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Bishydrazino-s-triazine derivatives and their microbicidal activity

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ABSTRACT

A series of compounds have synthesized by reaction of 2(4-chloro arylamino)-4,6-dichloro-1,3,5-triazine and various phenyl hydrazine derivatives. The structures of novel synthesized compound have been established on the basis of elemental analysis and IR spectral studies. All the synthesized compounds were evaluated for antimicrobial activity against different microorganisms.

KEYWORDS

2(4-chloro arylamino) diphenylhydrazino s-triazine derivatives;
Hydrazines;
IR & spectral study;
Antimicrobial activity.

INTRODUCTION

Literature survey reveals that number of derivatives containing s-triazine ring have been reported as heterocyclic compounds[1]. They are applicable mostly as reactive dyes and some are used as polymers and drugs[2,3]. The phenyl hydrazine derivatives containing s-triazine ring are not reported so far except one instance[4]. Recently our university scientists have studied the bishydrazino-s-triazine clubbed molecules having alkoxy group[4]. In extention of this work[4], the present authors reported the novel bishydrazino-s-triazine compounds[5,6]. In continues of this work the present communications deals with the studies on novel bishydrazino-s-triazine derivatives having the route shown in Scheme-1.

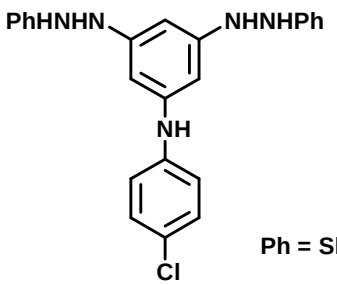
MATERIALS AND METHOD

Cyanuric chloride, 4-chloro arylamine and all the phenyl hydrazine derivatives (substitution shown in Scheme-1) were obtained as Analar grade from local dealer. 2(4-chloro aryamino)-4,6-dichloro-1,3,5-triazine was prepared by general method[4]. All other chemicals used were of laboratory grade.

General procedure for the synthesis of 2(4-chloro arylamino)-4,6-diphenyl hydrazine-1,3,5-triazines(3a-f)

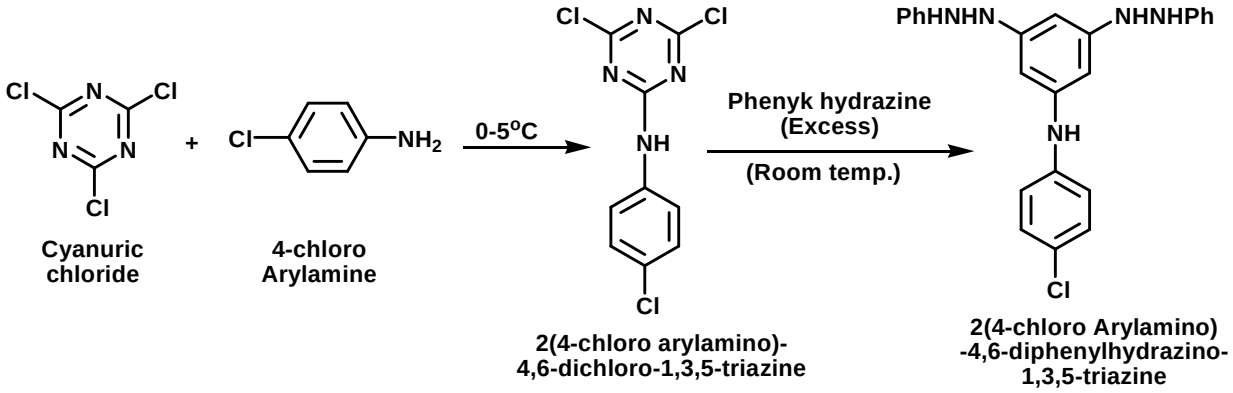
To a well stirred solution of 2(4-chloro arylamino)-

Structure 1

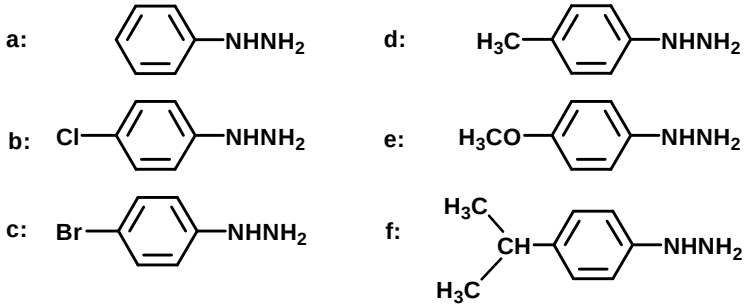


Ph = Showing in Scheme

2(4-chloro Arylamino)-4,6-diphenylhydrazino-1,3,5-triazine (3a-f)



Where, $PhNHNH_2$ =



Scheme 1

4,6-dichloro-1,3,5-triazine (0.01 mole) in tetrahydrofuran (THF) solvent (50ml) a solution of phenyl hydrazine (or substituted phenyl hydrazine) (Scheme-1) (0.02mole) in THF (50ml) was added gradually at room temperature. The mixture was stirred for two hours. Then the mixture was refluxed for further two hours. After completion of reaction, the resultant solid product was filtered, washed with THF and air-dried. All the (3a-f) compounds listed in TABLE 1 are dark yellow amorphous powders. The analytical data of novel title compounds are given a TABLE 1.

