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APPENDIX

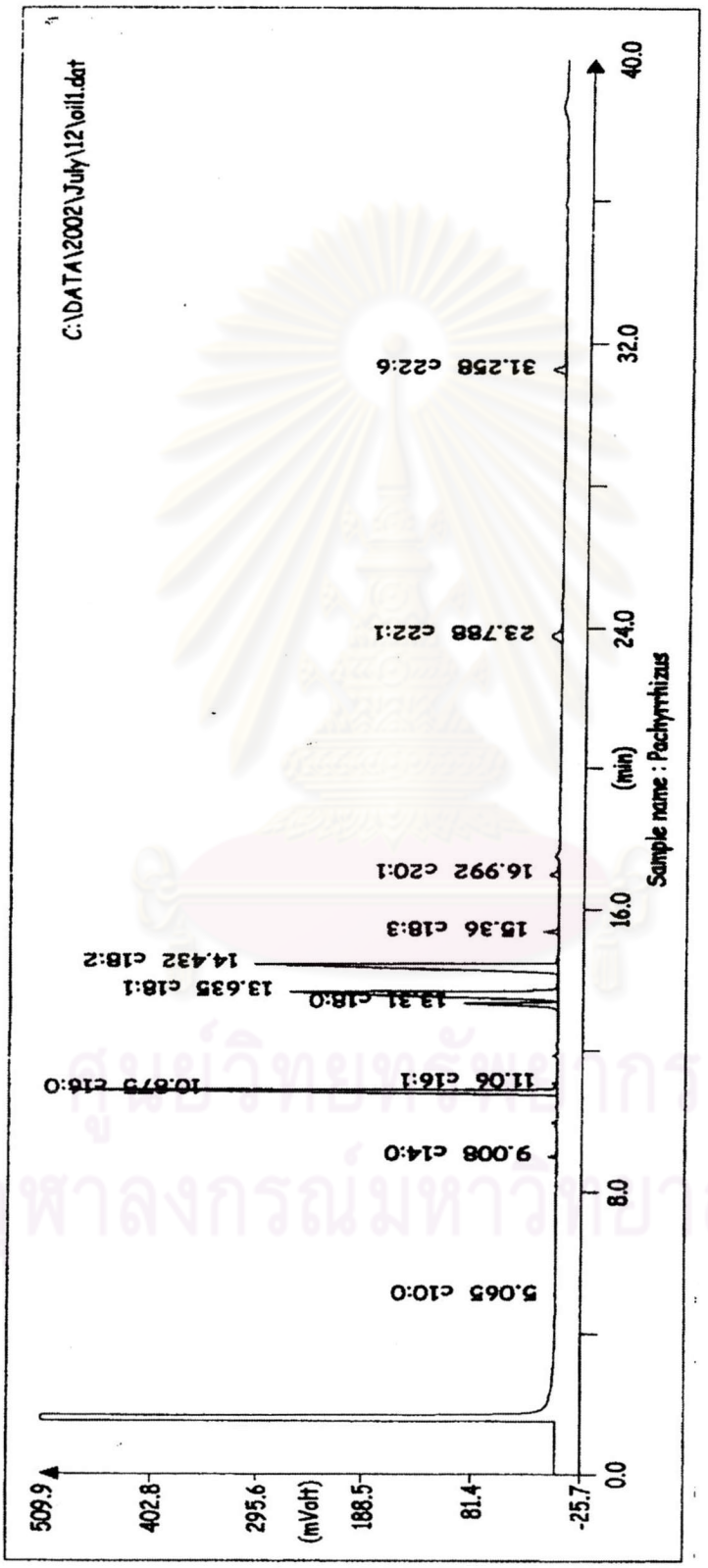

Figure 12 GC Chromatogram of the oil of *Pachyrrhizus erosus* seeds

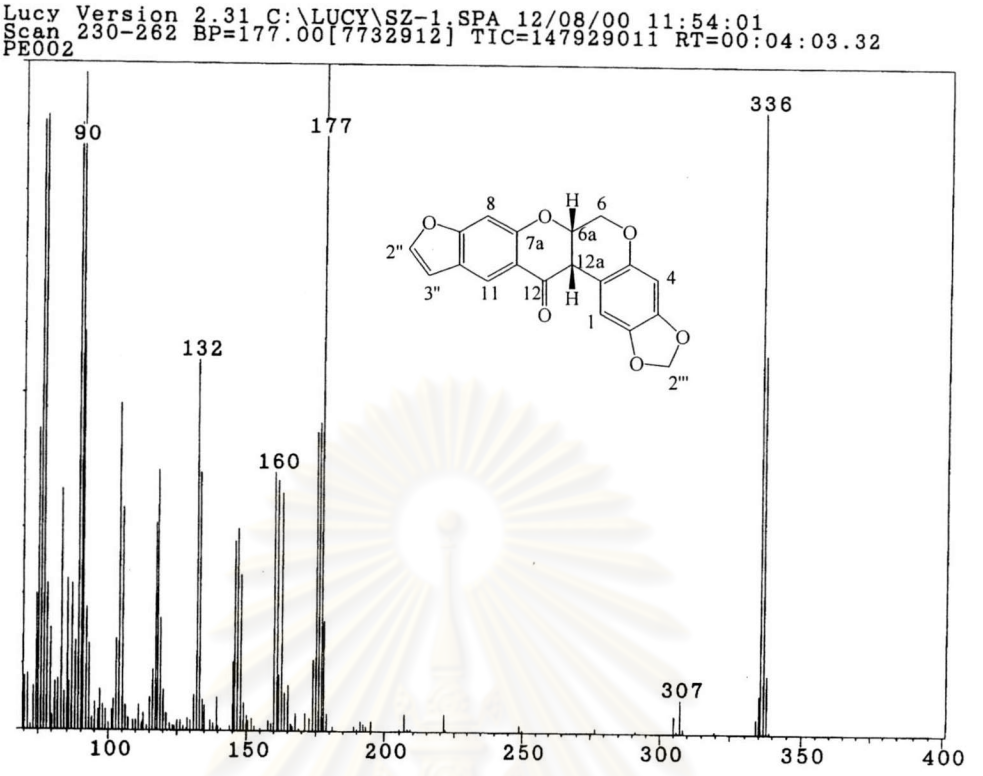

Figure 13 EI Mass spectrum of Compound **4**

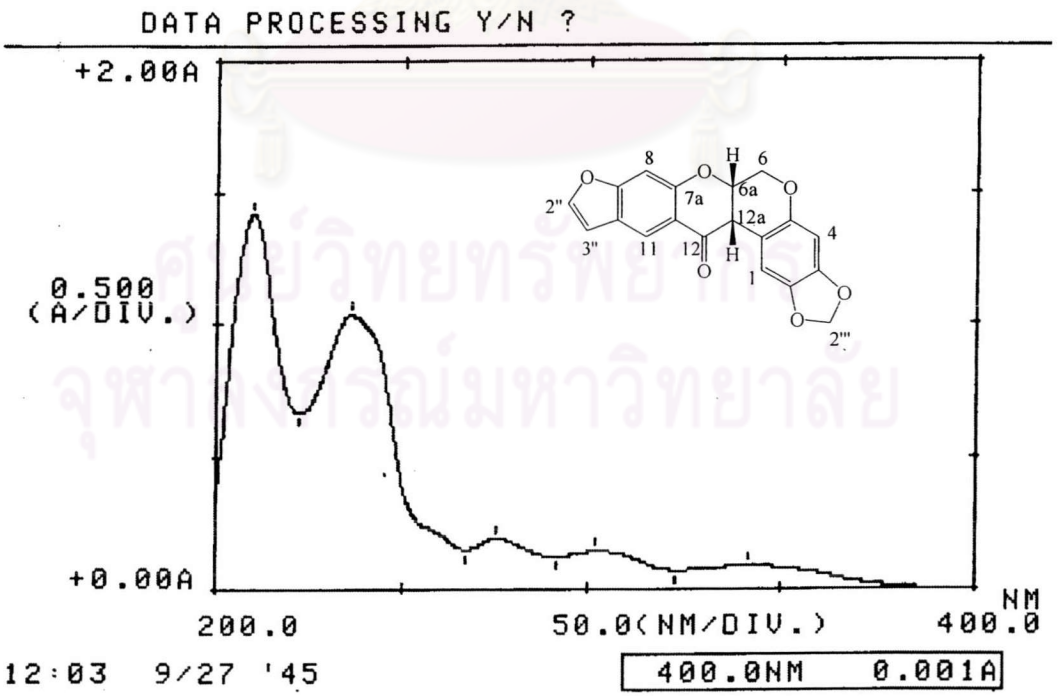

Figure 14 UV spectrum of Compound **4** (MeOH)

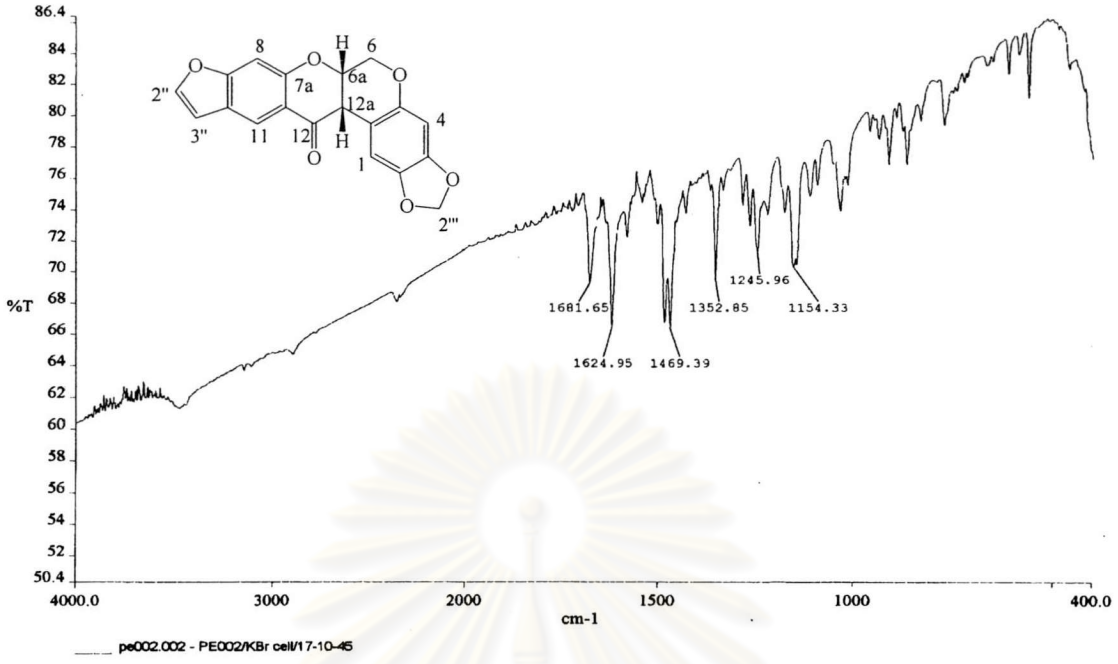

Figure 15 IR spectrum of Compound **4** (Film)

