Chinese Chemical Letters Vol. 13, No. 4, pp 292 – 293, 2002
http://www.imm.ac.cn/journal/ccl/html

# Synthesis of 5-Deoxy-5-Acyloxyiminoavermectin B1 Derivatives

Xi Guang LIU, Jing Ping WU, Xiao Mei LIANG, Dao Quan WANG*

Key Laboratory of Pesticide Chemistry and Application Technology, College of Applied Chemistry, China Agricultural University, Beijing 100094

**Abstact:** Four 5-deoxy-5-acyloxyiminoavermectin B1 derivatives **4a~d** were synthesized *via* three steps from avermectin B1 and their biological activities were tested against *Heliothis armigera, Laphygma exigua and Musca domestica*.

**Keywords:** 5-Deoxy-5-acyloxyiminoavermectin B1, synthesis, insecticidal activity.

The avermectins[1] are a unique collection of naturally occurring macrocyclic lactones with broad spectrum of anthelmintic and insecticidal activities. Their remarkable biological activity and complex molecular architecture stimulated significant interest in the scientific community. Much research has been carried out on these compounds. Many derivatives of avermectin have much more bioactivities and have been commercially utilized[2-5]. Here we describe the synthesis of 5-deoxy-5-acyloxyimino-avermectin B1 derivatives, which with excellent pesticidal activity (**Scheme 1**). We found that the reactivity of the C-5 hydroxyimino group with carboxylic acids was much higher than that of the C-4" hydroxyl group when compound **3** was esterified applying DCC as a dehydrating agent. The C-5 hydroxyimino group of compound **3** can be converted to ester by reacting carboxylic acid and DCC directly, the hydroxy group on C-4" was not affected. The bioactivities of the compounds **4a~d** were preliminarily tested.

Compound **2** was synthesized by oxidizing avermectin B1 with activated $MnO_2$ in anhydrous ether at room temperature for 18 h in the yield of 90%. Compound **3** was obtained by reaction of hydroxyamine hydrochloride with **2** in *iso*propanol at room temperature for 10 h in the yield of 88% (54% in the literature[6]). Compound **4a~d** were synthesized by esterification of **3** with *n*-butyl acid, *cis*-chrysanthemic acid, *cis*-dibromo-chrysanthemic acid and *cis*-trifluorochlorochrysanthemic acid respectively in anhydrous dichloromethane using DCC as a dehydrating agent at room temperature. Reaction time and yield are listed in **Table 1**. Their structures were confirmed by IR, $^{1}$HNMR, $^{13}$CNMR and MS[7].

*E-mail: wangdq@mail.cau.edu.cn

**Scheme 1**

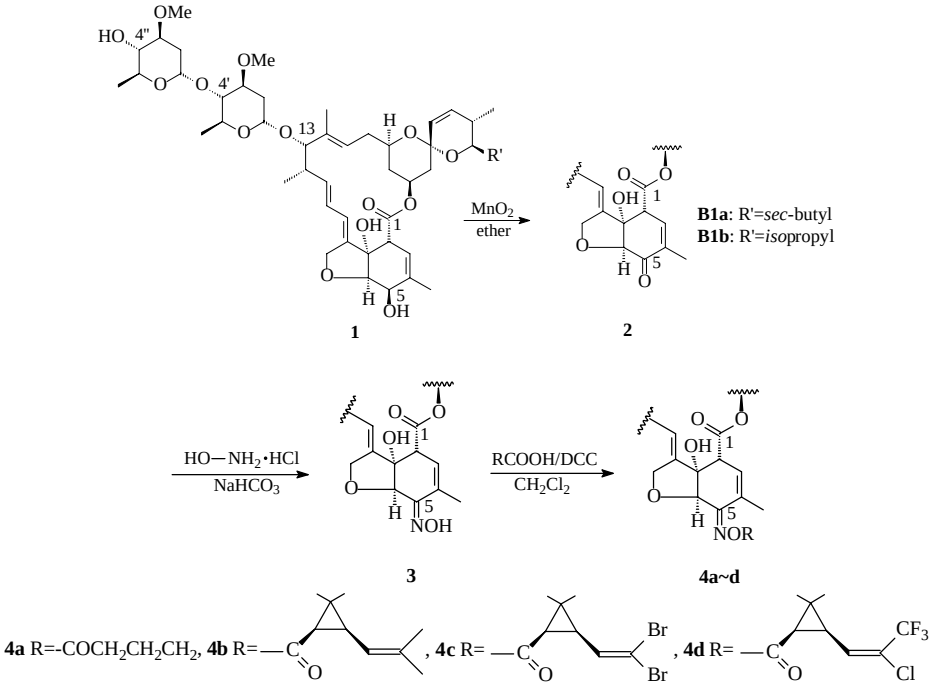


**Table 1** The reaction time and yield of **4a~d**

| Compds. | **4a** | **4b** | **4c** | **4d** |
|---|---|---|---|---|
| Reaction Time(d) | 4 | 12 | 5 | 3.5 |
| Yield(%) | 57 | 27 | 37 | 46 |

The insecticidal activities of compounds **4a~d** against *Heliothis armigera*, *Laphygma exigua* (immersion method) and *Musca domestica* (diet incorporated method) were evaluated. The results show that all of these compounds have insecticidal activity. Furthermore, compound **4a** has higher activity than the parent compound.

## References

1. G. Albers-Schönberg, B. H. Arison, J. C. Chabala, *et al*., *J. Am. Chem. Soc*., **1981**, *103*, 4216.
2. A. C. Goudie, N. A. Evans, K. A. F. Gration, B. F. Bishop, *et al*., *Veterinary Parasitology*, **1993**, *49*, 5.
3. M. H. Fisher, *ACS Symp. Ser*., **1993**, *524*, 169.
4. W. L. Shoop, P. Demontigny, D. W. Fink, *et al*., *International Journal for Parasitoly*, **1996**, *26*(11), 1227.
5. B. F. Bishop, C. I. Bruce, N. A. Evans, *et al*., *Veterinary Parasitology*, **2000**, *91*, 163.
6. M. H. Fisher, *EP 0379,341*, **1990**.
7. The data of IR, $^{1}$HNMR, $^{13}$CNMR and MS were submitted to the editoral office of CCL.

Received 25 July,2001