] The privileged" motif containing structures exhibits activities like diuretic[4], anticancer[5], anticoagulant[6], antiinflammetry[7], antimicrobial[8], anti-HIV[9], antimalarial[10], anti-tumoral[11], antihyperglycemic and antidyslipidemic.[12] Also many of them are used in Huntington's and Alzheimer's Parkinson disease[13] and many more.[14-15]

Moreover, different substituted 4H-pyran derivatives have engaged increasing roles in synthetic accession to promising molecules in the field of agrochemical[16], medicinal[17,18], and cosmetic industries.[19] Some of the naturally occurring pyran annulated heterocyles are shown in **figure- 1 (A-C)**, which shows diverse and wide range of pharmaceutical potentials.[20-29]



(+)-Calanolide-anti-HIV A | Laccardione-antiproliferatives B | Hyperxanthone E- antitumor C

Figure. 1.

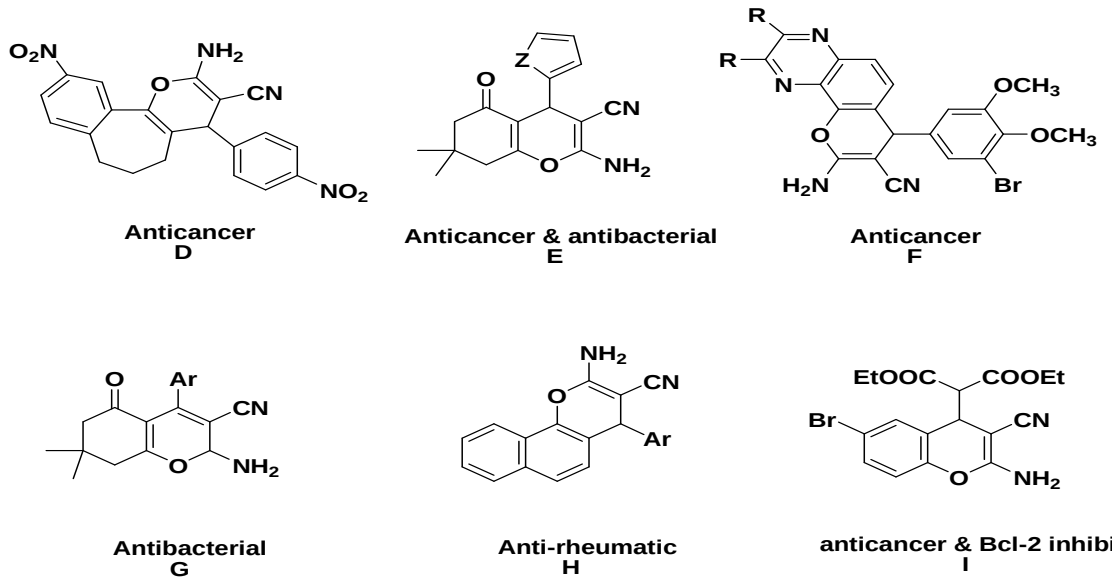
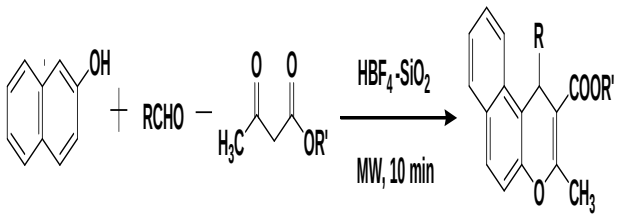


Figure: 2 (D-I) represent different drug molecules having 2-amino-3-cyano-4H-pyrans found to posses potent anti-bacterial, antifungal[30–33], anticancer,[34– 42] and antirheumatic[43] activities.

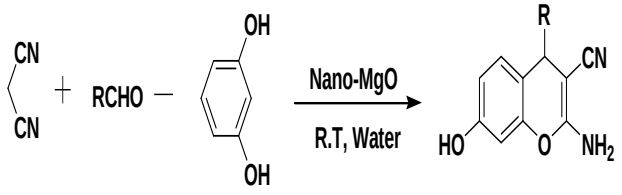
Such a handful of numerous applications of pyran molecules in medicinal chemistry have produced substantial attraction during the last few years among researchers to develop efficient and convenient synthetic protocols to these privileged scaffolds. Consequently, so many methods and strategies are already reported.

Sahil Sharma and coworkers[44] developed synthesis of naphtha-pyrans catalyzed by silica supported fluoroboric acid under solvent free conditions in a microwave irradiation (**Scheme: 1**).