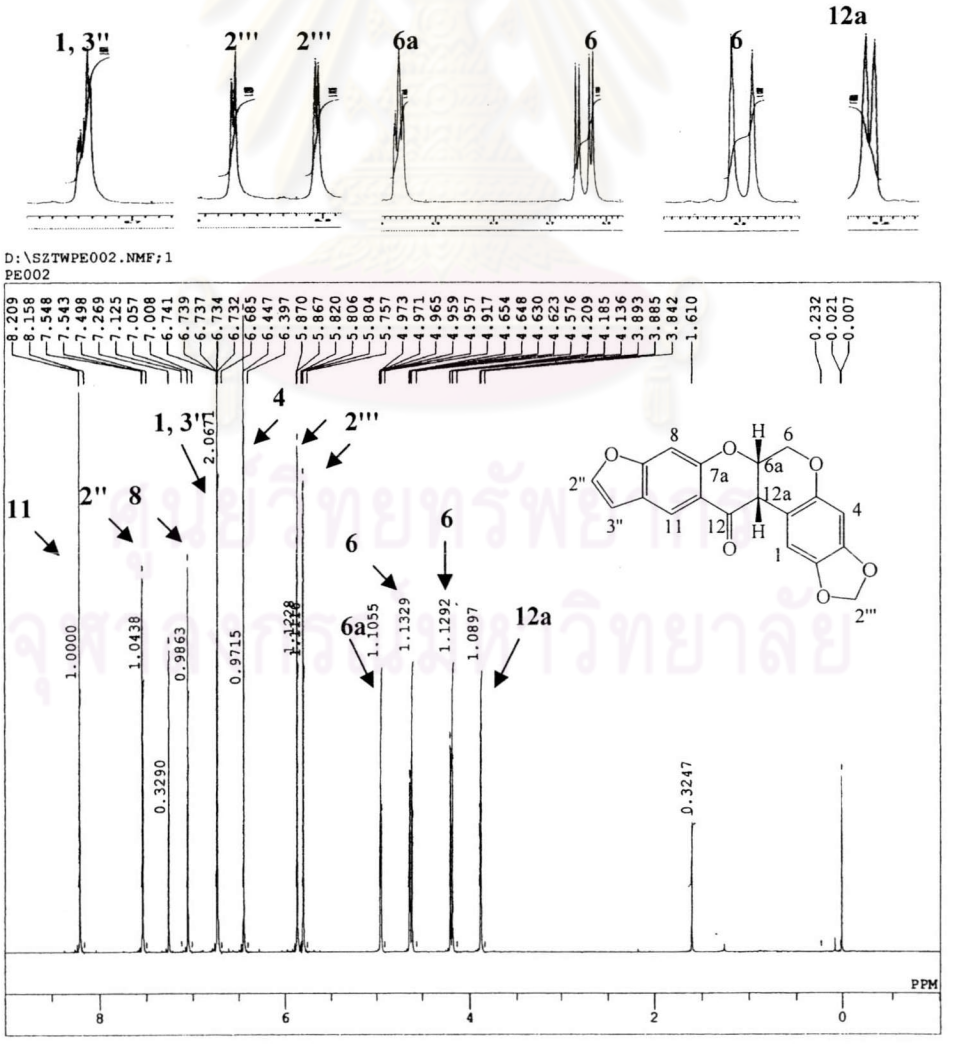

Figure 16 ^{1}H-NMR (500 MHz) spectrum of Compound **4** ($CDCl_3$)

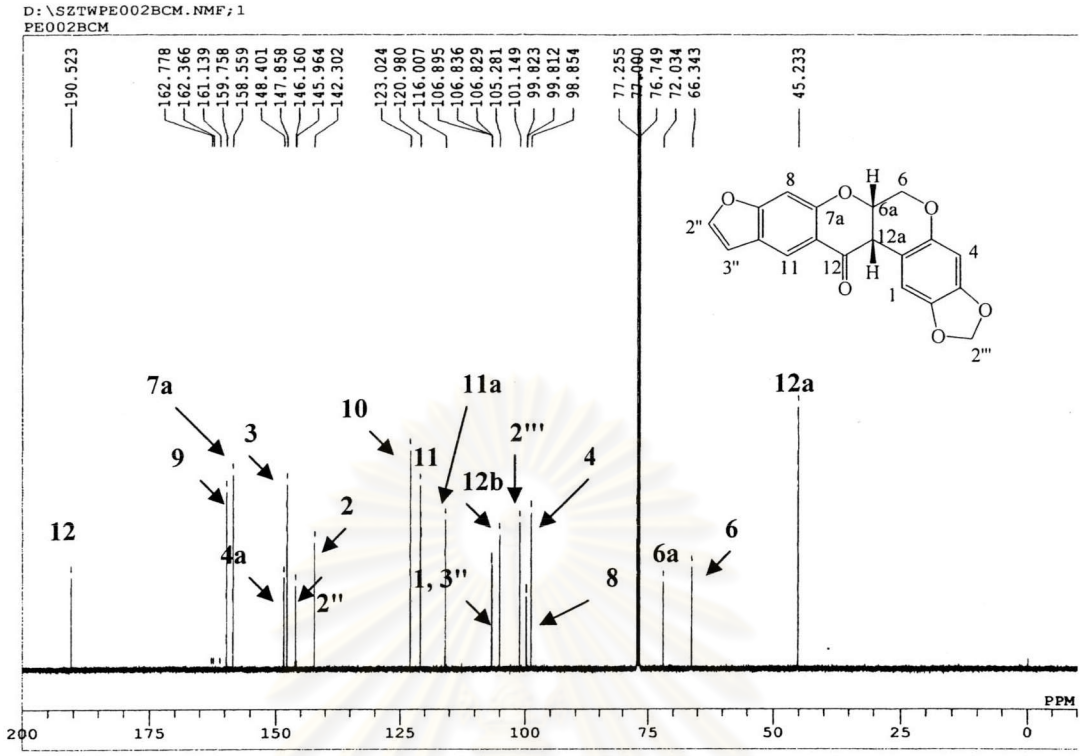

Figure 17 ^{13}C-NMR (125 MHz) spectrum of Compound **4** ($CDCl_3$)

Figure 18 HMQC spectrum of Compound **4** ($CDCl_3$)

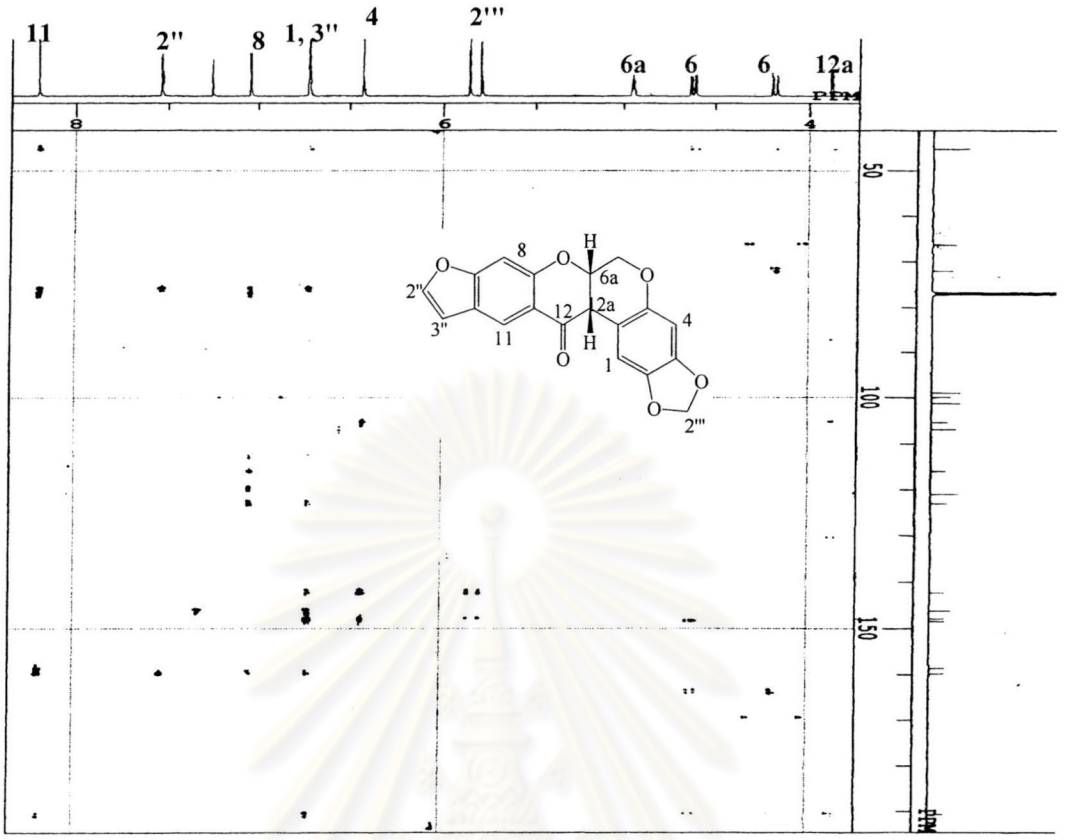

Figure 19 HMBC spectrum of Compound **4** ($CDCl_3$)

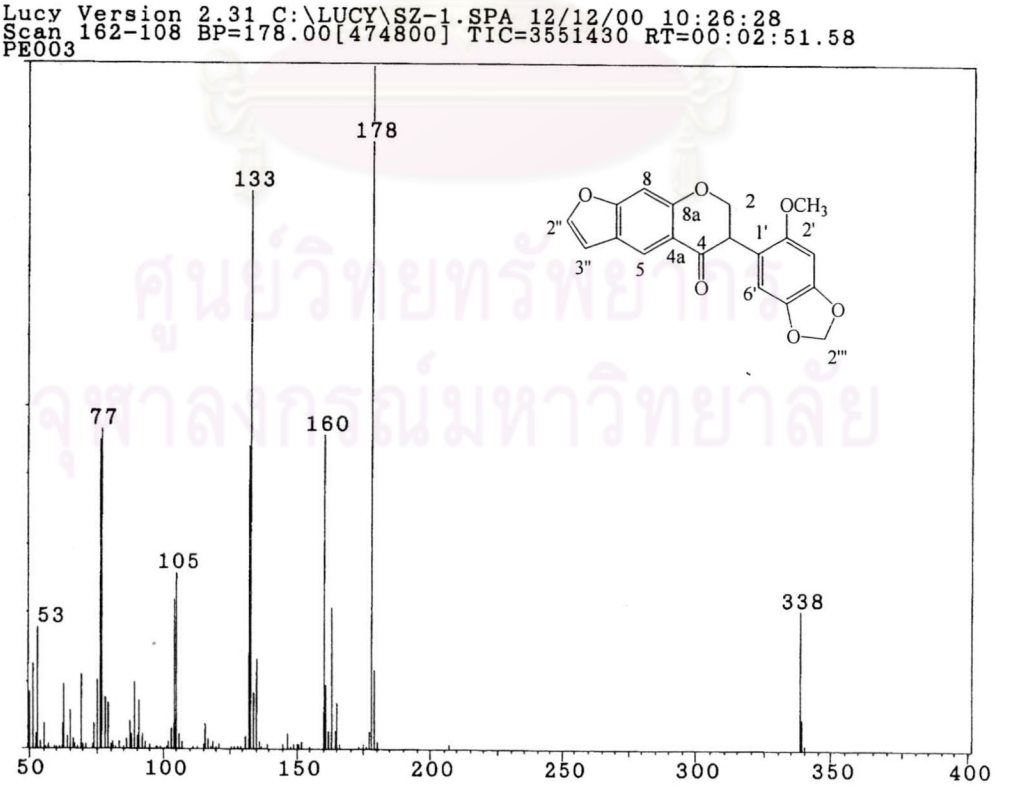

Figure 20 EI Mass spectrum of Compound **15**

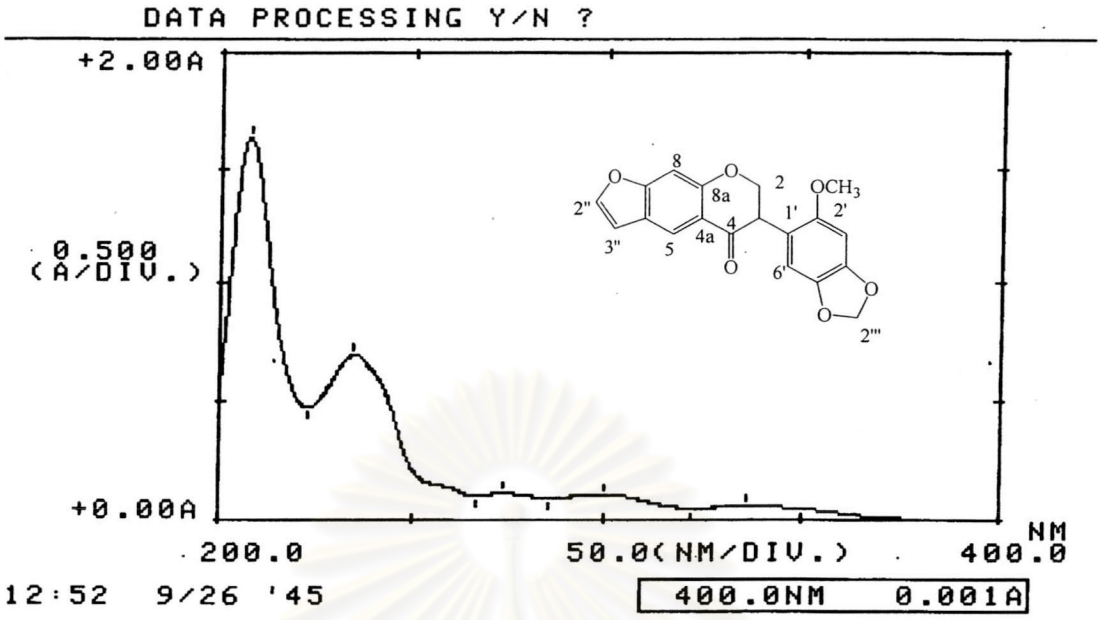

Figure 21 UV spectrum of Compound **15** (MeOH)

