J. Biol. Chem. Chron. **2019, 5***(3),* 40-43
ISSN (Print): 2454 – 7468
ISSN (Online): 2454 - 7476
www.eresearchco/jbcc/

Green Synthetic Approach to Some Biologically Active Heterocyclic Compounds: A Review

Makrand V. Kulkarni[1*] and B. K. Magar[2]

[1] *SRES's, Sanjivani College of Engineering, Kopargaon, Ahmednagar, Maharashtra, INDIA.*
[2] *Department of Chemistry, Shivaji Arts, Commerce and Science College, Kannad, Aurangabad, Maharashtra,, INDIA*

[*] *Correspondence: E-mail: makrand1055@gmail.com*

(Received 10 Dec, 2018; Accepted 11 Jan, 2019; Published 18 Jan, 2019)

ABSTRACT: The ongoing interest in the synthesis of heterocyclic compounds is basically because of their raised biological and pharmacological activities. Heterocycles form by far the largest of the classical divisions of organic chemistry. There is always a strong need for new and efficient processes in synthesizing of new Heterocycles by developing greener synthetic strategies. Various heterocyclic systems like oxazines, imidazoles, quinazolines, triazoles, tetrazoles, pyridines are synthesized compounds. The new compounds were characterized using IR, 1H-NMR, 13C-NMR and mass spectra. Biological screenings of some compounds are reported...

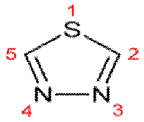
Keywords: Synthesized compounds; heterocyclic substances; greener strategies**.**

INTRODUCTION: Compounds classified as heterocyclic probably constitute the largest and most varied family of organic compounds. Heterocyclic compounds are organic compounds containing at least one atom of carbon, and at least one element other than carbon, such as oxygen, nitrogen, or sulphur within a ring structure. Heterocycles containing oxygen, nitrogen and sulphur atoms are abundant in nature and are of great significance to life because their structural subunits exist in many natural products such as vitamins, hormones, antibiotics, and alkaloids, as well as pharmaceuticals, herbicides, dyes, and many more compounds. These heterocycles are important classes of building blocks in organic synthesis and are known to possess important biological properties and have attracted much attention of medicinal chemists over the years. Heterocyclic compounds have enormous importance and widespread applications, hence efforts will be directed to synthesize heterocycles containing oxygen, nitrogen and sulphur heteroatoms, which have received considerable attention due to their significant biological properties.

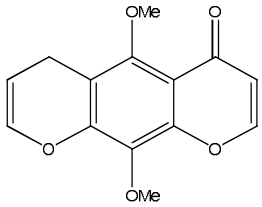
Most of the drugs belong to the class of heterogenius compounds. Heterocyclic compounds played a vital role in the metabolism of all living cells; large number of them are five and six membered heterocyclic compounds having one to three heteroatoms in their nucleus. The compounds may be pyrimidine and purine basis of genetic material DNA, and these heterocyclic compounds may be isolated or fused heterocyclic systems. Some of the common heterocyclic compounds used in the medicines are as amino acids like proline, histidine and tryptophan, the vitamins and coenzymes precursors such as thiamine, riboflavin, pyridoxine, folic acid, biotin, B12 and E families of the vitamins. There is a vast number of pharmacologically active heterocylic compounds, many of which are in regular clinical use. The pyrimidines and its derivatives have a vital role in biological properties. 2-Sulphanilamidopyrimidinesviz. Sulphadiazine Sulphamethoxydiazine and Sulphadiazine are well known antibacterial agents.

Literature survey shows that a number of heterocyclic compounds having condensed ring system possess various types of physiological activities. Condensed triazolo- pyrimidines and N-benzylidene derivatives exhibits antifungal[1-4],anti-inflammatory[5-12], antibacterial [13-20], anticonvulsant[21-24], antiallergic [25-33], herbicidal[34-41] and Anticancer activity [42-45].

Some Bioactive Heterocycles:



1,3,4-thiadiazole



Khelin(a naturally occuring furochromone)

Greener Approach: Green chemistry is considered as an integral part of a comprehensive program to protect human health as well as environment. Hence, during the recent years researchers are devoted to design and develop the new protocols that are both environmentally desirable and economically acceptable; by using ecofriendly reagents, solvents, ionic liquids, supercritical fluid extraction, catalysts and alternative sources of energy like microwave irradiation, ultrasound waves, etc.

