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SYNTHETIC STRATEGIES AND BIOLOGICAL ACITIVITY OF FURAN DERIVATIVE: A REVIEW

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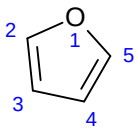
ABSTRACT

Furan is a 5-membered heterocyclic, oxygen-containing, unsaturated ring compound. The furan nucleus is found in a large number of biologically active materials. The furan ring is a constituent of several important natural products, including furan flavonoids, furan lactones, furanocoumarins, and many natural terpenoids. The synthesis and characterization of a novel family of linear polyurethanes are reported. The original feature stems from the use of furanic monomers, either as diols, or as di isocyanates, or both. Their thermal and photochemical properties were also studied. These moieties are widely employed as antibacterial, antiviral, anti-inflammatory, antifungal, antitumor, antihyperglycemic, analgesic, anticonvulsant, etc. A series of novel di arylhydrazine derivatives containing a furan ring were synthesized by the reaction of 5-fluorophenyl-2-furoyl chloride with substituted benzoyl hydrazide in anhydrous dichloromethane under reflux. These furan derivatives show broad-spectrum antibacterial and insecticidal activities and exhibit pharmacological properties which include serving as anti-depressant3 and anti-inflammatory agents.

KEYWORDS: Furan synthetic strategies, antibacterial, antiviral, anti-inflammatory, antifungal, antitumor, antihyperglycemic, anticonvulsant.

INTRODUCTION

FURAN



The name furan comes from the Latin *furfur*, which means bran. The 1st furan derivative to be described was 2-furoic acid, by Carl Wilhelm Scheele in 1780[1] Furan is a planer five member heterocyclic, ring with 4C and 1O atom and in ring O1st position.[2] Furan is an oxygen-containing, unsaturated ring compound. From a chemical perspective it is the basic ring structure found in a whole class of industrially significant products. The furan nucleus is also found in a large number of biologically active materials. Compounds containing the furan ring (as well as the tetrahydrofuran ring) are usually referred to as furans.[3]

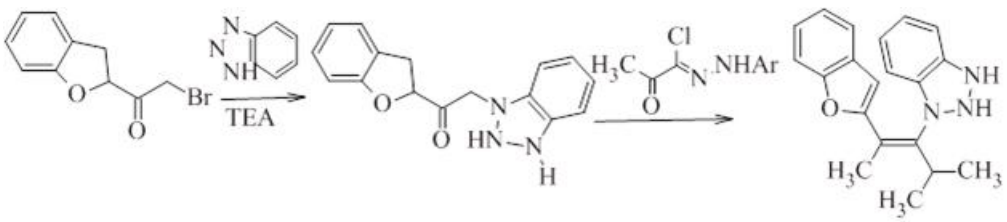
The simplest member of the furan family is furan itself, a colourless, volatile, and somewhat toxic liquid that boils at 31.36^{0}C (88.48^{0}F). Several other members of the furan family are produced on a large scale for use as solvents and chemical raw material.[4]

Furan and its derivatives are naturally occurring compounds formed in many heat-processed foods and drinks; these compounds have low odour thresholds and significantly contribute to the sensory properties of heated foods and beverages.[5]

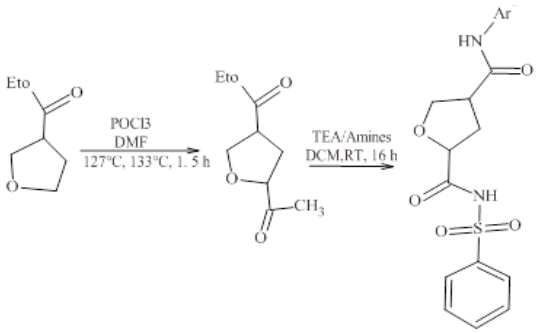
Furan derivative are an important class of heterocyclic compound that have been reported to possess various biological and therapeutic activity such as Anti-Inflammatory and Antimicrobial, Antibacterial, Anticancer, ant rhinoviral activity, Antihyperglycemic, Antiviral Antinociceptive, Analgesic, Antifungal, Anticonvulsant[6] etc.