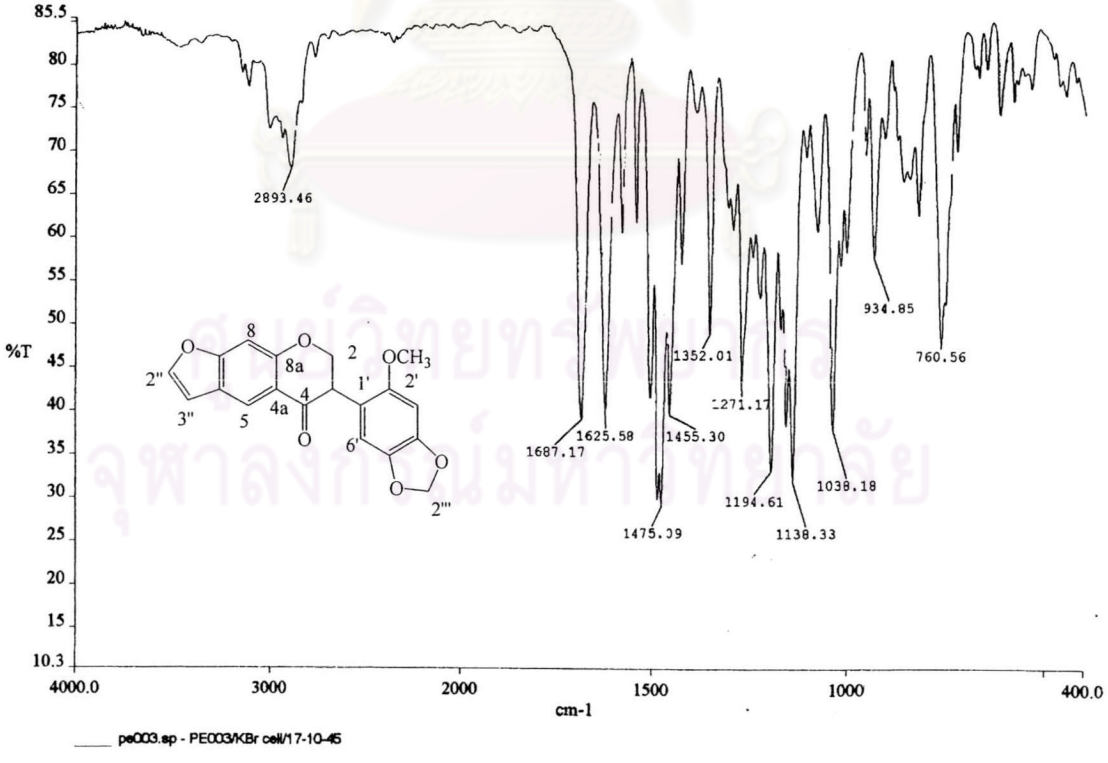

Figure 22 IR spectrum of Compound **15** (Film)

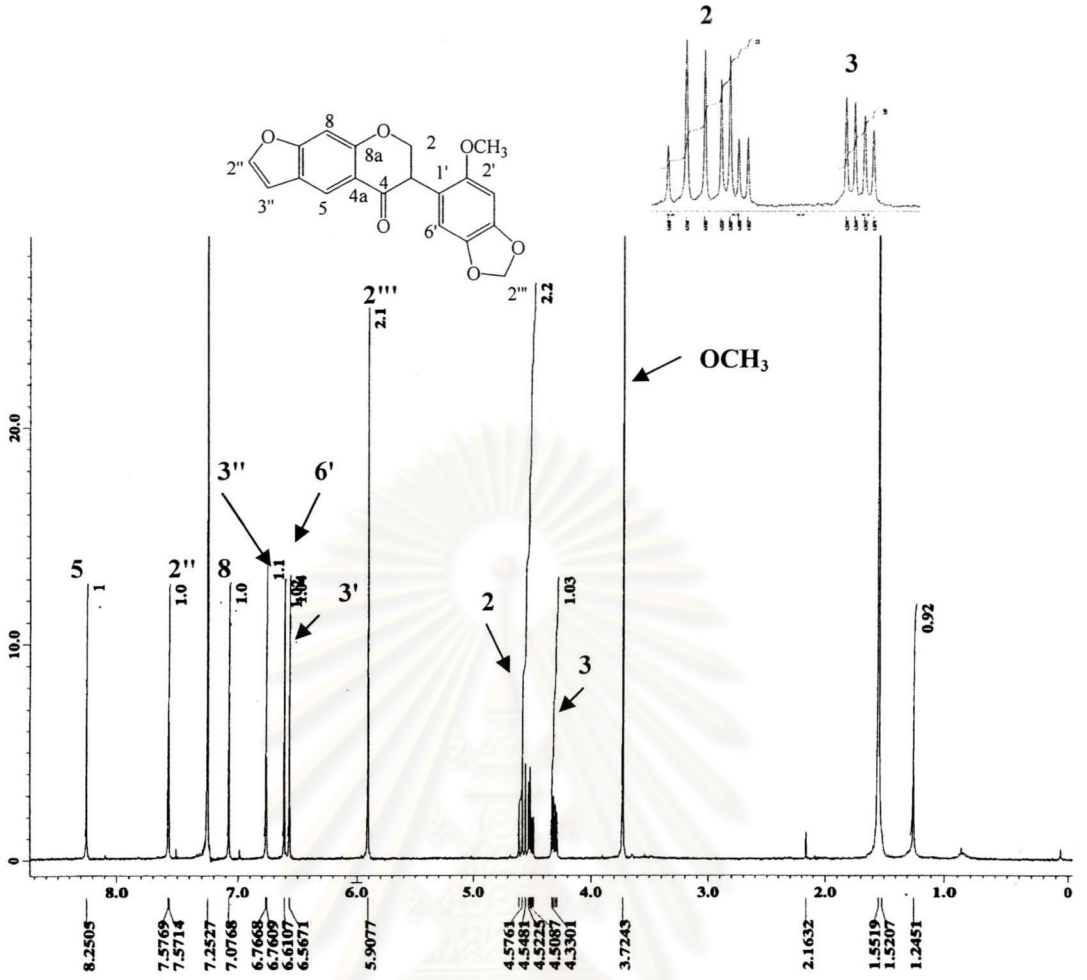

Figure 23 ^{1}H-NMR (500 MHz) spectrum of Compound **15** ($CDCl_3$)

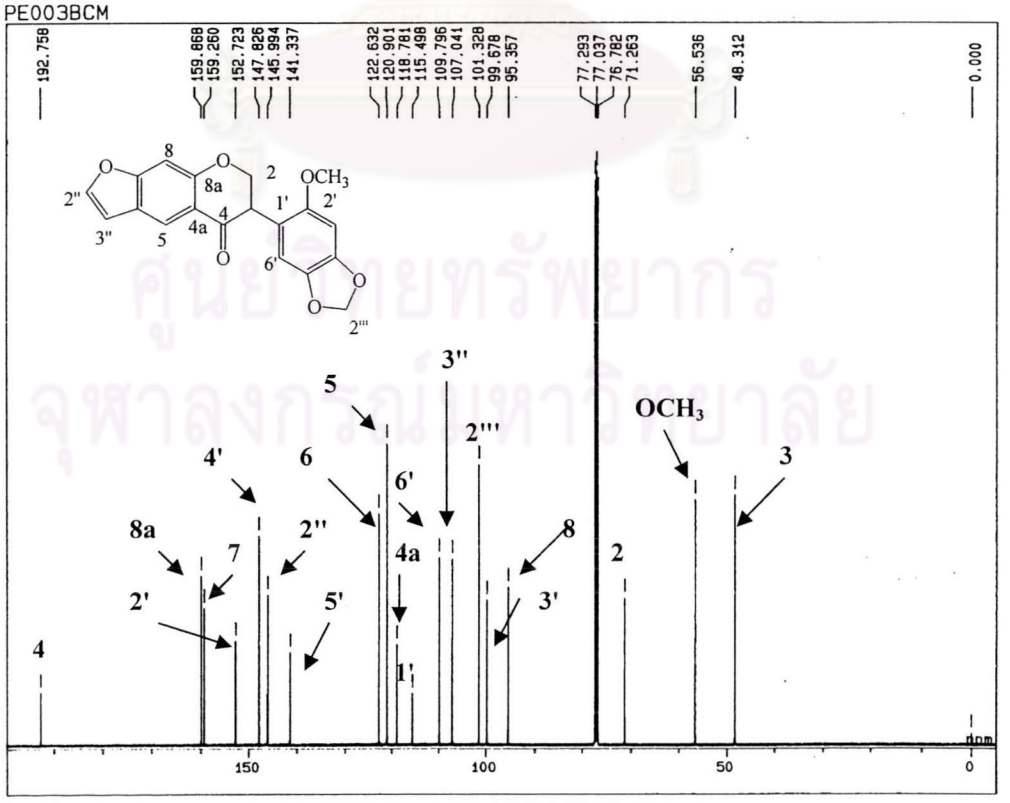

Figure 24 ^{13}C-NMR (125 MHz) spectrum of Compound **15** ($CDCl_3$)

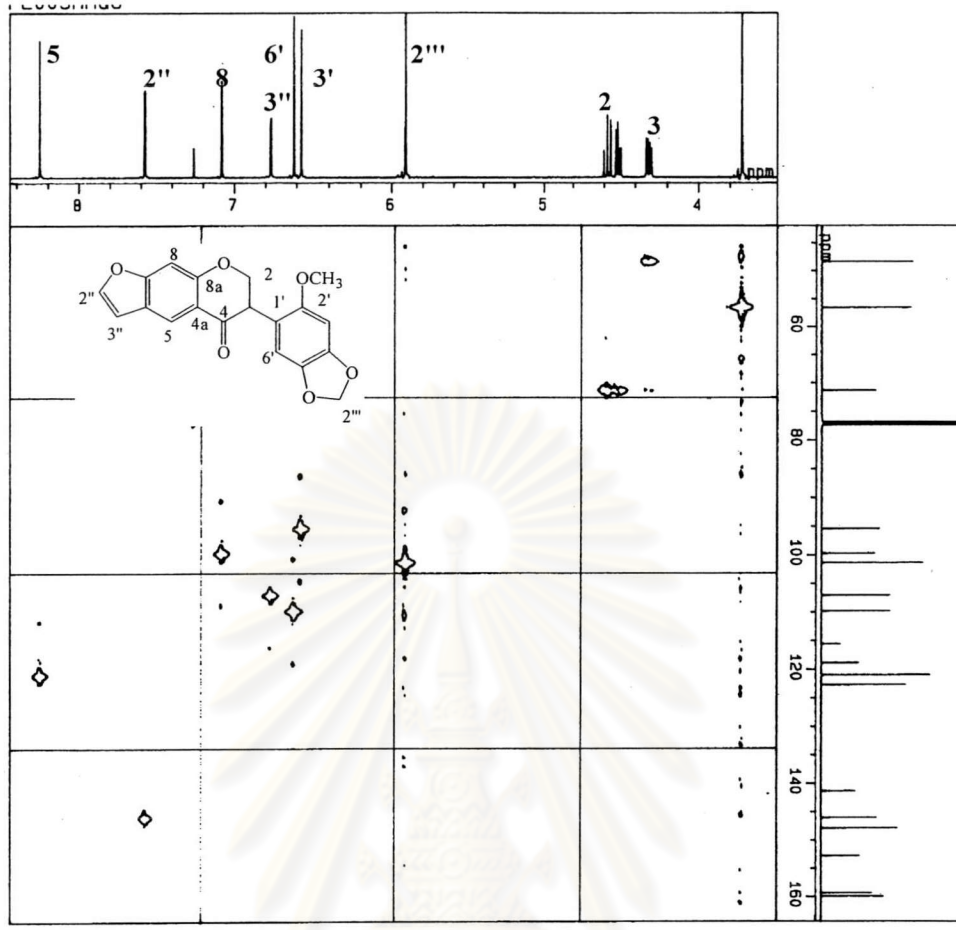

Figure 25 HMQC spectrum of Compound **15** ($CDCl_3$)