Measurements

The C, H, and N analysis were carried out on a Carlo-Erba EA 1108 Model elemental analyzer. The IR spectra (KBr pallet) were reported on Perkin Elmer FT-IR spectrophotometer and values are expressed in cm^{-1}. The NMR spectra of soluble sample No.3e was scanned on Perkin Elmer FT-NMR spectrophotometer.

TABLE 1 : Characterization of 2(4-chloro arylamino)-4,6-diphenyl hydrazino-1,3,5-triazine(3a-f)

Compounds	Molecular Formula	Mol. Weight	% C		% H		% N	
			Calcd	Found	Calcd	Found	Calcd	Found
3-a	$C_{21}H_{19}N_8Cl$	418.5	60.61	60.57	4.54	4.50	26.76	26.70
3-b	$C_{21}H_{17}N_8Cl_3$	487.5	51.69	51.60	3.49	3.45	22.97	22.80
3-c	$C_{21}H_{17}N_8Br_2Cl$	576.5	43.71	43.65	2.95	2.90	19.42	19.30
3-d	$C_{23}H_{23}N_8Cl$	446.5	61.81	61.70	5.15	5.10	25.08	25.00
3-e	$C_{23}H_{23}N_8O_2Cl$	478.5	57.69	57.60	4.81	4.75	23.41	23.30
3-f	$C_{27}H_{31}N_8Cl$	502.5	64.48	64.40	6.17	6.10	22.29	22.10

Antimicrobial activity

All the synthesized compound 3a-f was screened for their antibacterial activity against various microorganisms. The pour plate agar method was used for this study. Following general procedure is adopted[7].

The antimicrobial activity of all the compounds was studies at 1000ppm concentration in vitro. The different types of microorganism used were some gram negative bacteria [*Enterobacter aerogenes*, *Proteus valgaris*], gram positive bacteria [*Bacillus cereus*, *Streptococus species*], fungi [*Rhizopus stotonifer*], yeast [*Candida species*] and actinomycetes [*Streptomyces rimosus*].

The antibacterial activity of 3a-f compounds was measured on each of these microorganism strains on a potato dextrose agar medium (PDA). Such a PDA medium contained[8] potato 200gram, dextrose 20gram,

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agar 30gram, and water 1 Litre. PDA medium autoclaved at 121°C temperature and 15lbs pressure for 15 minutes. After autoclaving the compounds to be tested were inoculated (1000ppm) in PDA medium at 42°C temperature and mix it than these media were poured in to sterile empty glass Petri plates. The testing microorganism [young culture] was inoculating after solidification of the PDA medium plates. The percentage inhibition of growth of microorganism was calculated after 5 days of incubation of PDA medium plate inoculated with microorganism at appropriate temperature [Bacteria: 37°C, Fungi: 25°C, Yeast and Actinomyces: room temp.] percentage of inhibition of microorganism was calculated by using the formula given below.

$$\text{Percentage of inhibition of growth of microorganism} = \frac{100(X - Y)}{X}$$

Where,

X = area of bacterial growth in control plate (mm),

Y = area of bacterial growth in test plate (mm).

The antimicrobial activity of all the 3a-f compounds are furnished in TABLE 2.

RESULTS AND DISCUSSION

The reaction between phenyl hydrazine and 2(4-chloro arylamino)-4,6-dichloro-1,3,5-triazine3(a-f) are facile. The products (3a-f) are dark yellow amorphous powders. The C, H, N contents of all (3a-f) shown in TABLE 1 are consistent with the predicated structures shown in Scheme 1. the IR spectra of all (3a-f) are almost identical. All the IR spectra comprises following important features.

(1) –NH-NH- (hydrazine group) : 3280,1610,820 cm^{-1}

(2) s-triazine : 1510,1250,870 cm^{-1}

(3) –NH- (secondary) : 3400cm^{-1}

As the compounds (3a-f) except 3e are insoluble $CDCl_3$, the NMR spectral study attempted for 3e. The NMR spectrum of 3e comprises the multiplate between 6.9 to 8.1 δppm mainly due to aromatic protons. While the signal at 2.6 δppm with integration of 6H is responsible for two CH_3 of OCH_3 groups. The signals in most downfield (9.5 δppm) are from NH-NH protons. The result of anti microbial screening showed (TABLE 2) that compounds 3b,c,d,f displayed a high order of antibacterial activity and remaining compounds showed weak to moderate activity against both the bacteria. Similarly compounds 3b showed higher antifungal activity and remaining compounds displayed moderate antifungal activity against the fungi.

CONCLUSION

The synthesis of arylamino diphenylhydrazino -s-triazine is facile. The produced compounds have good microbial toxicity. Due to NH-NH groups these compounds can be utilized for epoxy resin hardner. Such work in polymer journal will be published shortly.

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TABLE 2 : Antimicrobial activity data of compounds (3a-f)

Sample	Percentage of inhibition of growth at 1000 ppm (%) concentrate of sample						
	Bacillus megaterim	*Staphylococsaureus*	*Enterobacter aerogenes*	*Proteus vulgaris*	Rhizopus *stolonifer*	Candida *species*	Streptomyces *rimosus*
Control	NIL	NIL	NIL	NIL	NIL	NIL	NIL
3-a	87	91	86	91	74	78	72
3-b	98	100	98	99	100	100	96
3-c	92	95	95	84	84	88	87
3-d	89	94	99	82	83	85	80
3-e	81	83	84	89	75	71	75
3-f	84	86	98	85	89	89	76

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