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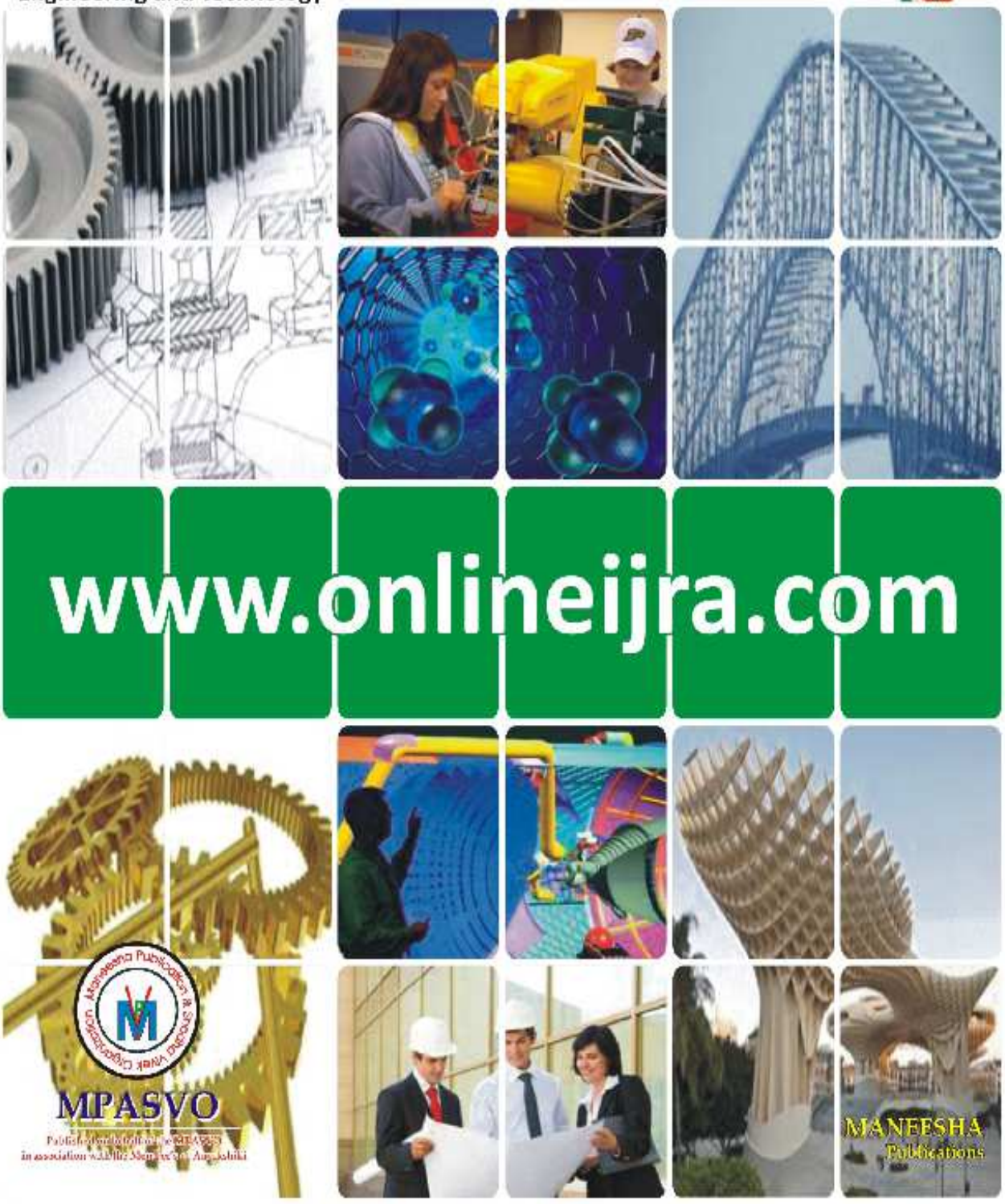

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DEPARTMENT OF CHEMICAL ENGINEERING & TECHNOLOGY
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INSTITUTE OF TECHNOLOGY
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(Established by Parliament by Notification No.225 of 1916)

Message

Scientific discoveries and advancement affect our lives by providing new policies and regulations that provide broad national direction and by new products that enhance our lives. Technology and engineering translate scientific knowledge into action. At the same time, technological innovations often require further research into materials, devices and processes. Engineers use the knowledge of science, mathematics, economics and appropriate experience to find suitable solutions to the problems and helps in creating an appropriate mathematical model for analysis.