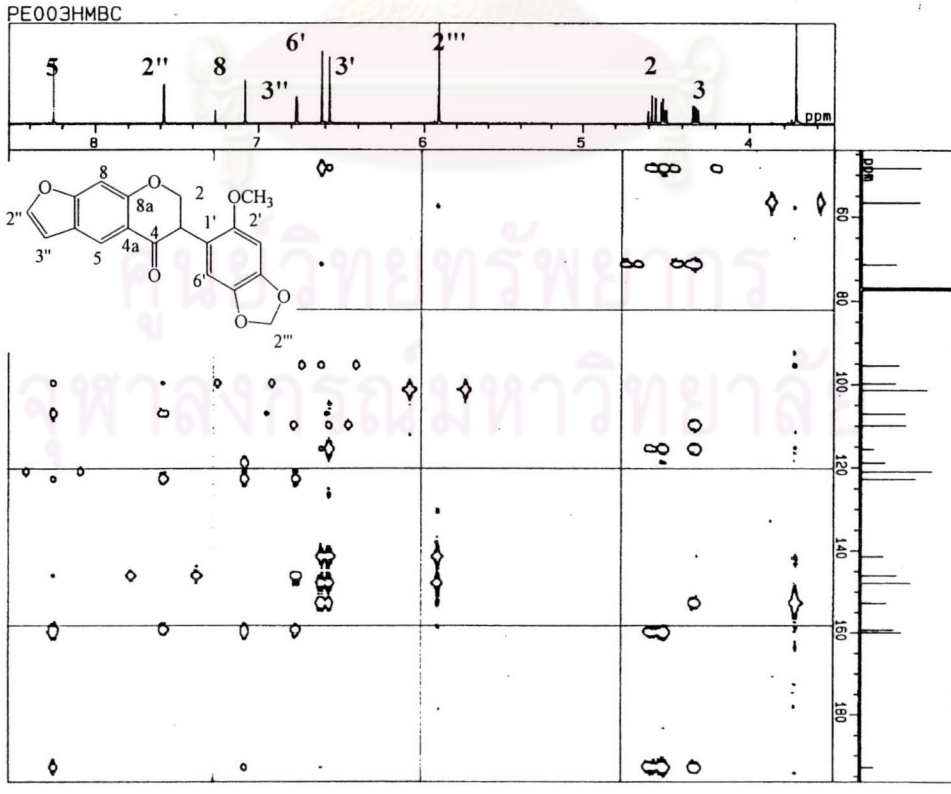

Figure 26 HMBC spectrum of Compound **15** ($CDCl_3$)

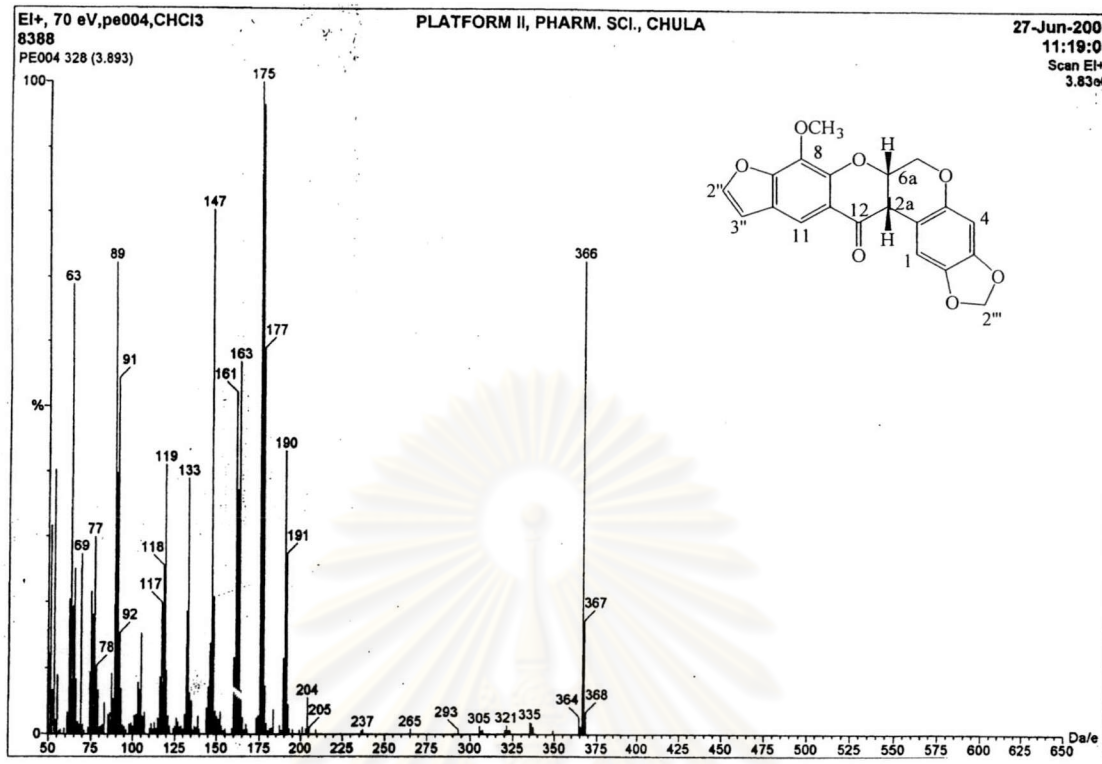

Figure 27 EI Mass spectrum of Compound **18**

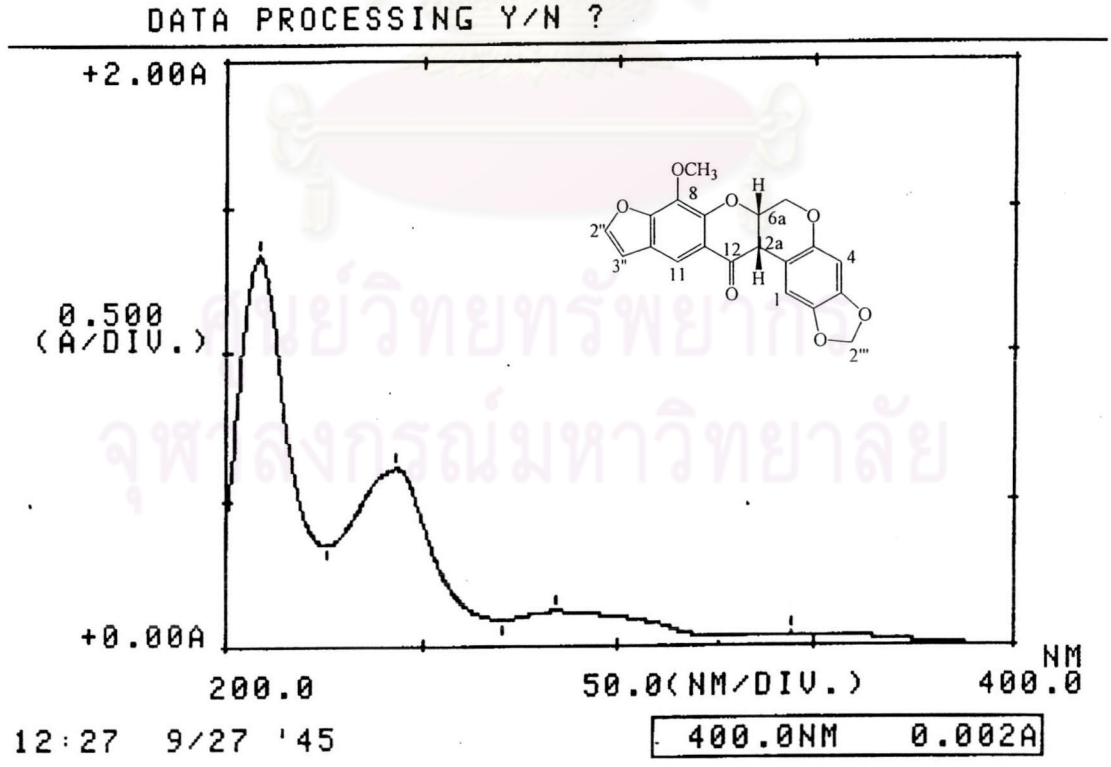

Figure 28 UV spectrum of Compound **18** (MeOH)

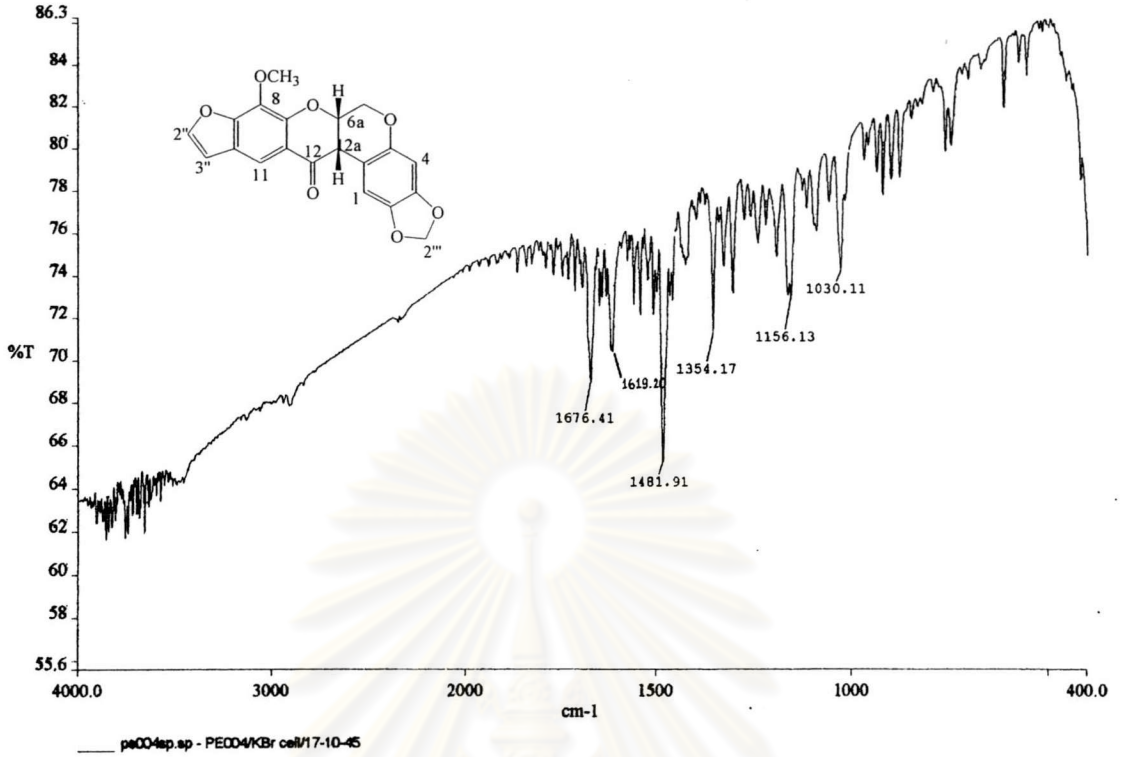

Figure 29 IR spectrum of Compound **18** (Film)

