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Original Research Article

Biological Evaluation of 1, 2-bis (2, 4, 6-Trinitrophenyl) Hydrazine

D. M. Badgujar, M. B. Talawar[1], P. P.Mahulikar[*]

School of Chemical Sciences, North Maharashtra University, Jalgaon- 425 001, India.

[1]High Energy Materials Research Laboratory, Pune - 411 021, India.

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ABSTRACT

1, 2-Bis (2, 4, 6-trinitrophenyl) hydrazine (3) and its precursor (2) were screened for its antimicrobial properties, namely, antifungal activity against *Aspergilus niger* and *Alternaria aletrnata* and antibacterial activity against *Bacillus substalis* and *Xanthomonas campstris* at different concentrations (0.5 % and 1%). The antimicrobial result exhibits the promising biological activity.

1. Introduction

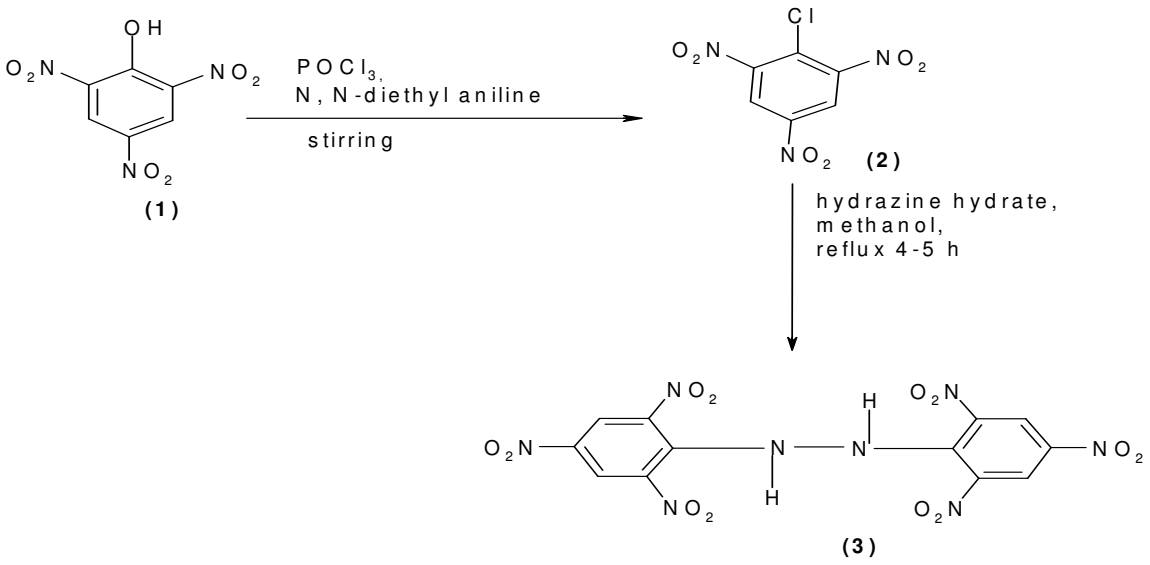
Many hydrazine derivatives show remarkable biological activities [1]. Hydrazine derivatives are well known among pesticides, drugs, amino acid precursors, and synthetic building blocks for heterocycle synthesis. Several similar compounds were shown to be effective for treatment of tuberculosis, Parkinson's disease, and hypertension [2]. Also, hydrazine-based peptidomimetics (azapeptides) are found to be potent agents against diseases effects such as hepatitis, AIDS, and SARS [3]. Therefore, it can be easily seen that synthesis of substituted hydrazines is a matter of great interest.

Hydrazine derivatives are widely used compounds in the pharmaceutical, agrochemical, polymer and dye industries and also as precursors in organic synthesis [4]. In addition, some hydrazines display neuroprotective properties and are used as antidepressant drugs [5]. Hydrazine-based peptidomimetics (azapeptides) were found to be potent agents against hepatitis [6], AIDS [7] and SARS [8]. Hydrazine derivatives are also being used for the derivatization of nanostructures [9]. Therefore, the synthesis of hydrazine derivatives is a matter of significant interest from both theoretical and practical perspectives [10].

Unsubstituted or substituted halo nitro and nitroso compounds and their metabolites are reported 11 as potent, selective and non-toxic inhibitors and supressants of cancer growth and viral infections in a mammalian host. The nitro compounds are particularly useful for treatment and suppression of tumors and viruses associated with breast cancer, AIDS, herpetic episodes and viral infections.

