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Reactions of the carbazole alkaloid Mahanimbine with mineral acid, Lewis acid and *m*-chloroperbenzoic acid

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Mahanimbine, a C_{23} carbazole alkaloid, has been isolated from the leaves of *Murraya koenigii* Spreng. This carbazole alkaloid, with a C_5H_9 ring residue, on reaction with different acids shows some interesting results. Structures of the naturally occurring compound as well as the synthetic products have been ascertained on the basis of 1D and 2D NMR spectroscopic data. In this paper is discuss isolation, structure elucidation and some chemical transformations of mahanimbine on reaction with mineral acid, Lewis acid and *m*-chloroperbenzioc acid.

Keywords: *Murraya koenigii*, carbazole alkaloids, mahanimbine, Lewis acid, mineral acid

The plant *Murraya koenigii* (L.) Spreng. belonging to the family Rutaceae is native to India and now distributed in most of southern Asia. The leaves of this plant are well-known as curry leaves and have been used as one of the important herbs of south Indian cooking. Various parts of the plant have been used in traditional medicine for the treatment of headache, toothache and stomachaches, influenza, rheumatism, traumatic injury, and insect and snake bites, and as an antidysentric as well as an astringent. Intake of the leaves can increase digestive secretions and relieve nausea, indigestion and vomiting[1]. The leaves and bark are used in analgesia and local anesthesia and for the treatment of eczema and dropsy[2]. Chloroform extract of the root bark of *M. koenigii* displayed significant cytotoxic activity against cultured KB cell.

Murrayanine is the first carbazole alkaloid isolated from the stem bark of *M. koenigii*. After that a number of carbazole alkaloids have been isolated from this plant, possessing C_{13}, C_{18} and C_{23} skeletons[3-6]. A number of derivatives of these carbazole alkaloids were also prepared, many of which showed potent biological activities[7-9].

Mahanimbine[10] was isolated from the leaves of *Murraya koenigii* Spreng, popularly known as curry leaves tree. Spectroscopic studies revealed that the compound is a pyranocarbazole alkaloid with a C_{23} skeleton. The compound also has a C_5H_9 side chain. Application of the Lewis acid BF_3-etherate on mahanimbine **1** resulted in the cyclisation of its side chain furnishing a penta-cyclic compound **2** (Scheme I), whereas in presence of mineral acid mahanimbine was converted into cyclomahanimbine **3** (Scheme II). Compound **2** was later proved to be an isomer of cyclomahanimbine **3**. On the other hand, reaction of mahanimbine **1** with *m*-chloroperbenzioc acid resulted in the formation of an interesting product **4** containing both an epoxy ring as well as two hydroxyl functionalities (Scheme III).

Results and Discussion

Reaction of mahanimbine **1** with BF_3-etherate resulted in the cyclisation of its C_5H_9 side chain and a penta-cyclic product **2** was formed. The ^{1}H NMR spectrum of the product showed signals for five aromatic protons at δ 7.44 (H-4), 7.63(H-5), 7.34(H-6), 7.89(H-7) and 7.14(H-8). It also showed signals for one benzylic methine at δ 4.26 (H-1'), one aromatic methyl at δ 2.13 (H-10) and one gem-dimethyl group at δ 1.43(H-8' and H-9'). The product displayed 23 signals in the ^{13}C NMR spectrum (five aromatic doublets, one aromatic methyl, one gem-dimethyl, one oxygen-bearing quaternary carbon, seven aromatic singlets, three characteristic aliphatic triplets, one C-C double bond, one benzylic methine and one aliphatic methyl). The product has close structural resemblance with cyclomahanimbine **3**. The major distinguishing factor between **2** and cyclomahanimbine **3** is the number of