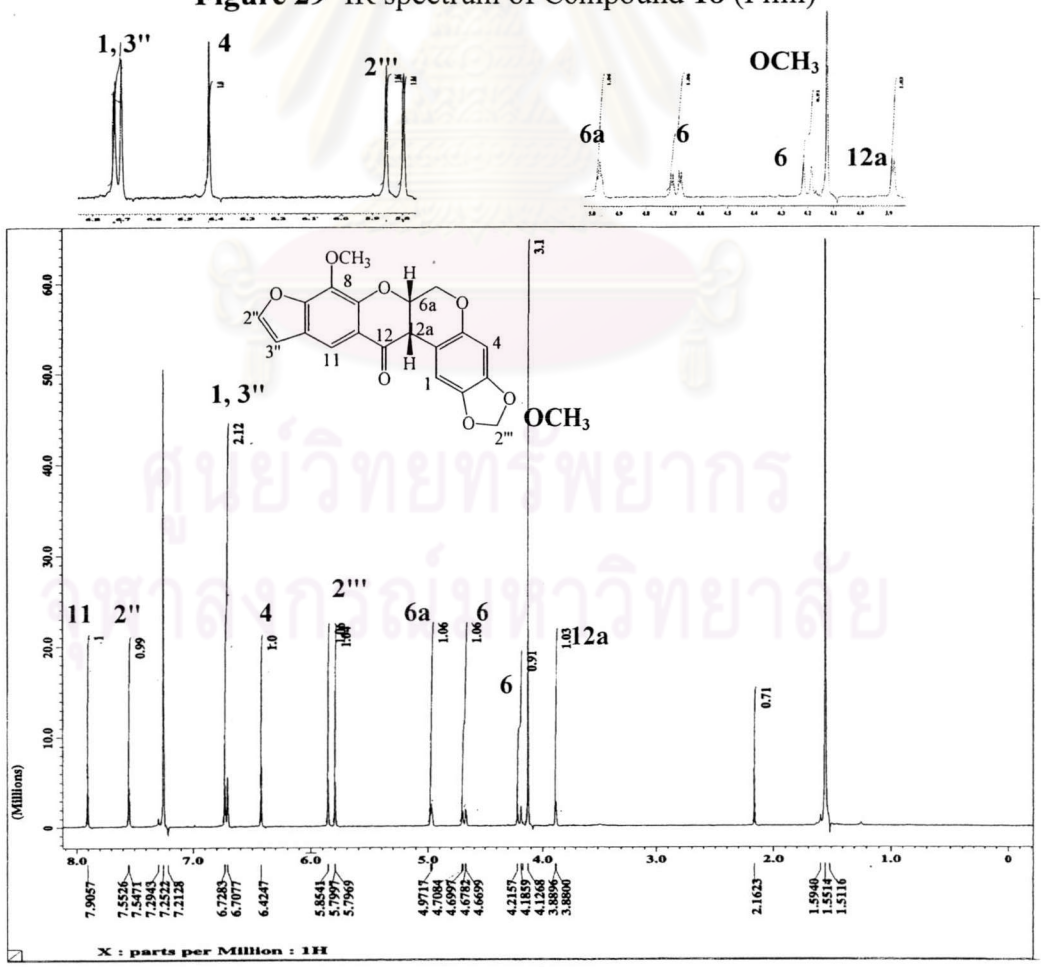

Figure 30 ^{1}H-NMR (500 MHz) spectrum of Compound **18** ($CDCl_3$)

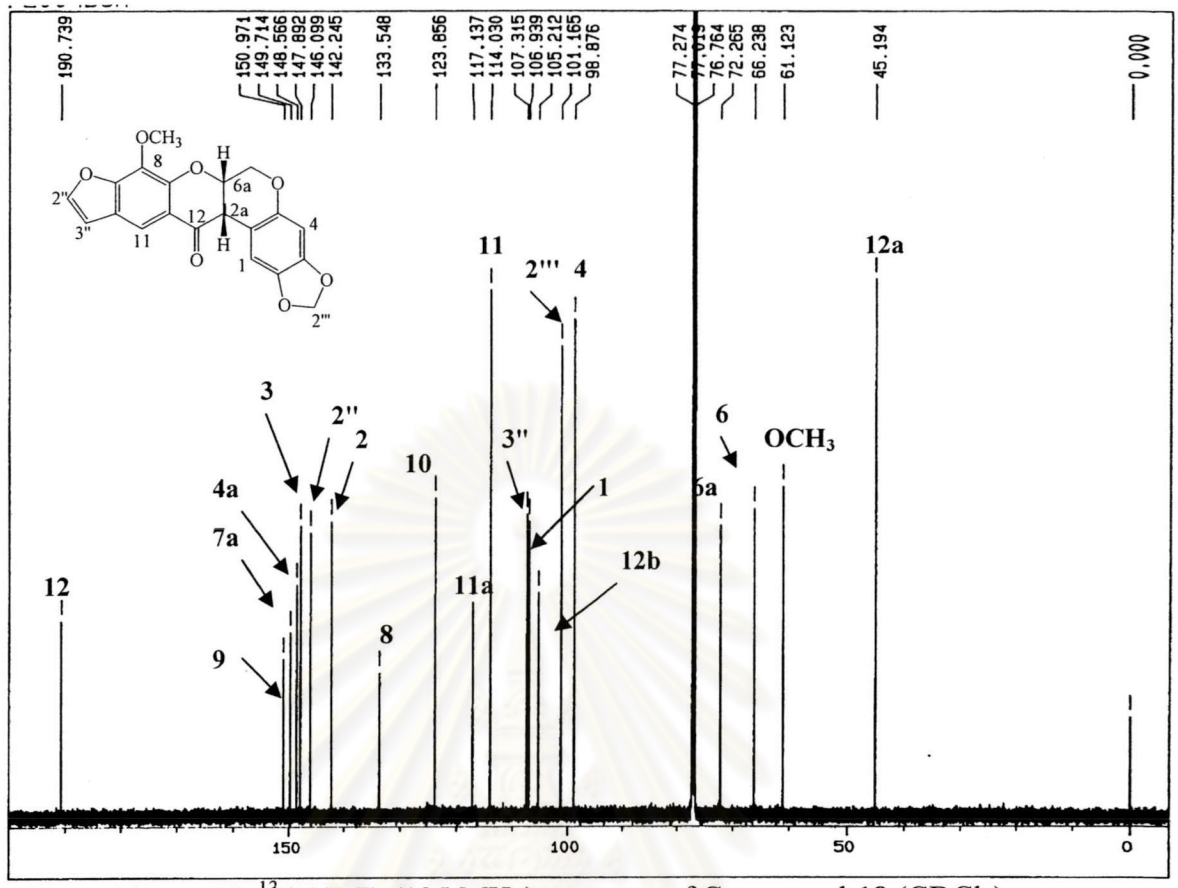

Figure 31 ^{13}C-NMR (125 MHz) spectrum of Compound **18** ($CDCl_3$)

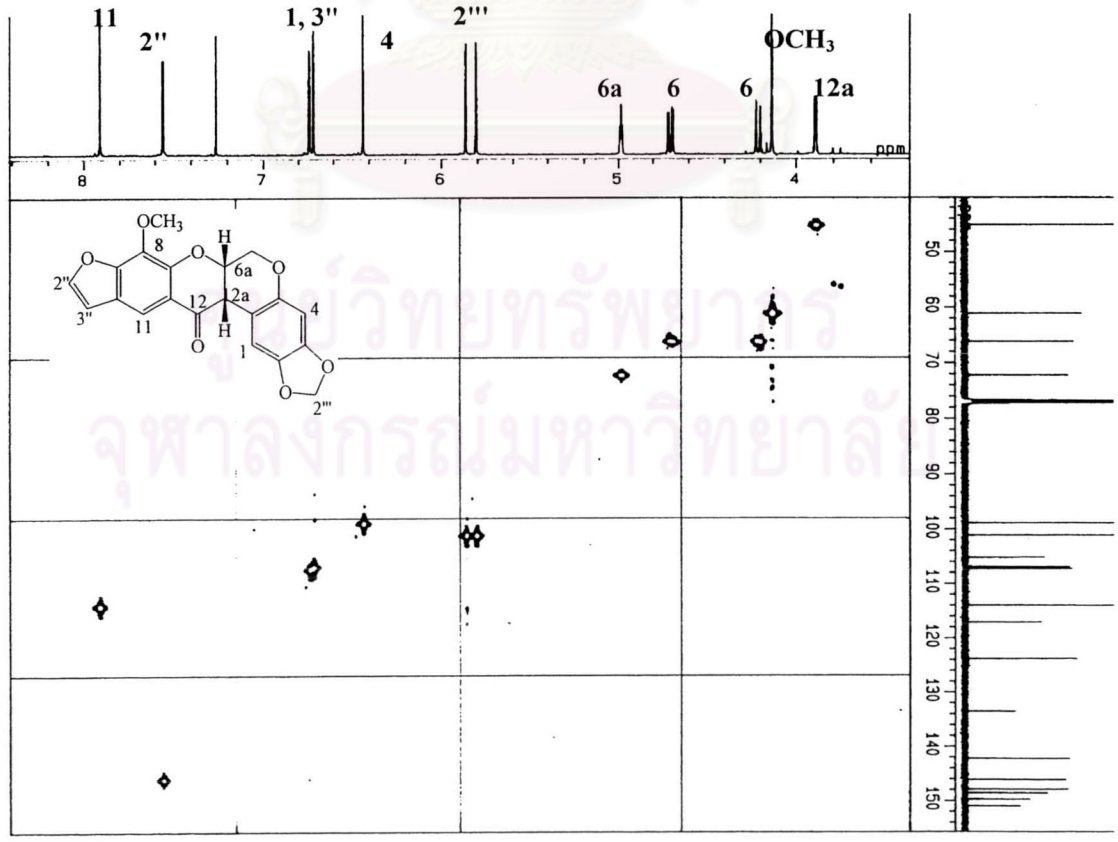

Figure 32 HMQC spectrum of Compound **18** ($CDCl_3$)

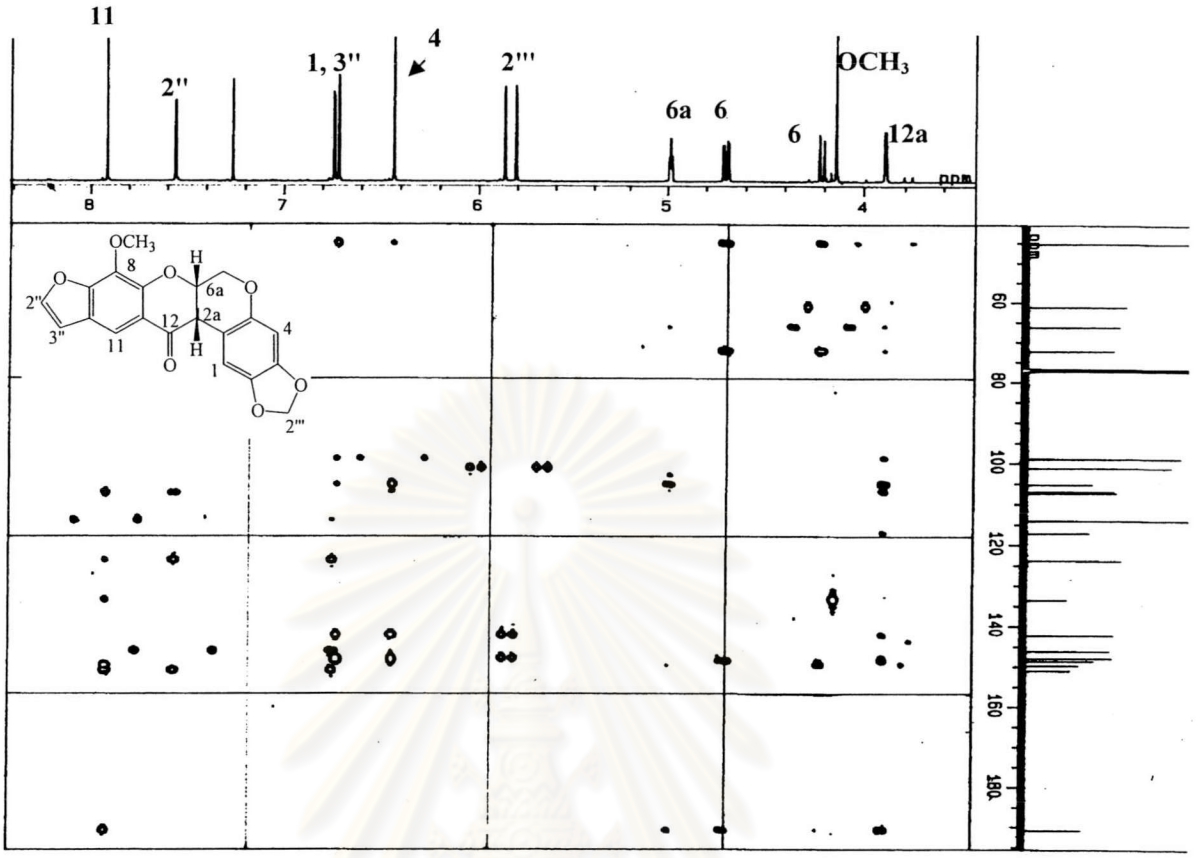

Figure 33 HMBC spectrum of Compound **18** ($CDCl_3$)