Green techniques differ from conventional techniques and have an upper hand in the following aspects:

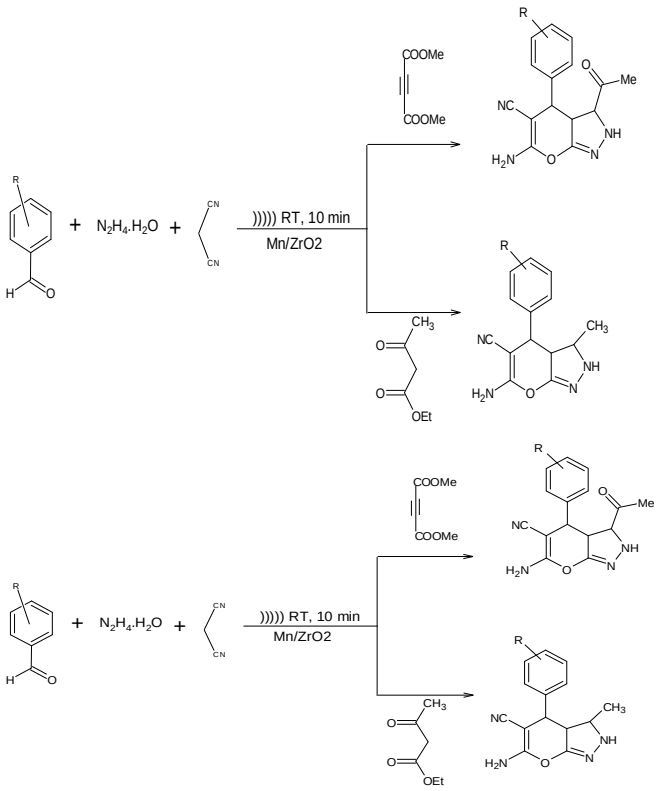
- Simple, safe and non-toxic.
- Economical.
- Milder reaction conditions.
- Higher chemical yield (i.e. atom efficient).
- Lower energy usage.
- Avoids waste.
- Sustainable and
- Environment friendly.

In the view of biological properties associated with the heterocyclic compounds and importance of environmentally benign organic synthesis, it was thought worthwhile to synthesize and develop novel synthetic methodologies of various heterocyclic compounds. The review focuses preferentially on diversity-oriented (multi-component, multi-step one-pot as well as domino) synthesis.

MATERIALS AND METHODS:

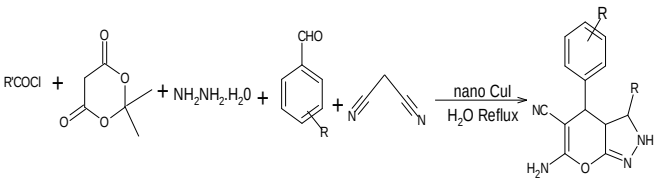
Pyranopyrazole:

Scheme-I: Suresh Maddila, Sridevi Gorle and team[01] reported clean and highly efficient approach for the synthesis of green, one-pot, four-component reactions catalyzed by Mn/ZrO2 under ultra-sonication to obtain pyrano[2,3-c]pyrazole—carboxylate/pyrano[2,3-c]pyrazole-5carbonitrile derivatives as the desired product in short time span and in quantitative yields by a simple and economical protocol.



[Scheme-I]

Scheme-II: Javad Safaei-Ghomi,1,* Abolfazl Ziarati and Mehrnoush Tamimi[02] developed a novel method for the one-pot, clean, Efficient, and economic procedure for the synthesis of pyranopyrazoles via five-component coupling of acid chlorides, Meldrum's acid, hydrazine hydrate, aromatic aldehydes and malononitrile over the high surface area of CuI nanoparticles in water media. *In situ* synthesis, mild reaction conditions, wide range of non-polluted product, excellent yields, and using recyclable catalyst make this methodology highly attractive.

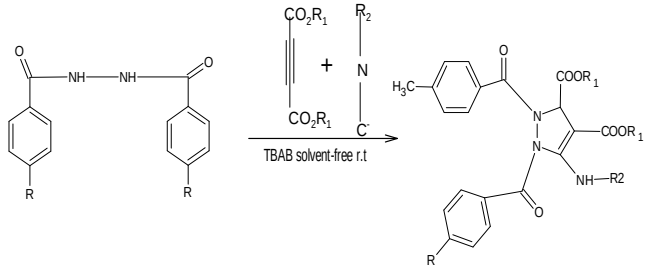


[Scheme-II]

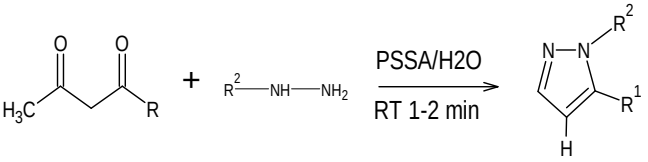
Pyrazoles:

Scheme-I: Zahra Soltanzadeh, Gholamhassan Imanzadeh, Nader Noroozi-Pesyan & Ertan Şahin[03]developed a green, environment-friendly, novel and inexpensive method for the synthesis of a series of pyrazole derivatives. The reaction took place in the presence of tetrabutylammonium bromide, a commercially available organic ionic salt, at room temperature under solvent-free conditions. All prod-

ucts were confirmed by infrared radiation, nuclear magnetic resonance and elemental analysis. Yields of products were 75–86%.