This special issue on Engineering and Technology 2012 of Anvikshiki brings together the latest developments in technology and gives a base for the future work to be done in respective areas.

I wish the journal to be a great success.

Bhawna Verma
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Message

I express my sincere gratitude to the editorial board of prestigious journal ANVIKSHIKI for believing in my technical competencies and choosing me as a reviewer of special issue on Engineering and Technology 2012. I understand that with great role comes great responsibilities. I will try to fulfill this highly valued responsibility with best of my technical knowledge and human values. This journal has been a guiding beacon for scientific community for numerous years & has gained the prestige due to it's original & rich articles. The contribution of ANVIKSHIKI in field of scientific research is immense.

I wish for the phenomenal success of special issue on Engineering and Technology,2012 of ANVIKSHINKI.

P K S Dikshit
Professor
Department of Civil Engineering
Institute of Technology
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Editorial Note

As my nomination as an Subject Expert and Editor for this Special Issue on Engineering & Technology 2012, I have worked a lot to make it successful. I do whatever task is at hand to the best of my ability. I take pride in my work and give hundred percent every time. For those submissions that were not suitable for publication, we tried to let authors know very quickly of our decision, giving them a chance to submit their manuscript to another journal if they so desire. I am fully aware that the prestige and quality of an ANVIKSHIKI Journal depends upon the altruistic participation of reviewers and the fairness and promptness with which the review process is conducted. In this regard, I wish to express my sincere gratitude to all board members for their nice cooperation and sustained effort. However, because of the increased number of submissions and the diversity of research fields involved, we have a difficult task ahead of us requiring a more rapid tempo of review. At the same time, from now on the authors themselves should assume their own inescapable responsibilities. The editor will return immediately any manuscript that is incomprehensible to reviewers on account of substandard grammar and syntax.

Finally, it is a pleasure to thank my Editor in chief for their nice cooperation and valuable suggestion. Now, we all look forward to embarking in a journey that can take ANVIKSHIKI on to the next plateau of excellence.

I hope you will enjoy reading this issue and we welcome your feedback .

With best regards,

Jyoti Prakash

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Best regards,

Dr. Maneesha Shukla.

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Pitout JDD, Church DL, Gregson DB, Chow BL, McCracken M, Mulvey M, Laupland KB (2007). Molecular epidemiology of CTXM-producing *Escherichia coli* in the Calgary Health Region: emergence of CTX-M-15-producing isolates. Antimicrob. Agents Chemother. 51: 1281-1286.
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SYNTHESIS, CHARACTERIZATION, ANTIMICROBIAL AND ANTIFUNGAL ACTIVITY OF PYRAZOLENE-BENZOFURAN

KHAGESH KUMAR SINGH*

Declaration

The Declaration of the author for publication of Research Paper in The Indian Journal of Research Anvikshiki ISSN 0973-9777 Bi-monthly International Journal of all Research: I, *Khagesh Kumar Singh* the author of the research paper entitled SYNTHESIS, CHARACTERIZATION, ANTIMICROBIAL AND ANTIFUNGAL ACTIVITY OF PYRAZOLENE-BENZOFURAN declare that , I take the responsibility of the content and material of my paper as I myself have written it and also have read the manuscript of my paper carefully. Also, I hereby give my consent to publish my paper in Anvikshiki journal , This research paper is my original work and no part of it or it's similar version is published or has been sent for publication anywhere else. I authorise the Editorial Board of the Journal to modify and edit the manuscript. I also give my consent to the Editor of Anvikshiki Journal to own the copyright of my research paper.