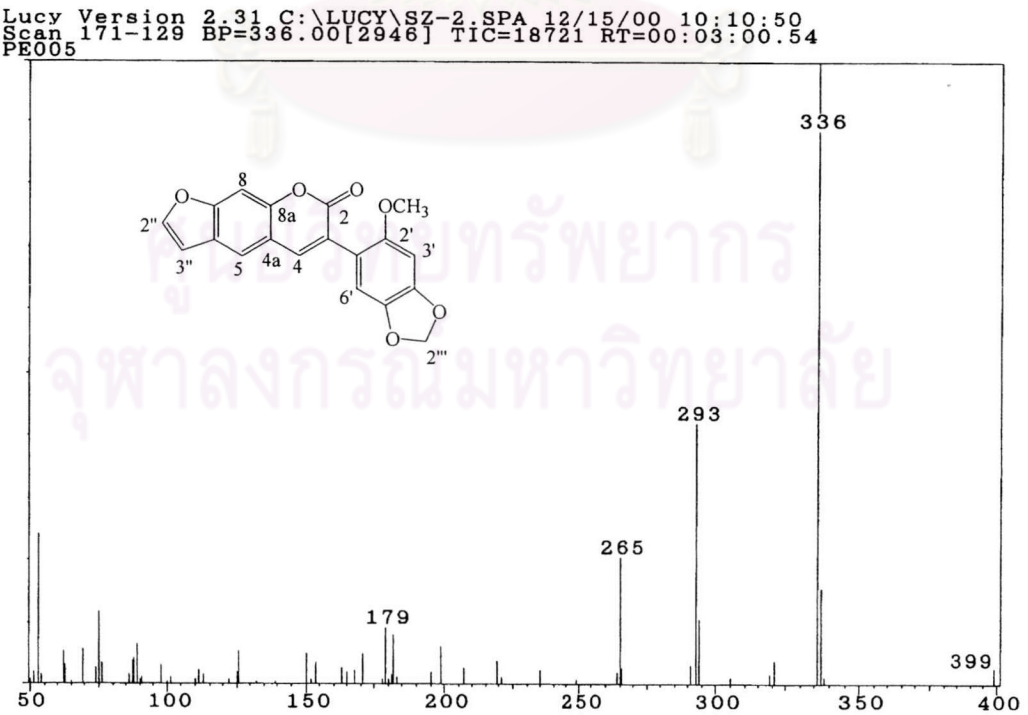

Figure 34 EI Mass spectrum of Compound **17**

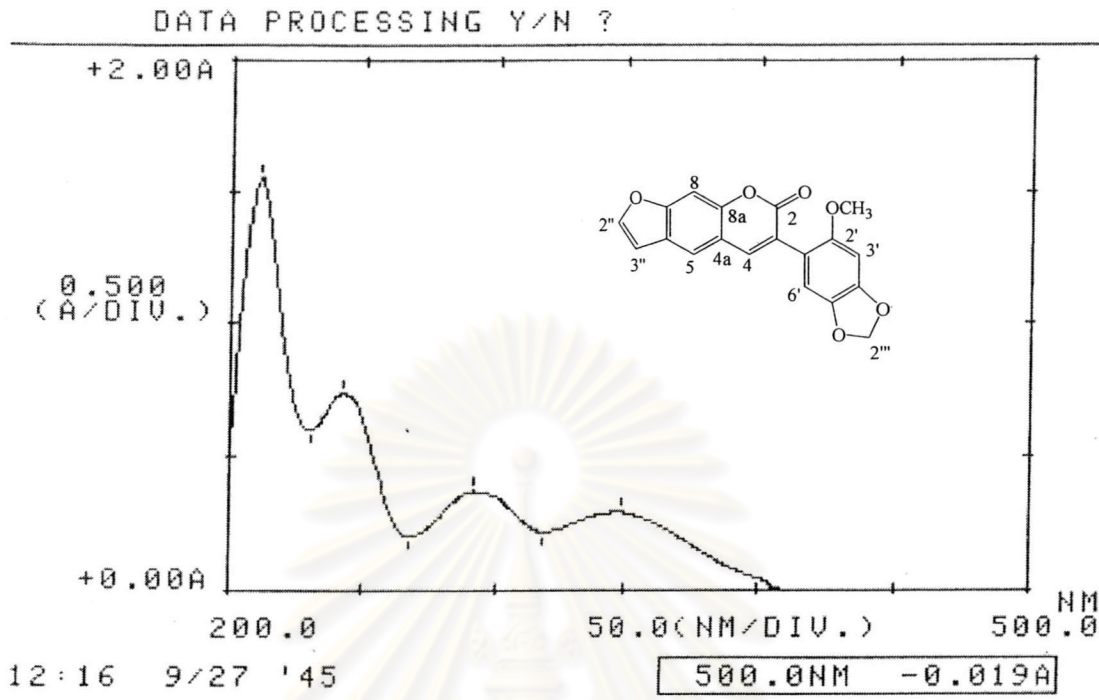

Figure 35 UV spectrum of Compound **17** (MeOH)

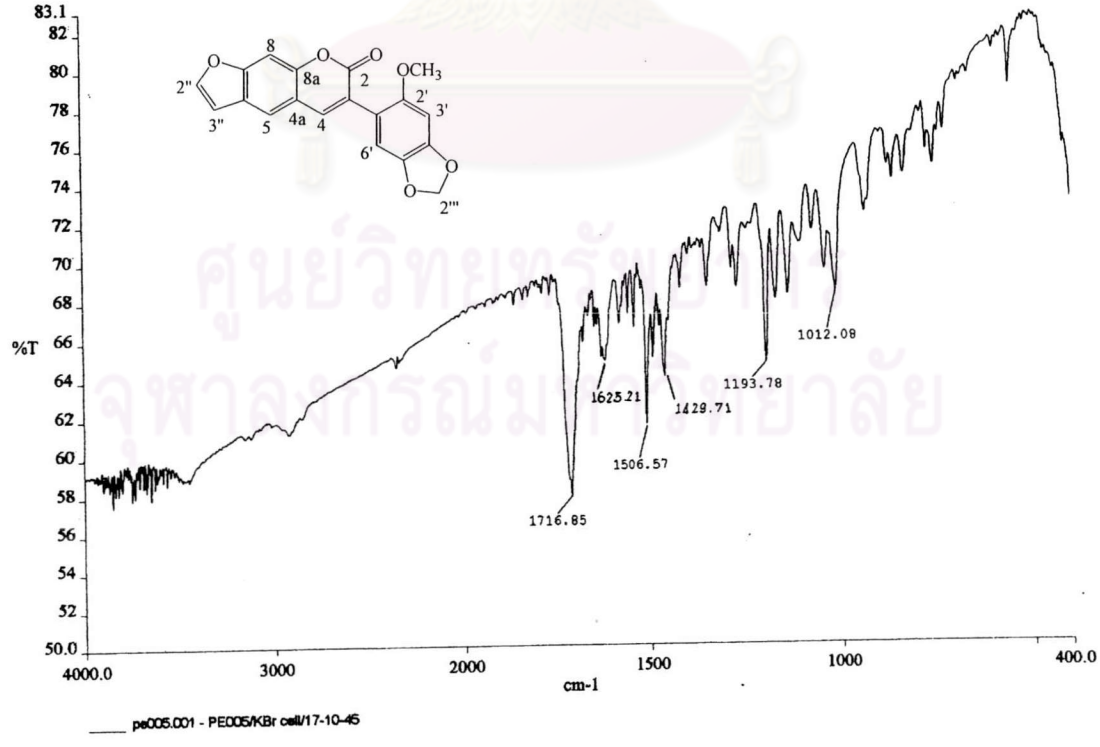

Figure 36 IR spectrum of Compound **17** (Film)

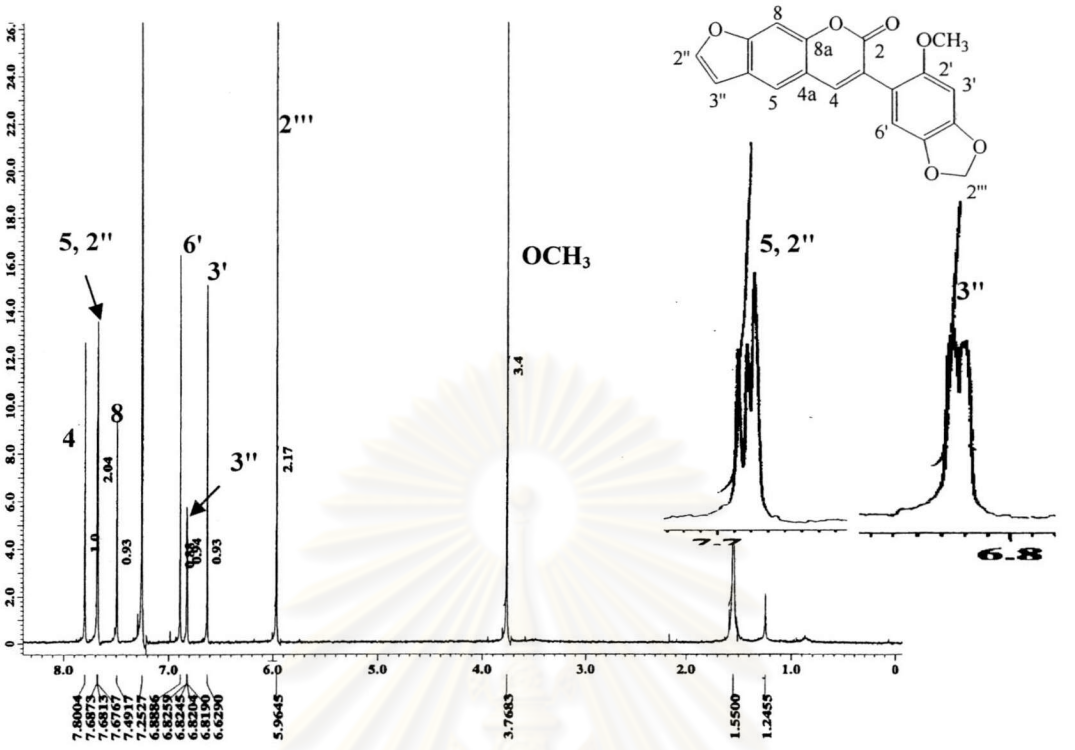

Figure 37 ^{1}H-NMR (400 MHz) spectrum of Compound **17** ($CDCl_3$)

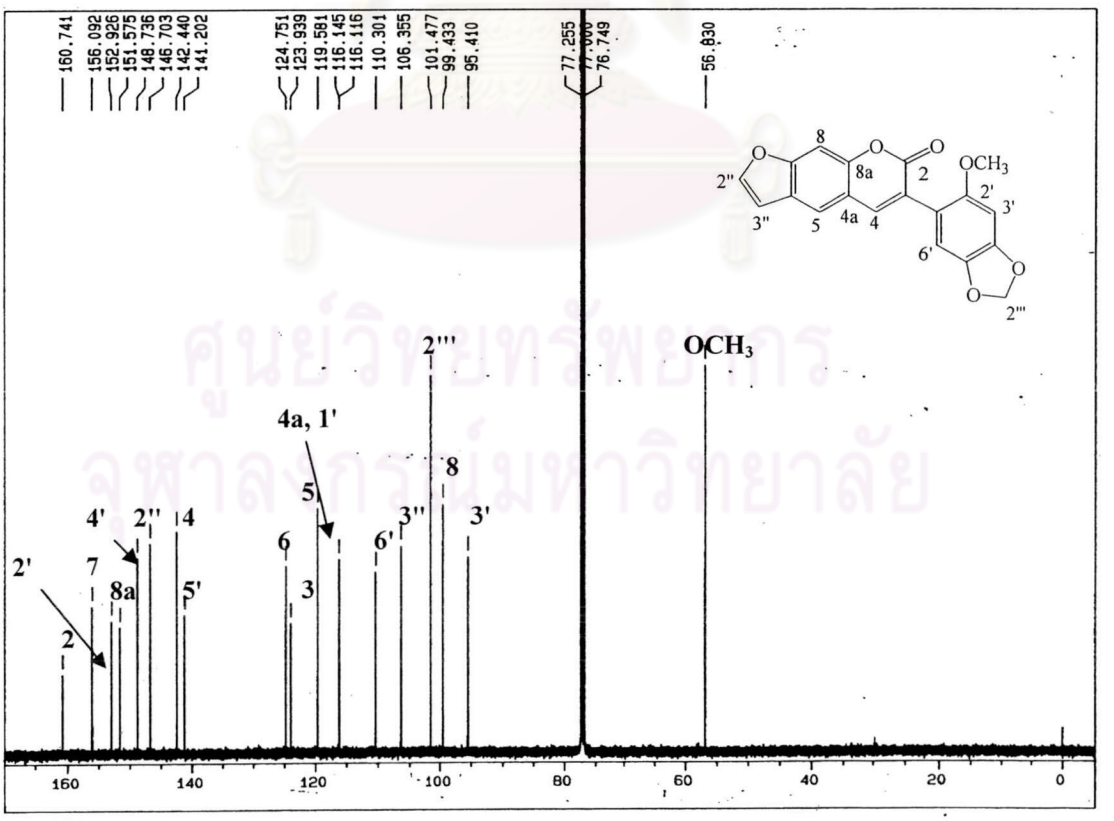

Figure 38 ^{13}C-NMR (100 MHz) spectrum of Compound **17** ($CDCl_3$)