In present work we report the synthesis (Scheme-1) and characterization of 1, 2-bis (2, 4, 6-trinitrophenyl) hydrazine, and its evaluation for antimicrobial applications.

***Corresponding Author: P.P Mahulikar,** High Energy Materials Research Laboratory, Pune , India. **E-Mail:** dmbadgujar@rediffmail.com



Scheme-1 Synthesis of 1, 2-bis (2, 4, 6-trinitrophenyl) hydrazine [3]

2. Materials and Methods

2.1 *Experimental section*

The starting materials used in the present study were of AR grade and used directly as purchased from the trade. The completion of reaction and purity of products were checked by silica gel thin layer chromatography (TLC). The melting point of the synthesized compounds was measured using Thomas Hoover capillary melting point apparatus. The IR spectra were determined as nujol mull on a Shimadzu FTIR-8400 spectrophotometer. Proton NMR spectra were recorded on Varian 300 MHz spectrometer with tetramethyl silane as an internal standard.

1, 2-[bis- (2, 4, 6-trinitro) phenyl hydrazine and its precursors were synthesized and characterized based on the lines of reported methods [11,12]. The physical and spectroscopic data obtained in the current investigation is in accordance with the reported literature data [12].

3. Results

The title compounds picryl chloride (2) and 1, 2-[bis- (2, 4, 6-trinitro) phenyl hydrazine] (3), were screened for their antimicrobial properties after ascertaining their purity (TLC). The compounds were screened for antifungal activity against *Aspergillus niger* and *Alternaria aletrnata* and antibacterial activity against *Bacillus substalis* and *Xanthomonas campstris* at different concentrations (0.5 % and 1%) using agar well method [13].

The bioassay media was prepared for bacterial and fungal species separately. For bacteria 3.5 g of nutrient agar and 1 g of agar type firstly suspended in distilled water (100 ml). For antifungal activity study, 3.5 g of Czepadox broth and 3 g of agar type firstly suspended in distilled water (100 ml). The medium was kept in autoclave at 15 lbs for 15 min for sterilization. Petriplates and saline (prepared by pinch of NaCl in 100 ml distilled water) were also sterilized in an autoclave. The sterile medium was then poured into sterile petriplates in between two burners. The space between two burners provides sterile atmosphere. The culture of microorganism was then mixed with saline in test tube and spread on petriplates with the help of spreader. The well was prepared with the help of cork borer. The samples were poured in respective wells with the help of micropipette. Plates were kept for 48 h and 24 h for antifungal and antibacterial bioassay, respectively and then zone of inhibition was measured as diameter in mm and the results are summarized in table 1 and 2, respectively. The antimicrobial activity was found to be proportional to the diameter (mm) of the zone of inhibition. The experiments were performed in duplicate and the average of the measured zones of inhibition was considered as summarized in Figure 1 and 2, respectively.

TABLE NO. 1. ANTIFUNGAL MICROBIAL ASSAY OF 1, 2-[BIS- (2, 4, 6-TRINITRO) PHENYL HYDRAZINE]

Compound	Concentration	Zone of inhibition (diameter, mm)	
		Aspergilus niger	*Alternaria aletrnata*
1,2-[bis-(2,4,6-trinitro) phenyl hydrazine] (3)	0.5 %	22	34
	1.0%	41	45
Picryl chloride (2)	0.5 %	32	28
	1.0%	46	36
Methanol (as control)		00	00

TABLE NO. 2. ANTIBACTERIAL MICROBIAL ASSAY OF 1, 2-[BIS- (2, 4, 6-TRINITRO) PHENYL HYDRAZINE]

Compound	Concentration	Zone of inhibition (diameter, mm)	
		Xanthomonas campstris	***Bacillus substalis***
1,2-[bis-(2,4,6-trinitro) phenyl hydrazine] (3)	0.5 %	29	33
	1.0%	41	39
Picryl chloride (2)	0.5 %	12	21
	1.0%	16	36
Methanol (as control)		00	00