SYNTHESES OF FURAN DERIVATIVES

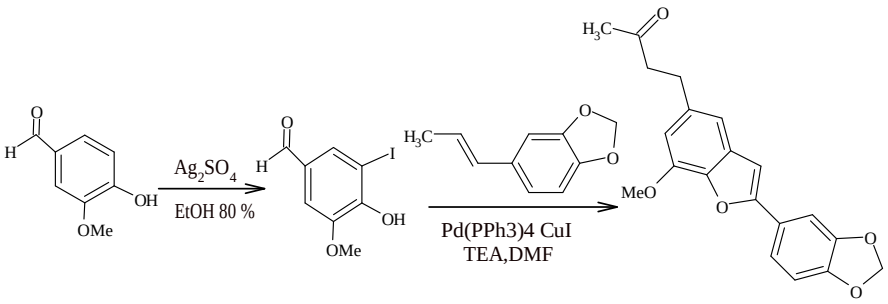
1. K. M. Dawood *et al*. (2006) Were Reported Synthesis, anticonvulsant, and anti-inflammatory evaluation of some new benzotriazole and benzofuran-based heterocycles.[7]



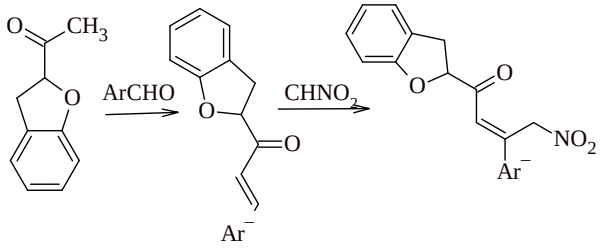
2. Sireesha Malladi *et al*. (2017) Were Reported Synthesis And Antibacterial Activity Studies Of 2, 4- Di Substituted Furan Derivatives.[8]



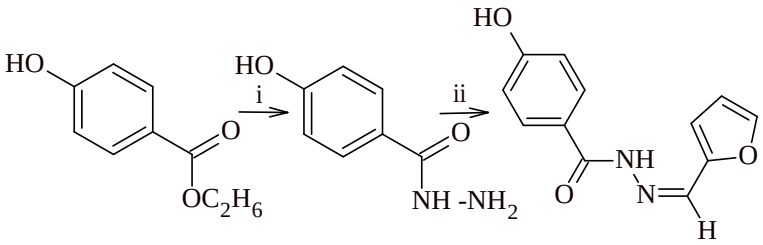
3. Da Hye Choi et.al (2008) Were Reported Highly Effective Total Synthesis of Benzofuran Natural Product Eugenol[9]



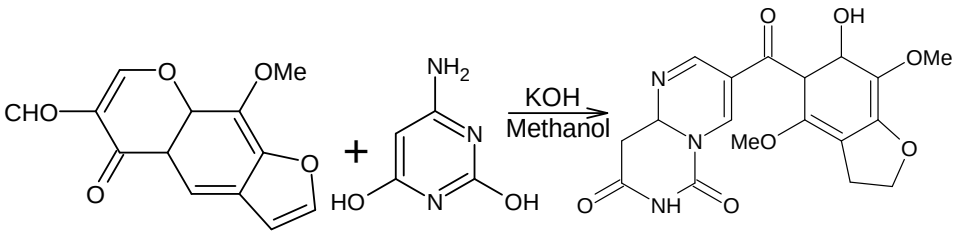
4. B.F. Abdel-Wahab *et al*.(2009) Were Reported Synthesis and antimicrobial evaluation of 1-(benzofuran-2-yl)-4-nitro-3- arylbutan-1-ones and 3-(benzofuran-2-yl)-4,5-dihydro-5-aryl-1-[4-(aryl)-1, 3-thiazol-2-yl]-1H-pyrazoles[10]