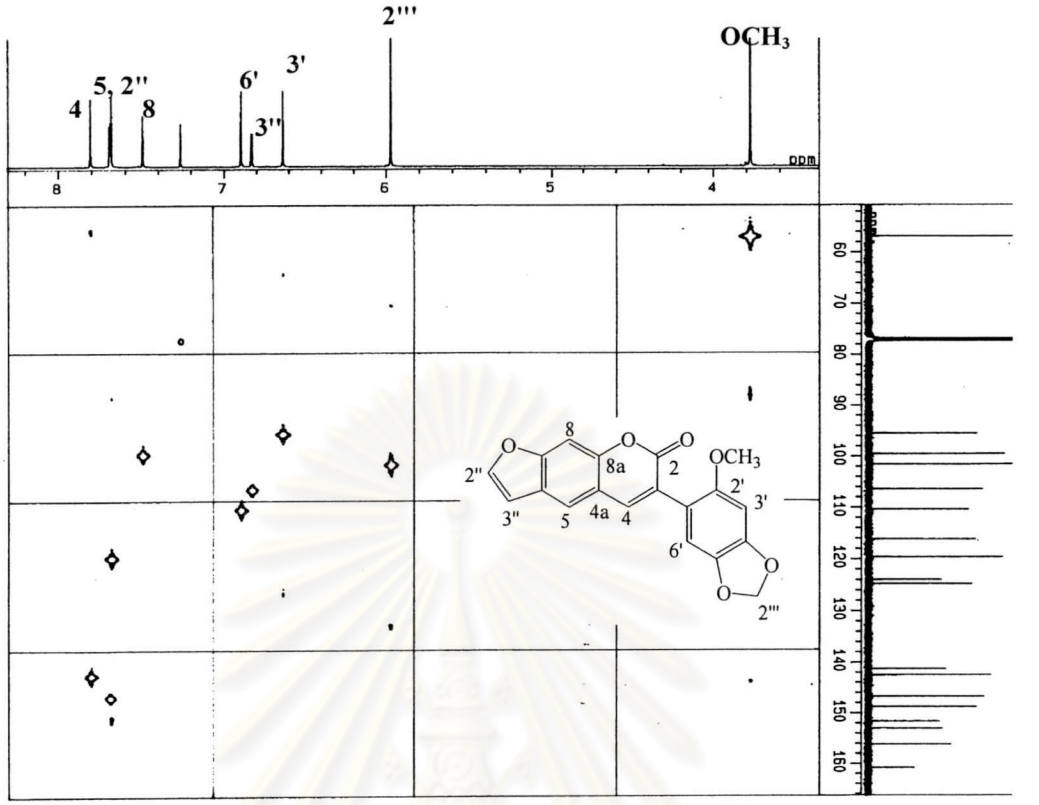

Figure 39 HMQC spectrum of Compound **17** ($CDCl_3$)

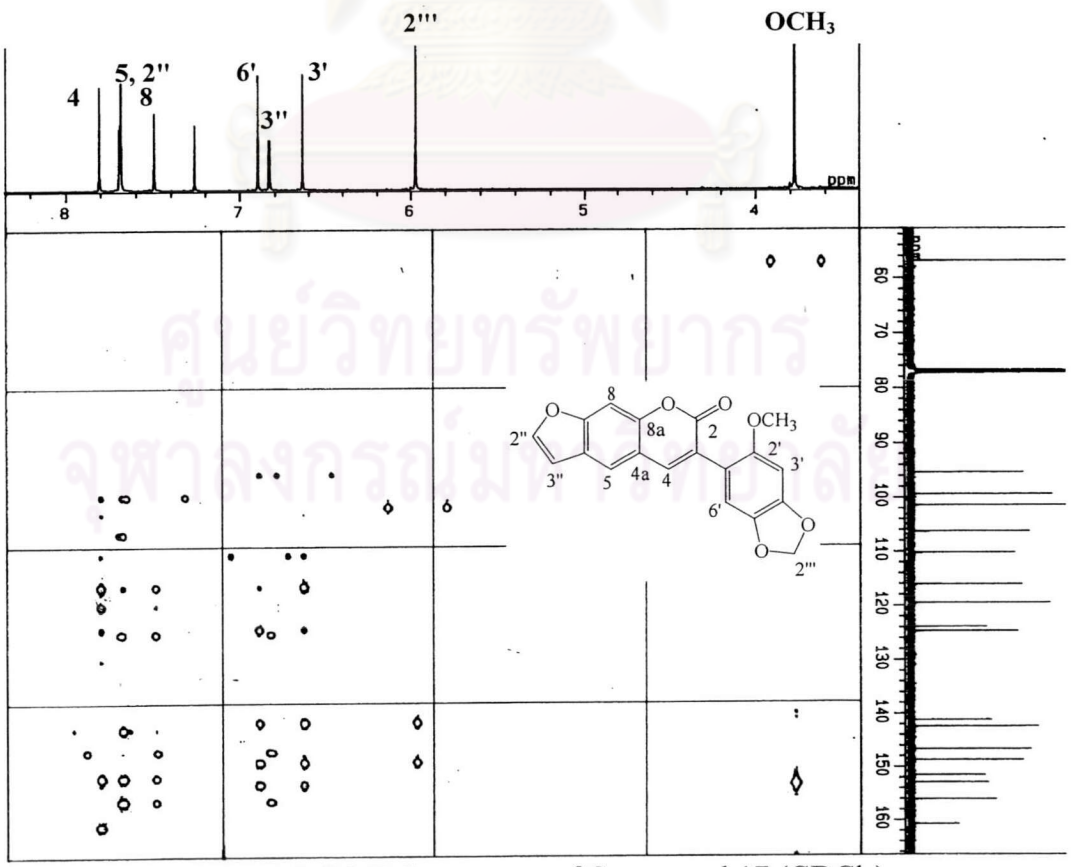

Figure 40 HMBC spectrum of Compound **17** ($CDCl_3$)

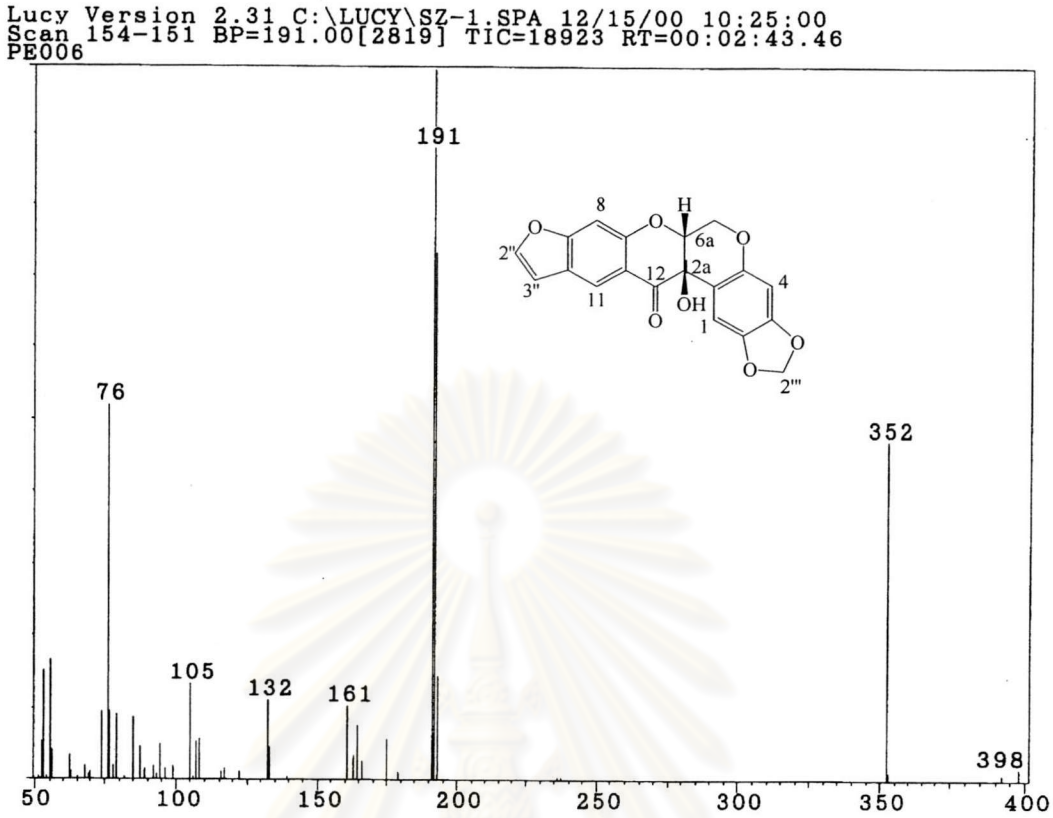

Figure 41 EI Mass spectrum of Compound **8**

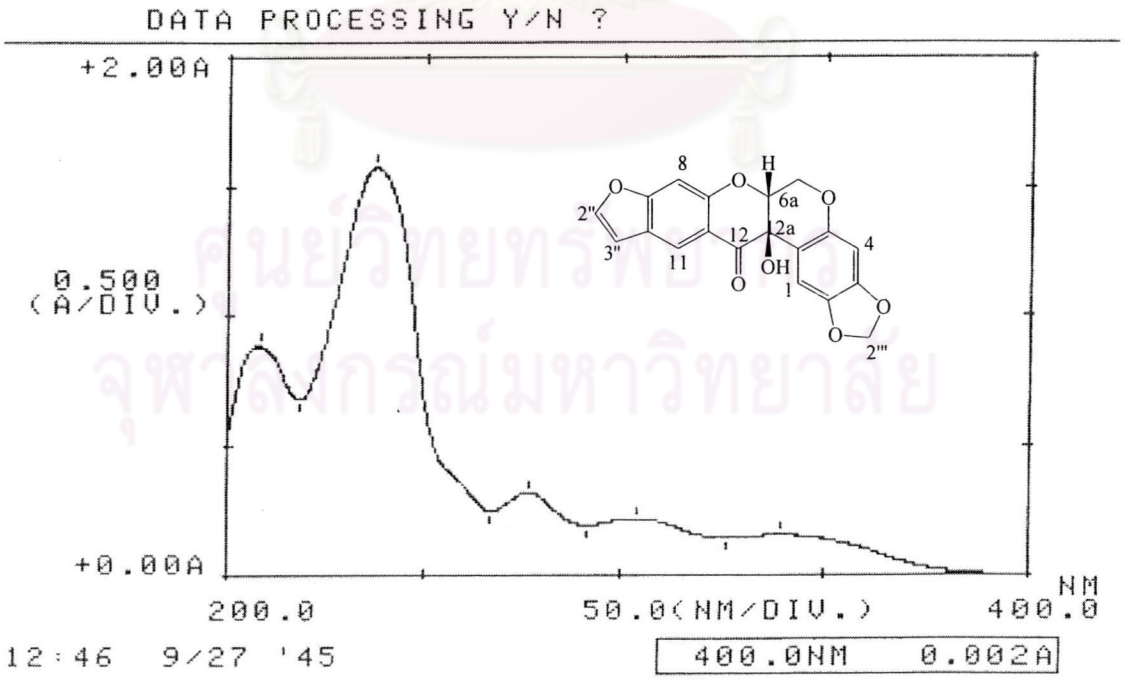

Figure 42 UV spectrum of Compound **8** (MeOH)

