



AMERICAN JOURNAL OF PHARMTECH RESEARCH

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Green Synthesis of 2-Substitutedimino-4-Amino-6-Ethylformamidino-1,3,5-Thiadiazines

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ABSTRACT

“Non-conventional” synthetic method has shown broad applications as a very efficient way to accelerate the course of many organic reactions, producing high yields, higher selectivity and lower quantities of side products consequently easier work-up and purification of the products. One-pot two-component condensation of 1-formamidino-5-ethylformamidonothicarbamide (**IIIa**) with various isocyano-dichlorides (**XIa-g**) were carried out in presence of lemon juice as a biocatalyst respectively to synthesize a novel series of 2-substitutedimino-4-amino-6-ethylformamidino-1,3,5-thiadiazines (**XIIa-g**) which are either to unknown. The structures were confirmed by conventional chemical characterization, elemental analysis and spectral studies.

Keywords: Lemon Juice, various isocyanodichlorides, 1-formamidino-5-ethylformamidonothicarbamide.

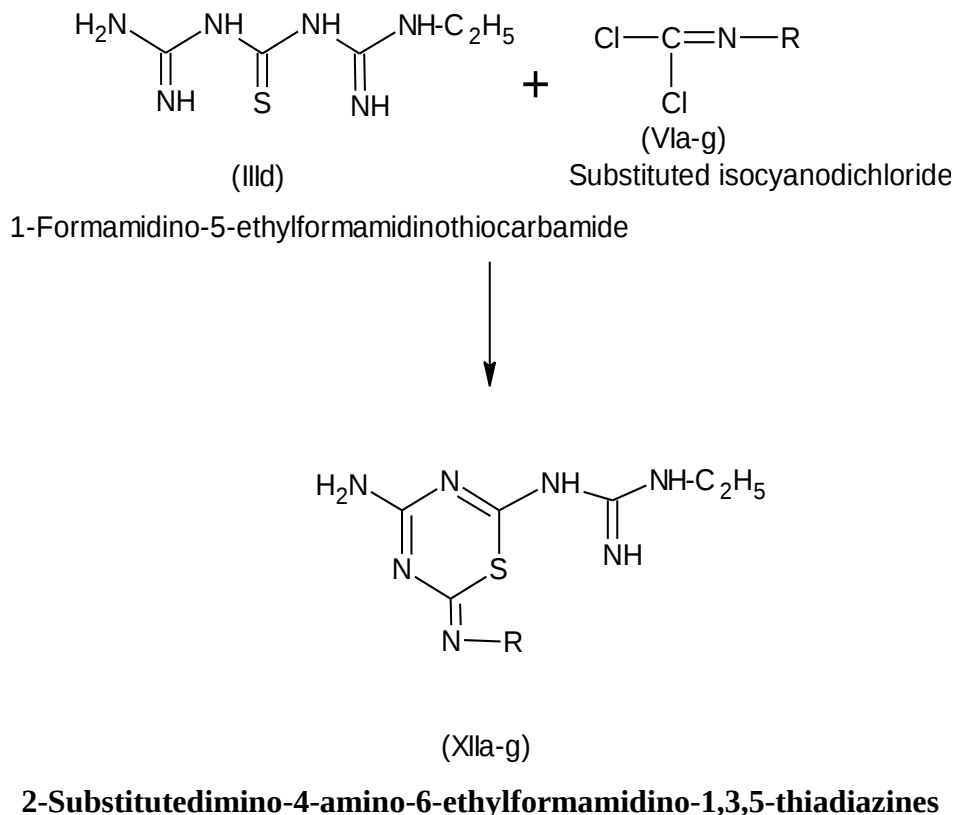
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Received 08 July 2016, Accepted 05 August 2016

INTRODUCTION

In recent years the chemical research has been focused on the eco friendly, environmentally, benign process to reduce the impact of environmental pollution. Green Chemistry¹⁻⁴ is placed in the frontier areas in this regard which involves the design, development and implementation of the performance criterion. So the 'greening' of conventional reactions is done to meet the ever increasing demands of selectivity in modern synthesis⁵. Sonochemical methods of synthesis use non classical forms of energy to modify the time duration and product yield by avoiding the undesired side products^{6,7}. Microwave heating and sonochemical methods have emerged as a powerful energy and time saving techniques to promote a variety of chemical reactions⁸⁻¹². These reaction methods, under solvent-free conditions are eco-friendly by reducing pollution and offer low cost, facile, safe and reproducible experimental procedures¹³. Therefore by using lemon juice as a biocatalyst¹⁴⁻¹⁵ technique has gained popularity in past decade as a powerful tool for rapid, economic and efficient synthesis of variety of compounds.

