Chemistry of Heterocyclic Compounds, Vol. 31, No. 10, 1995

CONVENIENT METHOD FOR INTRODUCTION OF CYANO GROUP INTO NITROGEN, SULFUR, AND OXYGEN HETEROCYCLIC COMPOUNDS

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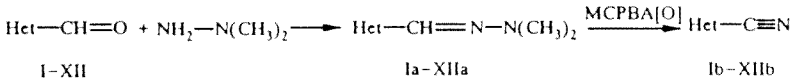
A number of heterocyclic aldehydes were transformed via their N,N-dimethylhydrazones to nitriles in high yields using a one-pot procedure.

Over the years there have been numerous reports concerning the transformation of aldehydes to nitriles [1-5]. Although one can choose from a great variety of reagents, many of these methods are deficient in some respects, such as low yields, expensive procedures, not readily available reagents, and harsh reaction conditions. Therefore, the search for a mild and universally applicable method continues.

Now we wish to report a mild and versatile method for easy introduction of a cyano group into heteroaromatic rings such as those of furan, thiophene, pyridine, 4-pyridone, and 4-pyranone. Such nitriles can serve as precursors of active medicinal agents, bioactive compounds, and of novel materials, such as dyes, additives, and organic conductors.

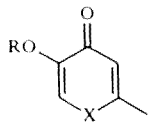
The method is based on oxidative transformation of N,N-dimethylhydrazones of heterocyclic aldehydes (I-XII) with *m*-chloroperbenzoic acid (MCPBA). In the majority of cases the hydrazones are first prepared and isolated, and then treated with MCPBA [5]. Now the method could be simplified into a one-pot procedure involving the addition of MCPBA to the *in situ* generated hydrazones Ia-XIIa.

The main goal of the present work was the synthesis of nitriles of more complex heterocyclic systems, such as furans (Ib, IIb), thiophenes (IIIb-VIb), pyridines (VIIb, VIIIb), 4-pyrones (IXb, Xb), and 4-pyridones (XIb, XIIb). These multifunctional compounds appeared to be good models for testing the chemoselectivity of the oxidative conversion of aldehydes via N,N-dimethylhydrazones into nitriles.



I-XII Ia-XIIa Ib-XIIb

I Het = 2-Furyl; II Het = 5-Methyl-3-carbomethoxy-2-furyl,
III Het = 2-Thienyl; IV Het = 3-Thienyl; V Het = 3-Methyl-2-thienyl;
VI Het = 3-Methyl-4-carbomethoxy-5-N-acetamido-2-thienyl,
VII Het = 3-Pyridyl; VIII Het = 4-Pyridyl



IX-XII

IX X = O, R = CH_3; X X = O, R = $CH_2—C_6H_5$,
XI X = NH, R = CH_3; XII X = NH, R = $CH_2—C_6H_5$;

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0009-3122/95/3110-1186$12.50

TABLE 1. Yields of the Transformation of Heterocyclic Aldehydes to Nitriles via N,N-Dimethylhydrazones in a One-Pot Procedure

Aldehyde	Yield, %	Aldehyde	Yield, %	Aldehyde	Yield, %
I	93	V	85	IX	53
II	90	VI	75	X	56
III	90	VII	78	XI	65
IV	88	VIII	88	XII	65

The discovered method is chemoselective, and the desired nitriles are obtained in good to excellent yields.

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