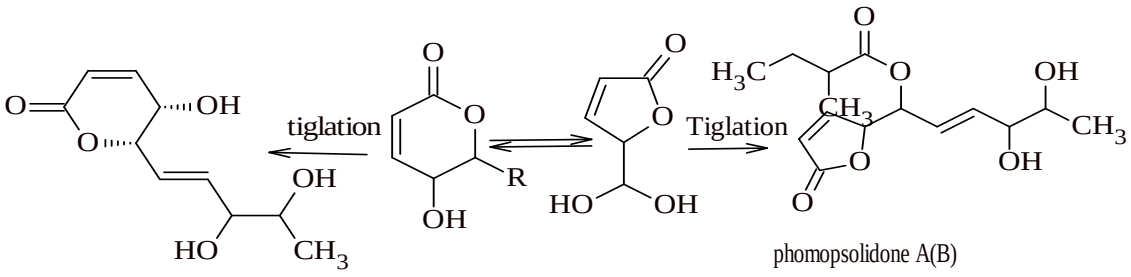
5. C. Gokce and R. Gup **et.al** (2013) Were Reported Synthesis, characterization and DNA interaction of the transition metal complexes with 2-formyl furan-derived aroyl hydrazones.[11]



6. S.A. Galal ***et al***. (2010) Were Reported Novel antiviral benzofuran-transition metal complexes.[12]



7. Alhanouf Z *et al*. (2020) Were reported synthesis and biological study of the phomopsolide and phomopsolidone natural products.[13]



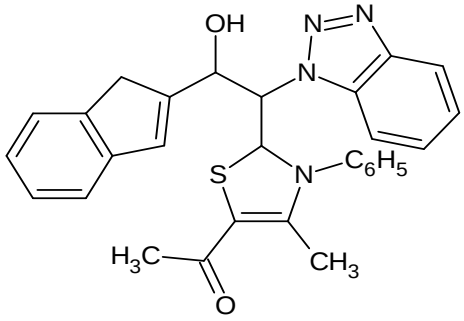
phomopsolide B(2)

phomopsolidone A(B)

BIOLOGICAL ACTIVITY OF FURAN DERIVATIVES

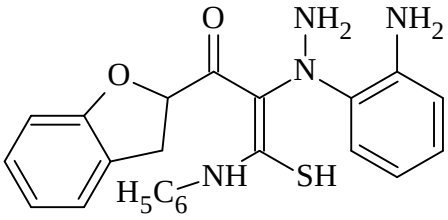
ANTI-INFLAMMATORY

Dawood synthesized benzofuran-benzotriazole-based heterocycles compound. The thiadiazol derivative 2- (5-Acetyl-3-phenyl-1,3,4-thiadiazole-2-ylidene)-1-(2- benzofuryl)-2 (1 benzo tria zolyl) ethenone was the most potent anti-inflammatory compound. The anti-inflammation effect of the thiazolidine ester derivative is higher than that of its acetyl derivative[14]



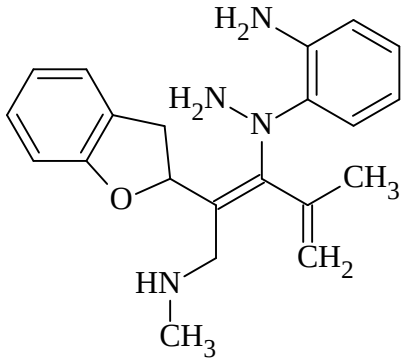
ANTICONVULSANT

Dawood newly synthesized benzotriazole derivatives were screened for anticonvulsant activity in maximal electroshock seizure (MES) and subcutaneous methazole test in mice. The test compound 2-(5-Acetyl-3-phenyl- 1,3,4-thiadiazole-2-ylidene)-1-(2-benzofuryl)-2-(1-benzotriazolyl)-ethanone were found to be active in subcutaneous metrazole[14]