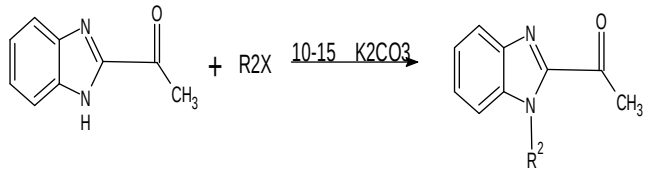
Scheme-II: Here they report an expeditious synthesis of pyrazoles by the reaction of 1,3 diketones with hydrazines and hydrazides catalyzed by polystyrene supported sulphonic acid (PSSA) which proceeded efficiently in water in absence of any organic solvent at room temperature within 1-2 minutes



Benzimidazole:

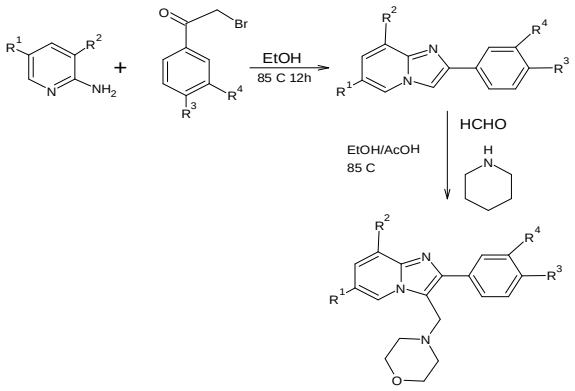
Scheme-I: ***Synthesis of N1-Derivatives of 2-acetyl-benzimidazole by PEG-400 green catalyst***: The 2-acetyl-benzimidazole was treated with alkylating reagents with different ratio of anhydrous K2CO3 and with and without PTC such as PEG-400 and TEBAC to produce N1 derivatives of 2-acetylbenzimidazoleas. **[05]**

They derived this alkylation of heterocyclic compound by using PEG-400 green catalyst and get better result.



Imidazo Pyridine:

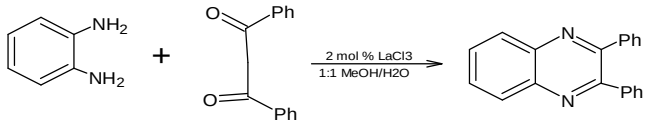
Scheme-I: ***Synthesis and Biological Evaluation of Imidazo Pyridine Derivatives Containing Morpholine Nucleus:*** Literature review shows that the presence of morpholine moiety in the compounds is act as the precursor in the preparation of Linezolid, an antibiotic and anticancer agent. By observing this Y. D. Bodke et al. **[06]** reported the synthesis of some new imidazo pyridine derivatives containing morpholine nucleus**.**



QUINOXALINE:

Scheme-I: ***Synthesis of substituted quinoxaline from o-phenylene diamine and enzyl in presence of lanthanum chloride:*** Author Ajit P Ingale**[09]** Synthesised substituted quinoxaline from o-phenylene diamine and enzyl in presence of lanthanum chloride.

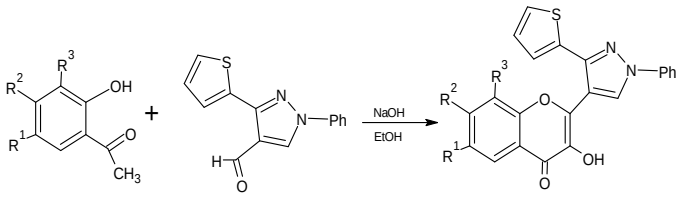
As per review, quinoxaline has vast biological importants. Here they report new methodology for the synthesis of quinoxaline which is ecofriendly



FLAVONOLS:

Scheme-I: ***Synthesis of some new flavonols:*** Flavanoids are a group of common and naturally occurring compounds that are widely found in the plant kingdom.