Abstract

Benzofuran[1] compounds are ubiquitous in nature, particularly among plant kingdom. Often such natural products possessing benzofuran nucleus are endowed with useful pharmacological properties. This has generated enormous interest in synthetic products containing benzofuran nucleus and has resulted in the development of benzofuran chemistry during the last several years. The recent reviews of literature shows that benzofuran[2] was clinically potent moiety possess diverse biological activities and profound efficacy. Among the wide variety of Nitrogen heterocyclic compounds that have been exploited to develop pharmaceutically important molecule such as Pyrazole[3] and their derivatives due to their diverse biological activities such as Anti-inflammatory, Antifungal, Anti-bacterial, Anti-Pyretic and others.

Pyrazole[4] derivatives have a long history of application in agrochemicals and pharmaceutical industry as herbicides and active pharmaceuticals. The recent success of pyrazole COX-2 inhibitor has further highlighted the importance of these heterocycles in medicinal chemistry. A Systematic investigation of this class of heterocyclic lead revealed that pyrazole containing pharmacoactive agents play important role in medicinal chemistry. The prevalence of pyrazole cores in biologically active molecules has stimulated the need for elegant and efficient ways to make these heterocyclic lead.

These finding encourage us to undertake the synthesis of pyrazolene-Benzofuran ring system, in the hope that that they could have some promising biological interest. The synthesized compounds were screened for their anti-bacterial and anti-fungal activities. The various screenings carried out include the in vitro *study against Gram positive* Staphylococcus aureus (ATCC 3750), *Gram negative* Salmonella typhi (NCTC 786) *and fungal strain* Candida Albicans. *The Minimum Inhibitory Concentration (MIC) was determined using tube dilution method according to the standard procedure[3]. DMSO was used as a solvent with appropriate controls. Ampicillin (MIC = 0.01 µg/ml against gram positive* S. aureus*), Trimethoprim (MIC =1 µg/ml against gram negative* S. typhi*) were used as standard drugs for anti-bacterial screening and Miconazole was used as anti-fungal standard drug (MIC = 0.01 µg/ml)*

Key words: Benzofuran, Pyrazole, Anti-microbial activity

*(Associate Professor) Shri Ram Murti Smarak College Of Engg.& Tech. Bareilly (U.P.) India. e-Mail : Khagesh_10@Sify.com & Khageshsingh 2010 @ Yahoo.com

Materials and Method

The synthesized compounds were screened for their anti-bacterial and anti-fungal activities. The various screenings carried out include the *in vitro* study against Gram positive *Staphylococcus aureus (ATCC 3750),* Gram negative *Salmonella typhi (NCTC 786)* and fungal strain *Candida Albicans.* The Minimum Inhibitory Concentration (MIC) was determined using tube dilution method according to the standard procedure[3]. DMSO was used as a solvent with appropriate controls. Ampicillin (MIC = 0.01 µg/ml against gram positive *S.aureus*), Trimethoprim (MIC = 1 µg/ml against gram negative *S. typhi*) were used as standard drugs for anti-bacterial screening and Miconazole was used as anti-fungal standard drug (MIC = 0.01µg/ml).

Experimental

Synthesis of 5-Bromo-3-methyl-2-acetylbenzofuran (I): To stirred mixture of 2.15g (0.01mole) of 5-Bromo-2-hydroxy acetophenone and 3.45g (0.025mole) of anhydrous K_2CO_3 in dry acetone for 30 mins. 1.0ml (0.01mole) of chloroacetone was added drop wise over a period of 10 minutes. Reaction mixture was stirred for 3 hours. Allow cooling and poured into crushed ice. Solid thus separated was filtered washed with 20ml cold water, crystallized with ethanol.

Synthesis of 5-Bromo-2-cinnamoyl-3-methylbenzofurans (II): 5-Bromo-3-methyl-2-acetylbenzofuran *(I)* 2.52g (0.01mole) was stirred in 10ml of anhydrous Ethyl alcohol. 1.40g (0.01mole) of 3-chlorobenzaldehyde was added to the reaction mixture at room temperature. This reaction mixture was cooled to 0-5^{0}C and aqueous solution of sodium hydroxide (70%, 5ml) was added in portion while stirring. After complete addition stirring was continued for 3 hours and contents allow standing overnight. The solution was diluted with water and neutralized with dilute HCl. The off-white colored solid thus separated was collected, dried and crystallized from ethanol.