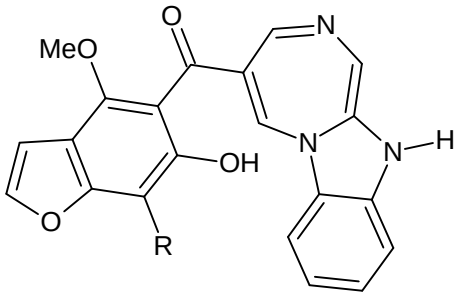
ANTINOCICEPTIVE EFFECT

Dawood newly synthesized benzotriazole derivative to show antinociceptive effect. The Furan derivative 3-acetyl-1-aryl-5-(benzofuran-2-yl)-4-(benzotriazol-1-yl) pyrazoles showed a higher antinociceptive activity.[14]



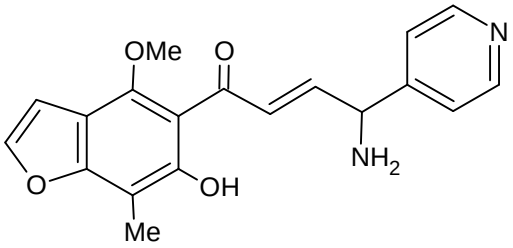
ANTIVIRAL

Galal *et al*. 2009 synthesized derivatives can serve as lead compound for further investigation and act as antiviral activity. Compound (11 H- Benzo[4,5] imidazole [1,2-a] [1,4]diazepin-4-yl) (6-hydroxy-4,7- dimethoxy- benzofuran-5-yl) methanone[15]



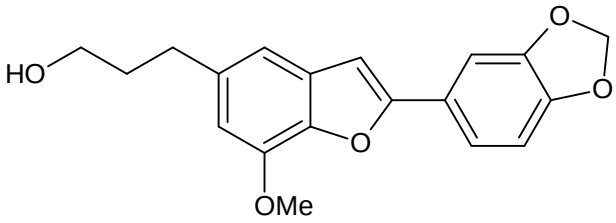
ANTITUMOR ACTIVITY

Galal synthesize a new series benzofuran derivative by the reaction of the fur chromone-carboxaldehydes with different heterocyclic amines to yield the benzofuran-5- carbonyl derivative. The synthesized compound was tested against twelve different human cancer cell lines and all of the compound were more potent than the comparative standard.[15]



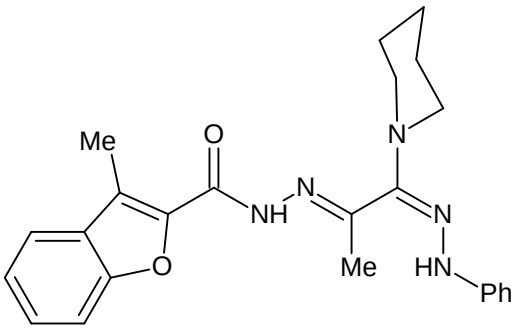
ANTIBACTERIAL ACTIVITY

Hatem A. Abdel-Aziz *et al* synthesized compound that showed a variable potencies against tested bacteria. The tested compound (1E-2E)-1-(Piperidin-1-yl)-1-[(4- nitrophenyl hydrazonal]-2-[(3-methylbenzofuran-2-oyl)hydrazono] propane exhibited weak inhibitory effect against the Gram-negative bacterium *E.Coli* (1) whereas they revealed no effect, or very weak against P.aerogenosa[16]



ANTIFUNGAL ACTIVITY

Abdel-Aziz AAI Mekawey in 2009 synthesize various compound like (1Z,2E)-N-(aryl)propane hydrazonoyl chloride bearing active methyl group used as C- nucleophiles. The newly synthesized benzofuran–based (1E)-1-(Piperidine-1-yl)-N2-arylamidrazones have significant antifungal activity[16]



CONCLUSION

Different derivatives of furan have been synthesized and studied in the past and found to be effective in a variety of pharmacological and pathological disorders, which are briefly reviewed in this article. The focus of this study was on furan synthesis strategies and biological activity of Furan derivatives and their significance in biological systems,

medicines, agrochemicals, and several number of other fields because of this. industrial products Researchers used this review as a foundation to develop a novel synthetic approach and novel physiologically active compounds.

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CONFLICT OF INTEREST

All authors are no conflict of interest.

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