Author reported a new series of 3-hydroxy-2-[1-phenyl-3-(thiophen-2-yl)-1H-pyrazol-4-yl]-4H-chromen-4-ones has been synthesized from substituted 2-hydroxyacetophenones and 1-phenyl-3-(thiophen-2-yl)-1H-pyrazole-4-carbaldehyde using NaOH and H2O2 by modified Algar–Flynn–Oyamada reaction under conventional and microwave irradiation conditions. This compound shows excellent biological activity and also the route of synthesis is ecofriendly. **[10]**



CONCLUSION: The Main focus of this review work is to study synthesis, characterization and evaluation of biologically active synthesized Heterocyclic Derivatives those have good pharmaceutical and industrial

applications. There is always a strong need for new and efficient processes in synthesizing of new Heterocycles. Developing environmental friendly and effective technologies coupled with green chemistry is a major challenge facing the chemical community.

ACKNOWLEDGEMENT: We are grateful to the Management and Principal, SRES's SCOE, Kopargaon for providing necessary facility for this work.

REFERENCES:

1. Suresh Maddila[a] Sridevi Gorle[b] Sebenzile Shabalala[a] Surya Narayana Maddila[a] "Ultrasound mediated green synthesis of pyrano[2,3-c]pyrazoles by using Mn doped ZrO_2" Arabion Journal of Chemistry-2016
2. Javad Safaei-Ghomi, Abolfazi Ziarti, Mehrnousch Tamini "A Novel Method for the One-Pot Five-component Synthesis Highly Functionalized Pyranopyrazoles Catalyzed by CuI Nanoparticles, Slovenion Chemical Society, Vol-60, 2013.
3. Zahra Soltanzadeh, Gholamhassan Imanzadeh, Nader Noroozi-Pesyan & Ertan Şahin "Green synthesis of pyrazole systems under solvent-free conditions" RESEARCH LETTERS (2017) Issue-03,148-153.
4. V. Polshettiwar, R. S. Varma "Greener and rapid access to bioactive heterocycles / Tetrahedron Letters 49 (2008) 397–400.
5. Wanegaonkar AM*1, Bhitre MJ1, Bairagi 'Synthesis of N-1 Fused Heterocyclic Derivatives Using Potassium Carbonate and PEG-400 as Green Catalyst "SH2, IJPRS ISSN No: 2277 – 7873.
6. Y. D. Bodke et al, Synthesis And Biological Evaluation Of Imidazo Pyridine Derivatives Containing Morpholine Nucleus, Heterocyclic Letters Vol. 6, No.2, 173-180, 2016.
7. Li-Rong Wen, Zhao-Rui Li, Ming Li and Han Cao "A green and highly efficient method for the regioselective synthesis of imidazo[1,2-*a*]pyridine derivatives" Green Chemistry, Issue, 3, 2012.
8. R. K. Pardeshiet al. Peg Mediatedmicrowave Assisted Synthesis Offunctionalized Thiazolones, Heterocyclic Letters, Vol. 6, No.2, 195-203, 2016.
9. A. P. Ingale et al. Lanthanum Chloride Catalysed Novel and Efficient Protocol For Synthesis of Substituted Quinoxaline at Room Temperature, Heterocyclic Letters, Vol. 6, No.2, 333-339, 2016.
10. Dongamanti Ashok, Mohsin Ahmed Kifah, Bommidi Vijaya Lakshmi, Madderla Sarasija, "Microwave-assisted one-pot synthesis of some new flavonols by modified Algar–Flynn–Oyamada reaction and their antimicrobial activity "Adam Chemistry of Heterocyclic Compounds 2016, 52(3), 172–176.
11. Bougrin, K.; Loupy, A. Microwave-Assisted Solvent-Free Heterocyclic Synthesis. J. Photochem. Photobiol. C, Photochem. Rev. 2005, 6, 139-167.
12. Rodriguez, H.; Perez, R.; Suarez, M.; Lam, A.; Cabrales, N.; Loupy, A. Alkylation of Some Pyrimidine and Purine Derivatives Using Microwave- Assisted Methods. Heterocycles 2001, 55, 291-301.
13. Eissen, M.; Metzger, J. O. Environmental Performance Metrics for Dayly Use in Synthetic Chemistry. Chem. Eur. J. 2002, 8, 3580-3585.
14. Vinod, K.; Kamalneet, K.; Girish Kumar, G.; Anil Kumar, S. Eur. J. Med. Chem. 2013, 69, 735.
15. Dong, F.; Chen, X.; Liu, X.; Xu, J.; Li, Y.; Shan, W.; Zheng, Y. J. Chromatogr. A, 2012, 1262, 98.