Literature survey reveals example of specific reactions, which do not occur under conventional conditional heating, but could be possible by lemon juice¹⁹ with good product yields. The present work describes suitable, convenient and somewhat direct method for the synthesis of 2-substitutedimino-4-amino-6-ethylformamidino-1,3,5-thiadiazines depicted below,



General remarks

All reagents were purchased from commercial suppliers and used without further purification. Dry methanol and diethyl ether were purchased from Aldrich and were used as such. All reactions were run in oven-dried round bottom flask or vial containing a teflon-coated stir bar and sealed with septum. Analytical thin layer chromatography was carried out on silica pre-coated glass plates (Silica gel 60 F254, 0.25 mm thickness) and visualized with UV light at 254 nm. ^1H NMR spectra were recorded on Bruker 400-MHz Ultrashield Advance II 400 model (400 and 100 MHz, respectively) at ambient temperature with CDCl_3 or DMSO-d_6 as solvents. CDCl_3 (δ 7.26 ppm), DMSO-d_6 (δ 2.50 ppm) or with tetramethylsilane (TMS, δ 0.00 ppm) as the internal standard. Chemical shifts (δ) were reported as part per million (ppm) in δ scale downfield from TMS.

RESULTS AND DISCUSSION**General procedure for the synthesis of 2-ethylimino-4-amino-6-ethylformamido-1,3,5-thiadiazine (XIa)**

A mixture of 1-formamidino-5-ethylformamidonothiocarbamide (0.1M)(IIIa), ethyl isocyanodichloride (0.2M) (XIa) freshly extracted lemon juice (20 ml) was taken in round bottom flask. It was tightly sealed and the reaction mixtures were kept in sun light for 50 hours. Then the reaction mixture was poured on ice cubes with vigorous stirring, ivory crystals were obtained these were washed several times with water. Recrystallised from ethanol. Yield 96%, melting point 174°C .

Properties of (XI):

It is brown colour crystalline solid having melting point 210°C . It gave positive test for nitrogen and sulphur. It was desulphurized by alkaline plumbite solution which clearly indicate the presence of $\text{C}=\text{S}$ group. It was soluble in water, ethanol, DMSO-d_6 while insoluble in carbon tetrachloride, chloroform, benzene, petroleum ether. It formed picrate having melting point 180°C .

Elemental analysis: [C: 38.37% (found), 39.00% (calculated)], [H: 04.85% (found), 05.50% (calculated)], [N: 41.17% (found), 41.17% (calculated)], [S: 13.20% (found), 14.68% (calculated)].

IR Spectrum: The IR spectrum was carried out in KBr-pellets. The important absorptions are correlated as (cm^{-1}): 3358.29 N-H stretching, 2920.64 C-H stretching, 1665.78 $\text{N}=\text{C}-\text{N}$ stretching, 1150.99 C-N stretching.

NMR Spectrum:

The NMR spectrum was carried out in DMSO-d₆ and CDCl₃. This spectrum distinctly displayed the signals due to Ar-H protons at δ 7.3241-6.0145 ppm, -NH proton at δ 3.6237-3.6582 ppm, -CH₂ protons at δ 2.3251-2.6063 ppm, -CH₃ protons at δ 1.2437 ppm.

