# SYNTHESIS AND ANTIBACTERIAL ACTIVITY STUDIES OF 3, 5-DI SUBSTITUTED FURAN DERIVATIVES

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**Abstract:**
**3,5-disubstituted furan derivatives was prepared from para methyl amino benzaldehyde and pentane 2,4-dione. Antibacterial activity of new 3,5-di substituted furan derivatives was studied against Gram (+) and Gram (−) bacteria. Least MIC value was found as 200 µg/ml against *B.subtilis and Escherichia coli*. Products exhibited better antibacterial activities especially towards *B.subtilis*.**

***Index Terms* — Pathogens; Antibacterial activity; Structure-activity relationship; Disubstitiuted furans; Synthesis**

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## I. Introduction

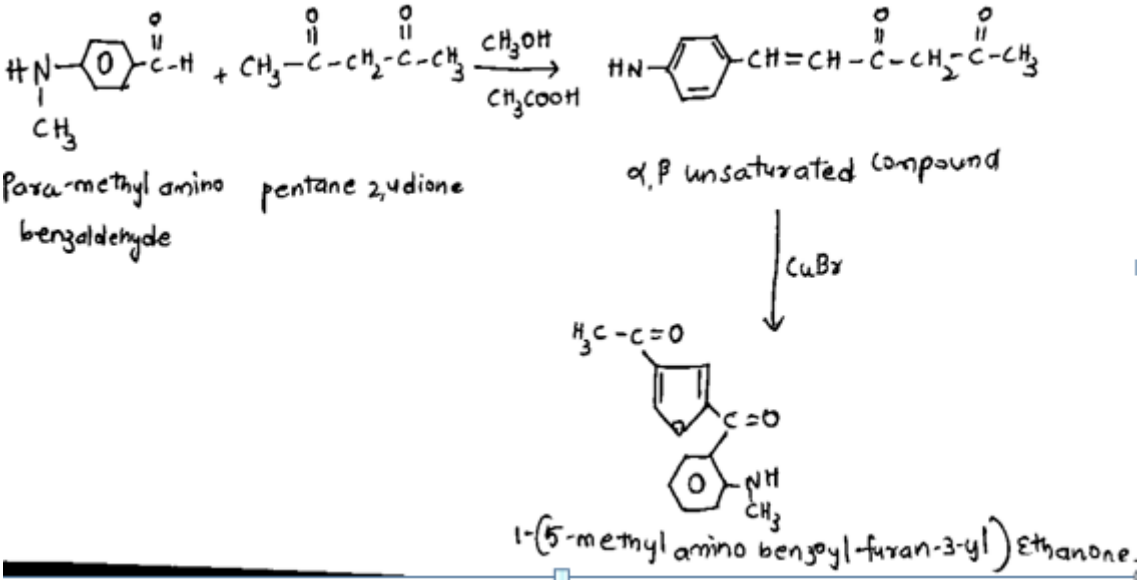
**Importance of Furans:**

Heterocyclic compounds containing oxygen or nitrogen atoms has important attention in spectrum for effective pharmacological activities. A significant and extent area of research notice for chemists is synthesizing of furan as furan derivatives for various biologically active and natural products. Some of their pharmacological properties helps to use them as antifungal, antioxidant, antimicrobial, anticancer, anti-inflammatory agents. Its therapeutic properties of furan derivatives help for synthesizing a number of chemotherapeutic agents as they act on various receptors. Understanding the importance of furan for its anti-microbial activity.

## II. Methodologies for Synthesis of Furans and need for new drugs:

Furan has multipurpose synthon described that furan ring has shown well antimicrobial activity related to other substituent's. Different synthetic routes were described in literature for synthesis of molecules combined with furan moiety. To synthesize the Furan by using Claisen Schmidt condensation method.To purifies the intermediate. Copper(I) salts catalyze a synthesis of multisubstituted furans from readily available acetophenones and electron-deficient alkynes via direct C($sp^3$)-H bond functionalization under radical reaction conditions in the presence of di-*tert*-butyl peroxide as an external oxidant. This method offers an efficient access to biologically important scaffolds from simple compounds. S. Manna, A. P. Antonchick, *Org. Lett.*, **2015**, *17*, 4300-4303.

## III. Objective of Study:




The present study was aimed for the synthesis of furan derivatives. In order to understand their anti – microbial activity. Furan derivatives was synthesized and screened for antimicrobial activity. The study was mainly focused on the synthesis of furan derivative**.**

**IV. SCHEME FOR THE SYNTHESIS OF FURAN DERIVATIVE:**

**V. Materials and Methods:**

Materials and methods used were synthetic grade from SD fine chemicals Ltd., {Mumbai, India} and Sigma- Aldrich Chemicals {Hyderabad, India}. Completion of the reactions was monitored by analytical thin layer chromatography {TLC} using E-Merck 0.25mm silica gel plates. Visualization was accomplished with UV light {256nm} and iodine chamber. Synthesized compounds were purified by re-crystallization process. The purity of the compounds was checked by a single spot in TLC and solvent system for TLC was determined on trial-and-error basis. Melting point was determined in open capillary tubes using ANALAB melting point apparatus and was uncorrected. The IR spectra were recorded using 1% potassium bromide discs.