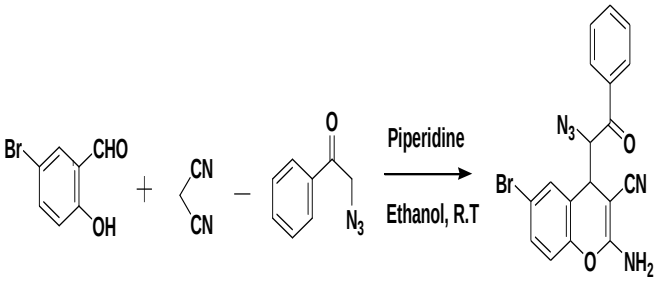
Scheme: 1.

J. Safari and coworkers[45] developed synthesis of synthesis of benzopyrans by the reaction of recercinol, aldehydes and malonitrile catalyzed by nanocrystalline MgO catalyst at room temperature conditions (Scheme: 2).



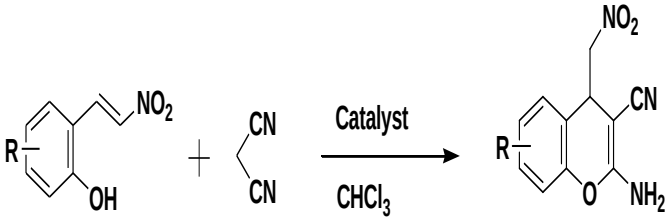
Scheme: 2.

T. H. Babu and his team[46] have developed an efficient synthesis of highly functionalized azidopyrans derivatives (**Scheme: 3**).



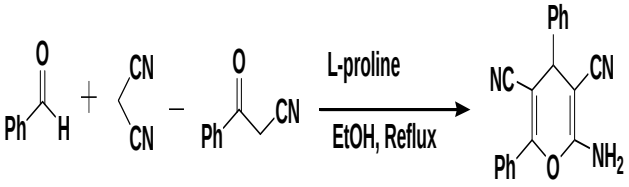
Scheme: 3.

Yu. Gao and coworkers[47] developed an organo-catalyzed synthesis of benzo pyrans via Michael addition-cyclization of malononitrile to nitroalkenes (**Scheme: 4**).



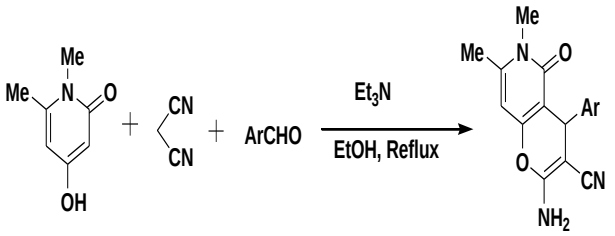
Scheme: 4.

Noha M. Hilmy Elnagdi and coworkers[48] designed synthesis of 2-amino-4, 6-diphenyl-4H-pyran-3, 5-dicarbonitrile promotd L-proline as enantioselective organocatalyst (**Scheme: 5**).



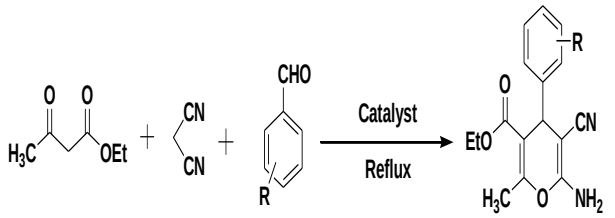
Scheme: 5.

Magedov and coworkers[49] developed synthesis of 4-arylpyrano-[3, 2-*c*]-pyridones via one-pot three-component reaction between aldehydes, malononitrile and 4-hydroxy-1,6-dimethylpyridin-2(1*H*)-one under basic (Et_3N) ethanolic medium (Scheme: 6).



Scheme: 6.

Ipsita Devi[50] and her team developed sodium bromide catalyzed three-component cyclocondensation of aryl aldehydes, alkyl nitriles and cyclic 1,3 diketone for the synthesis of highly functionalised tetrahydrobenzo [b] pyrans under microwave irradiation. Majid M. Heravi and his team[51] have synthesized 4*H*-Pyrans via one-pot, three-component reaction of benzaldehyde, malononitrile and ethyl acetoacetate catalyzed by Cu(II) oxymetasilicate as an efficient and reusable catalyst (**Scheme: 7**).



Scheme: 7.

CONCLUSION

In conclusion, the present review describes the various synthetic developments to functionalized pyrans including their biological applications. It has covered both traditional and modern methodologies to obtain a wide variety functionalized pyrans. Although several protocols are available for the synthesis of these pyran scaffolds there is a need to develop alternative protocols that are more convenient, environment friendly, cost effective, sustainable and compatible with an advantage of synthesis on scale-up level.

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