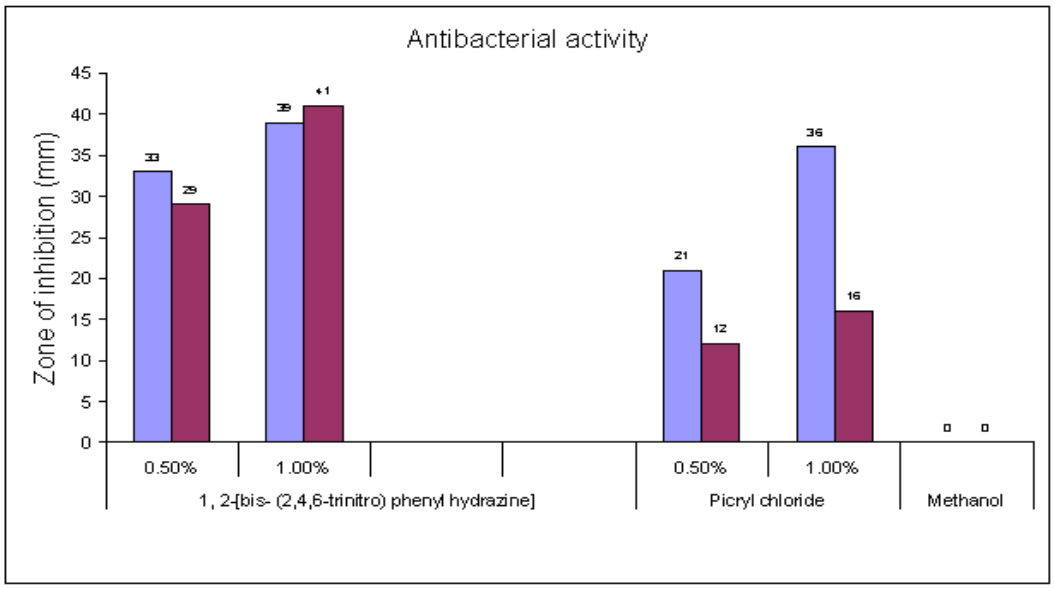


Figure 1 Antibacterial activity (B. substalis X .campstris)

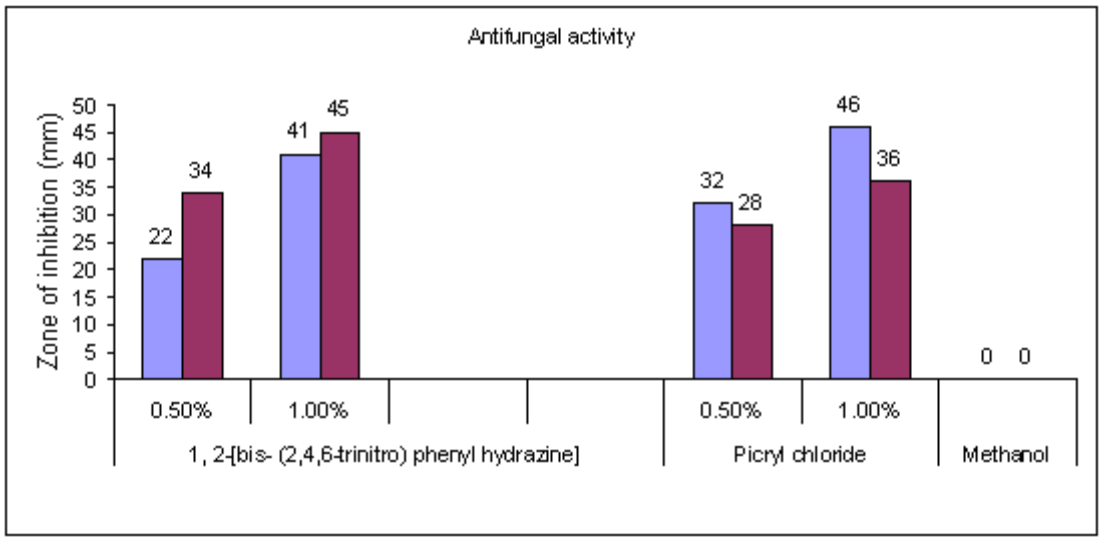


Figure 2 Antifungal activity (A. niger A. alternata)

4. Discussion

The picryl chloride (2) and 1, 2-[bis- (2, 4, 6-trinitro) phenyl hydrazine] (3), were screened for their antimicrobial properties.The compounds were screened for antifungal activity against *Aspergillus niger* and *Alternaria aletrnata* and antibacterial activity against *Bacillus substalis* and *Xanthomonas campstris* at different concentrations (0.5 % and 1%) using agar well method.

Both compounds 2 and 3 exhibited better antifungal potency against both test fungi species at 1% concentration. However, compound 3 reflected better antibacterial activity than 2 against the test bacterial species.

Conflict of interest statement

We declare that we have no conflict of interest.

Acknowledgement

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