Similarly, 2-phenylimino-4-amino-6-ethylformamidino-1,3,5-thiadiazine (**XIib**), 2-methylimino-4-amino-6-ethylformamidino-1,3,5-thiadiazine (**XIic**), 2-p-chlorophenylimino-4-amino-6-ethylformamidino-1,3,5-thiadiazine (**XIid**), 2-o-tolylimino-4-amino-6-ethylformamidino-1,3,5-thiadiazine (**XIle**), 2-m-tolylimino-4-amino-6-ethylformamidino-1,3,5-thiadiazine (**XIlf**) and 2-p-tolylimino-4-amino-6-ethylformamidino-1,3,5-thiadiazine (**XIlg**) were synthesized by the interaction of 1-formamidino-3-ethylformamidinothiocarbamide (0.1M) (**IIId**) with phenylisocyanodichloride, (0.2M) (**XIb**), methylisocyanodichloride, (0.2M) (**XIc**), p-chlorophenylisocyanodichloride (0.2M) (**XId**), o-tolylisocyanodichloride (0.2M) (**XIe**), m-tolylisocyanodichloride (**XIf**) and p-tolylisocyanodichloride (**XIg**) lemon juice respectively and enlisted in **Table- 1**

Table 1: Synthesized compound, its % yield and melting point.

Sr. No.	2-Substitutedimino-4-amino-6-ethylformamidino-1,3,5-thiadiazine	Juice	Yield %	M. P.
1.	2-Phenylimino-----thiadiazine	Lemon	94	198
2.	2-Methylimino-----thiadiazine	Lemon	90	168
3.	2-p-Chlorophenylimino--thiadiazine	Lemon	93	153
4.	2-o-Tolylimino-----thiadiazine	Lemon	97	179
5.	2-m-Tolylimino-----thiadiazine	Lemon	97	158
6.	2-p-Tolylimino-----thiadiazine	Lemon	97	165

REFERENCES:

1. P.T. Anastas , and J.C.Warner , Green Chemistry ; Theory and Practice , Oxford University Press, New York ,(1998)
2. R.S. Varma, ACS Symposium “ Green Chemical synthesis and Processes , Chap 23, Pg 292-313, American Chemical Society , Washington D.C.(2000).
3. R.S. Verma “ Green Chemistry , Challenging Perspective” Oxford University Press , Oxford , Pg 221 ,(2000)
4. R.S.Varma “ Microwaves in Organic Synthesis , Chap. 6 , Wiley –VCH , Weinheim , PP 181(2002)
5. Doble M. and Kruthiventi A.K., Green Chemistry and Engineering, Academic Press (2007)
6. Luche J.L. and Bianchi C., Synthetic Organic Sonochemistry, Springer, US (1998)

7. Strauss C. and Varma R., Microwaves in Green and Sustainable Chemistry, *Microwave Methods in Organic Synthesis*, 199-231 (2006)
8. Fini A. and Breccia A., Chemistry by Microwaves, *Pure Appl. Chem.*, 71(4), 573-580 (1999)
9. Larhed M. and Hallberg A., Microwave-Assisted High-Speed Chemistry: a New Technique in Drug Discovery, *Drug Discovery Today*, 6(8), 406-416 (2001)
10. Lidstroem P., Tierney J., Wathey B. and Westman J., Microwave Assisted Organic Synthesis: a Review, *Tetrahedron*, 57(45), 9225-9283 (2001)
11. Caddick S., Microwave Assisted Organic Reactions, *Tetrahedron*, 51(38), 10403-10432 (1995)
12. Kappe C.O., Controlled Microwave Heating in Modern Organic Synthesis, *Angew. Chem. Int. Ed.*, 43(46), 6250-6284 (2004)
13. Loupy A., Petit A., Hamelin J., Texier-Boullet F., Jacquault P. and Mathe D., New Solvent-Free Organic Synthesis using Focused Microwaves, *Synthesis*, 1998(9), 1213-1234 (1998)
14. R.S. Varma , Microwaves : Theory and application in material processing IV, American chemical society , Westerville , Ohio, PP 357 (1997)
15. S.K. Dewan, Plant extracts with anti-inflammatory properties-A new approach for characterization of their bioactive compounds and establishment of structure-antioxidant activity relationships. *Indian J. Chem.* , 45B, , 2337 ,(2006)

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