**VI. Result and Discussion:**

The present study was aimed at synthesis of Furan derivatives by a new synthetic procedure using Para methyl amino benzaldehyde and Pentane 2,4- dione as starting compound. The resulting intermediate of these reactants was reacted with copper bromide in the presence of acetic acid resulting in generation of Furan derivative. Compounds were confirmed by FT-IR studies and TLC.

**Identification and Characterisation**

The identification and characterization of the prepared compound were carried out by the following procedure-

➢ 1. Melting point

➢ 2. Solubility

➢ 3. Thin layer chromatography

- Petroleum ether

➢ 4. Infra red spectroscopy (I.R).

**Thin Layer Chromatography Procedure:**

✓ Cleaned and dried glass plates were taken.

✓A uniform slurry of silica Gel-G in water was prepared in the ratio of 1:2.

✓The slurry was then poured into the chamber of the TLC applicator, which was fixed and thickness was set to 0.5 mm

. ✓ Glass plates were moved under the applicator smoothly to get an uniform coating of slurry on the plates.

✓ The plates were dried at room temperature and then kept for activation at 110°C for 1 hour . The compound was taken in a small bored capillary tube and spotted at 2 cm from the base end of the plate.

✓Then the plate were allowed to dry at room temperature and plates were transferred to chromatographic chamber containing solvent system for development.

✓ The developed spots were detected by exposing them to iodine vapors. Then the Rf values of compounds were calculated using the formula –

R f value = distance moved by sample/ distance moved by solvent.

**Biological Evaluation (Antimicrobial Activity)**

Furans possess diverse variety of pharmacological activities. Due to this Furan have occupied unique place in field of medicinal chemistry. Furan ring system is present occasionally in nature. Furan finds use in research as a starting material for synthesis of larger, usually bioactive structure. It is structurally similar with nucleic bases as well as isosteres of naturally occurring cyclic nucleotide such as adenine and guanine that is why it probably interacts with biopolymers in living systems and show diverse biological activities like antimicrobial, anti-inflammatory, analgesic, antifungal, anticonvulsants, antitumor, anticancer, CNS activities, anti-tubercular, anti-HIV agents anthelmintic, and other anticipated activities

**Principle: -**

**Antimicrobial activity:**

The number of life threatening infections caused by multidrug resistant gram positive pathogens has reached an alarming level in hospitals and the community. The infections caused by these organisms pose a serious challenge to serious challenge to the specific community and the need for an effective therapy has led to search for novel antimicrobial agents. Anti-microbial drugs are effective in treatment of infection because of their selective toxicity that is they have the ability to injure or kill an invading microorganism without harming the host. It is evident from literature that Furan is known to be associated with broad spectrum of biological activities like antibacterial, antifungal etc.

**Preparation of Antibiotic solution: -**

- Prepare different concentrations of antibiotic solution (i.e.)10 mg/ml, 20, 30, 40, solutions
- Take 10 mg of antibiotic and dissolve in solvent and make up to 10 ml to get 1 mg/ml or 1000 mg/ml solution

**RESULTSAND DISCUSSION**

- From the above solution take 0.1, 0.2, 0.3, and 0.4 and make up to 10 ml respectively to get 10, 20, 30, 40 mg/ml

**Experimental procedure (By Cup Plate method):**

- Prepare nutrient media and transfer 20ml into boiling tube, plug and sterile them
- After cooling, inoculate each boiling tube with 0.1 ml of test organism (*Bacillus subtills or E.coli*)
- The inoculated agar media is poured into petri plate and solidified
- Make holes in the solidified media at the center by using sterile borer
- Add 0.1 ml of prepared antibiotic solution of various concentrations into the holes
- Incubate the petri plate for 24hrs.
- Fig no. Measurement of zone of inhibition:

**In-Vitro Antibacterial Activity**

Pathogenic bacteria are selected in the present studies to evaluate the antibacterial nature of the synthesized compounds as these bacteria are responsible for main threats to public health in the developing countries. The zones of inhibitions (mm) and MIC values of tested compounds against bacterial strains were shown and the experimental result indicated variable degree of efficacy of the compounds against different strains of bacteria. Antibacterial activities of the synthesized organic compounds depend on different parameters like nature, type, position, molecular weight of substituent and presence of aromatic moiety. Antimicrobial activity of furan derivative was influenced by the substitution on furan ring. Antibacterial activity of synthesized compound was observed against E. coli and B. Subtillis.

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## CONCLUSION

The present study was aimed for the synthesis of furan derivative and evaluation of anti-microbial activity. Furan derivative was synthesized and screened for antimicrobial activity. The Study was mainly focused on the synthesis of furan derivative. In the study following steps were performed, Synthesis of furan derivative was carried out by a synthetic procedure in order to obtain desired products in acceptable yield. Product formed was confirmed by TLC and characterized by FT-IR. The compound was tested for antimicrobial activity.

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**FTIR :**