Synthesis of 5-(3-Chlorophenyl)-3-(5-bromo-3-methylbenzofuran-2-yl)-1H-pyrazolines (III): A mixture of 3.91g (0.01mole) of 5-Chloro-2-cinnamoyl-3-methyl benzofuran (II) and 2.5g (0.15mole) of hydrazine hydrate in 50ml anhydrous ethanol was refluxed for 3 hours. Excess of solvent was distilled off. Pour on to crush ice, solids collected. Product crystallized from methanol.

Synthesis of 5–(3–Chlorophenyl)–3–(5–bromo–3–methyl benzofuran–2–yl)–1– (Substituted benzoyl)–pyrazolines.(IV): A mixture of 1.94g (0.005mole) of 1H-pyrazoline (III) and 0.6ml (0.005mole) of substituted benzoyl chloride in anhydrous pyridine (10ml) was refluxed for one hour. Allow cooling, reaction mixture neutralized with cold dilute HCl. The solid separates out; product was filtered off and crystallized from ethanol.

*Schematic Representation :*5-Aryl-3-(5-bromo-3-methyl benzofuran-2-yl)-1-(substituted benzoyl)-pyrazol-2-enes.

In Vitro Antimicrobial Screening

Sr. no	Substituent's		Antibacterial		Antifungal	
	R	R'	S. aureus	S. typhi	C. Albicans	A. niger
1	3-Chloro	4-Chloro	100	200	100	200
2	4-Chloro	4-Chloro	200	200	50	200
3	4-Chloro	3-Fluoro	100	100	100	100
4	4-Chloro	4-Hydroxy	50	200	200	200
5	4-Chloro	2,4-Dimethoxy	50	200	200	NA

Ampicillin (MIC-0.04 µg/ml) used as standard against *S. aureus.*
Trimethoprim (MIC 0.01 µg/ml) used as standard against *S. typhi*

- Miconazole (MIC 6.25 µg/ml) as standard against *C. albicans* and *A. niger*
- N.A. -: Not active at 200 µg/ml.

Results

All the five synthesized compounds (Table No. 1) showed moderate activity upto 200µg/ml among which 4-Hydroxy and 2, 4-dimethoxy (Sr.No 4 & 5) showed activity upto 50µg/ml against *S. aureus*. The 4-fluoro derivative (Sr. No 3) exhibited activity at 100µg/ml while the other remaining compounds exhibited activity upto 200µg/ml against *S. typhi*.

All the compounds showed moderate activity against fungal species of *C. albicans* upto 100µg/ml exceptional of 2, 4-Dimethoxy substitutions (Sr. No 5) with activity at 200µg/ml. The compounds 4-fluoro substitution (Sr.No 3) showed activity at 100µg/ml, while remaining others at 200µg/ml against *A. niger* species except 2, 4-Dimethoxy substitutions (Compound No. 305) which is found not active upto 200µg/ml.

Discussion

The purpose of the present study was to examine whether molecular modification might result in detection of new potential antimicrobial drugs. A series of compounds were prepared and assayed in a variety of biological test for antimicrobial activity. The data reported in Table 1 shows that effect of variation in chemical structure on activity was rather unpredictable. The substitution which appeared to be most important for high order of activity in the greatest number of test was the p-choloroaryl group. The introduction of Para Methoxy and p-hydroxy group in aryl moiety of the pyrazole analogs produce compounds with antimicrobial properties.

Acknowledgement

The author feels pride in thanking his honourable chairman Shri Dev Murtiji for providing research facility and valuable guidance.

Conclusion

In conclusion, the results of this investigation revealed that the observed substitution at Para-position is better for enhancing anti microbial activity. Obviously, the comparative evaluation of active compounds will required further studies; the data reported in this article may be helpful guide for the medicinal chemist who is working in this area.

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