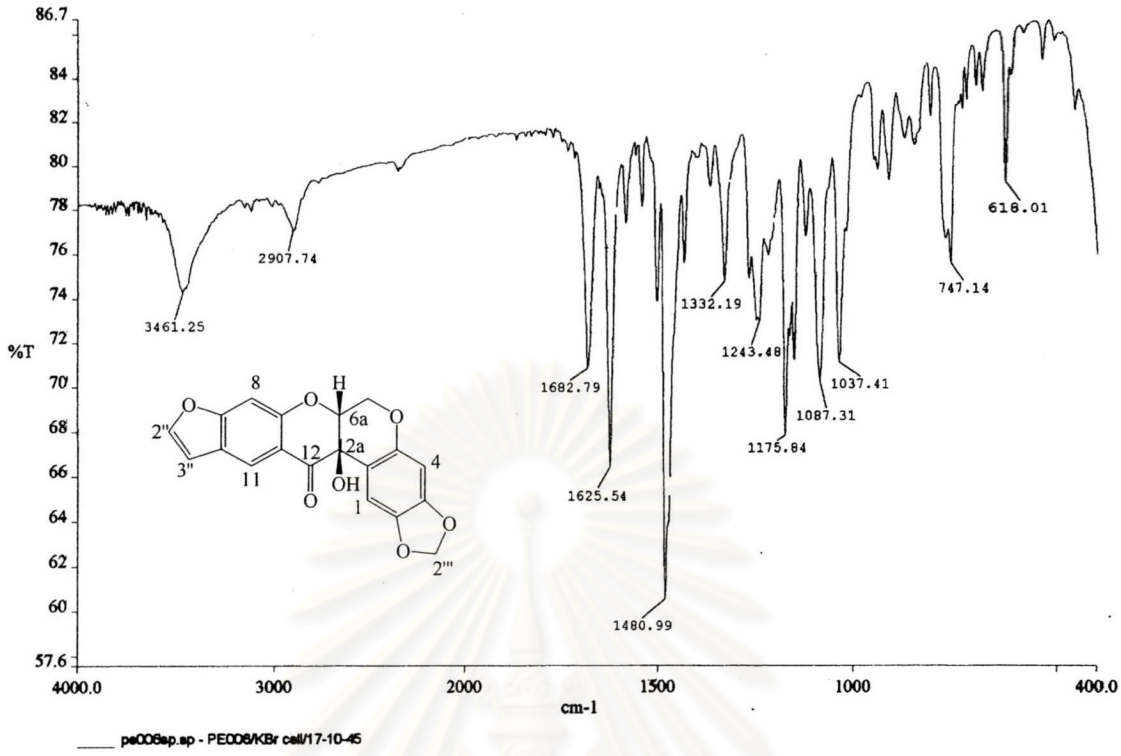

Figure 43 IR spectrum of Compound **8** (Film)

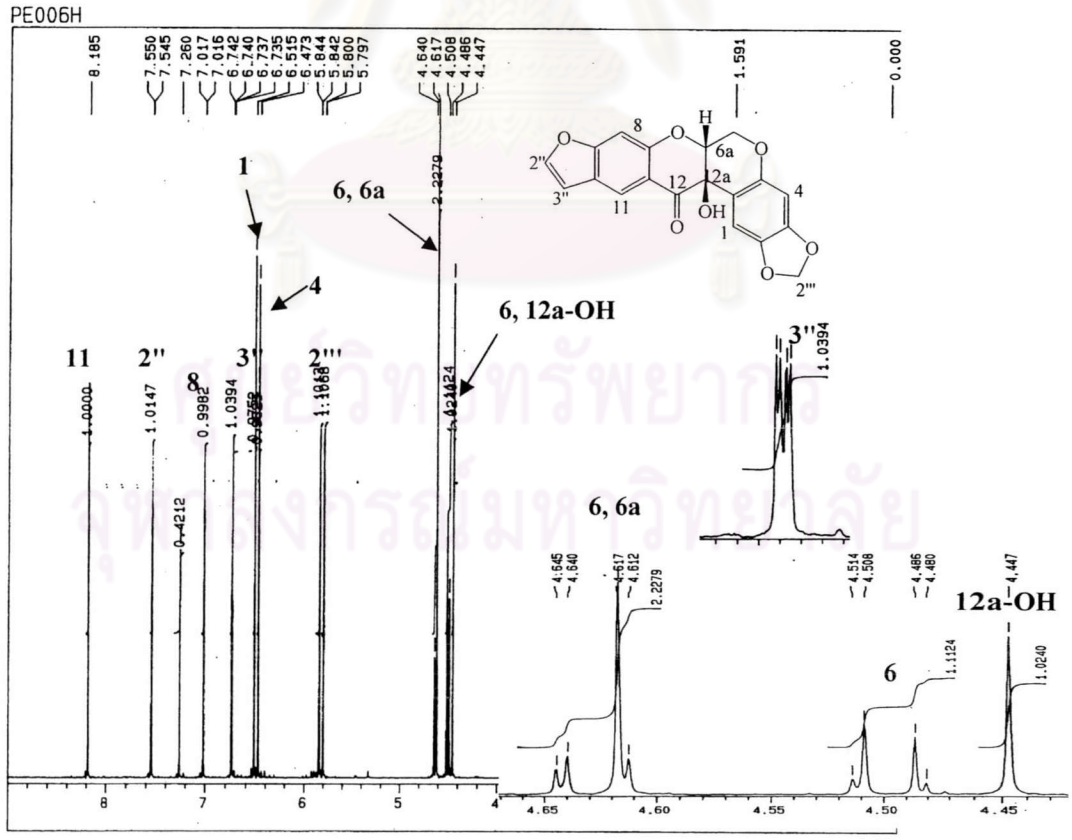

Figure 44 ^{1}H-NMR (600 MHz) spectrum of Compound **8** ($CDCl_3$)

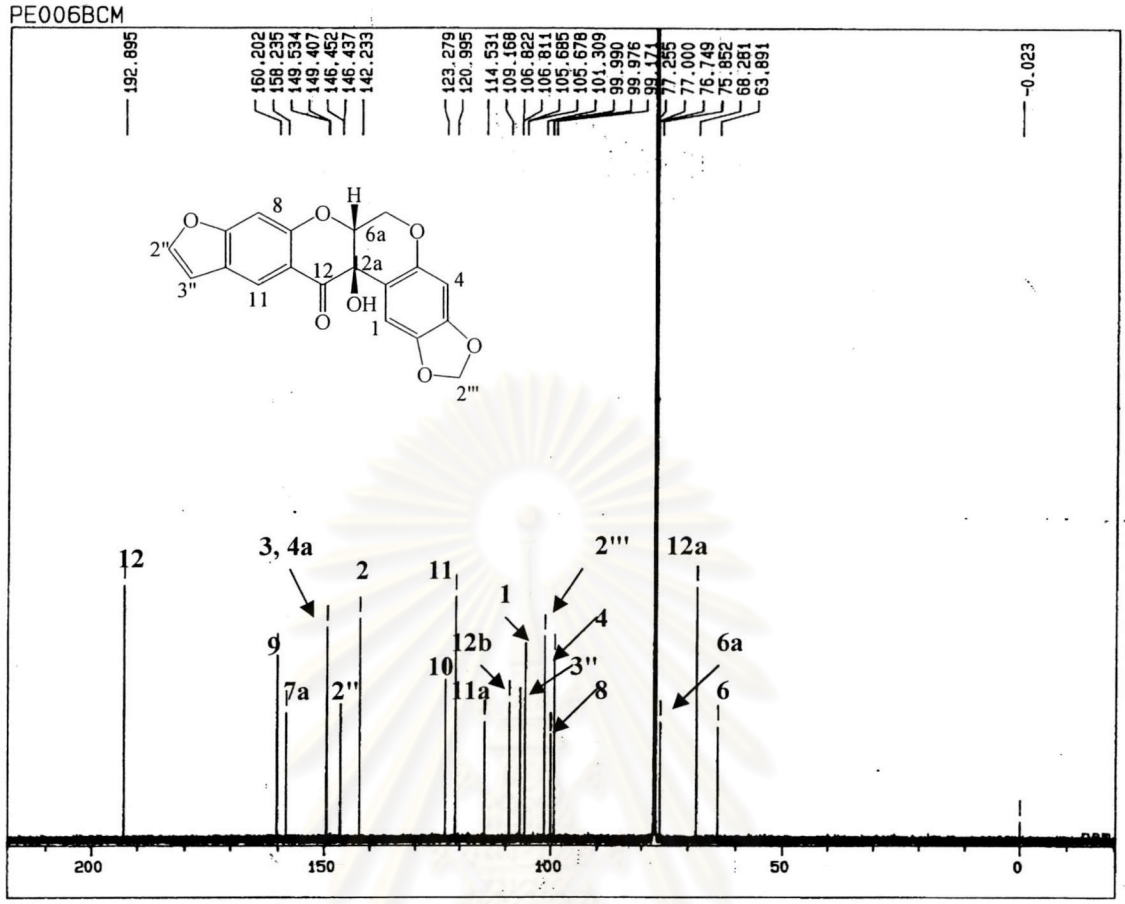

Figure 45 ^{13}C-NMR (150 MHz) spectrum of Compound **8** ($CDCl_3$)

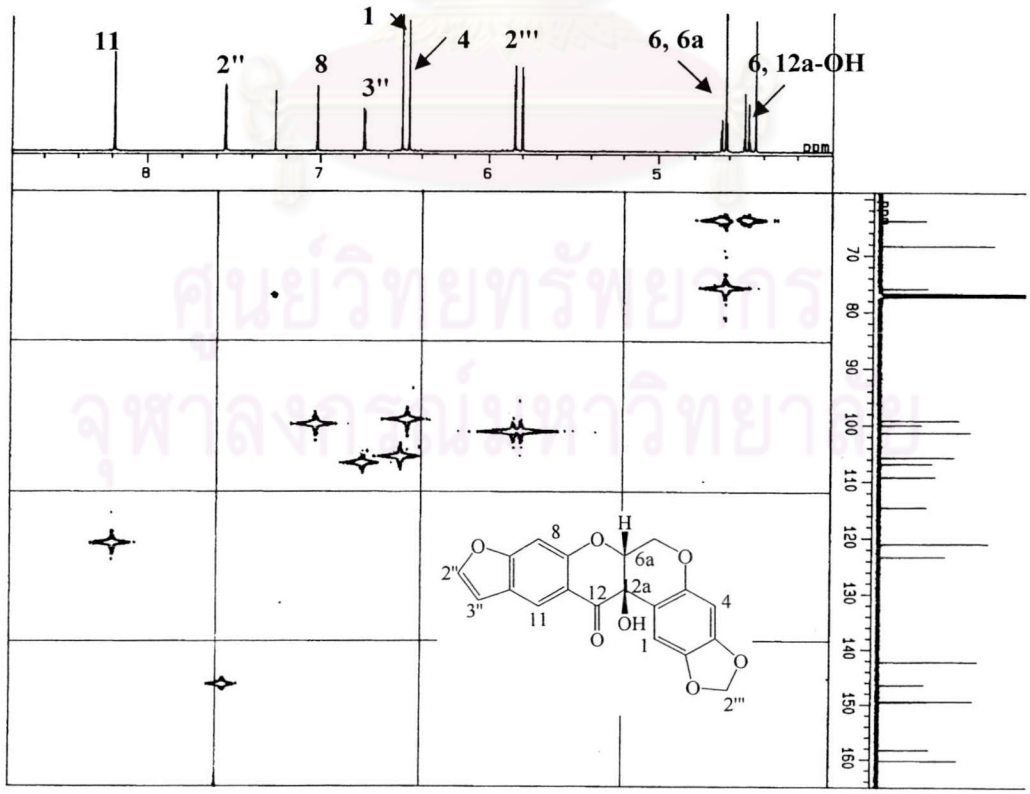

Figure 46 HMQC spectrum of Compound **8** ($CDCl_3$)

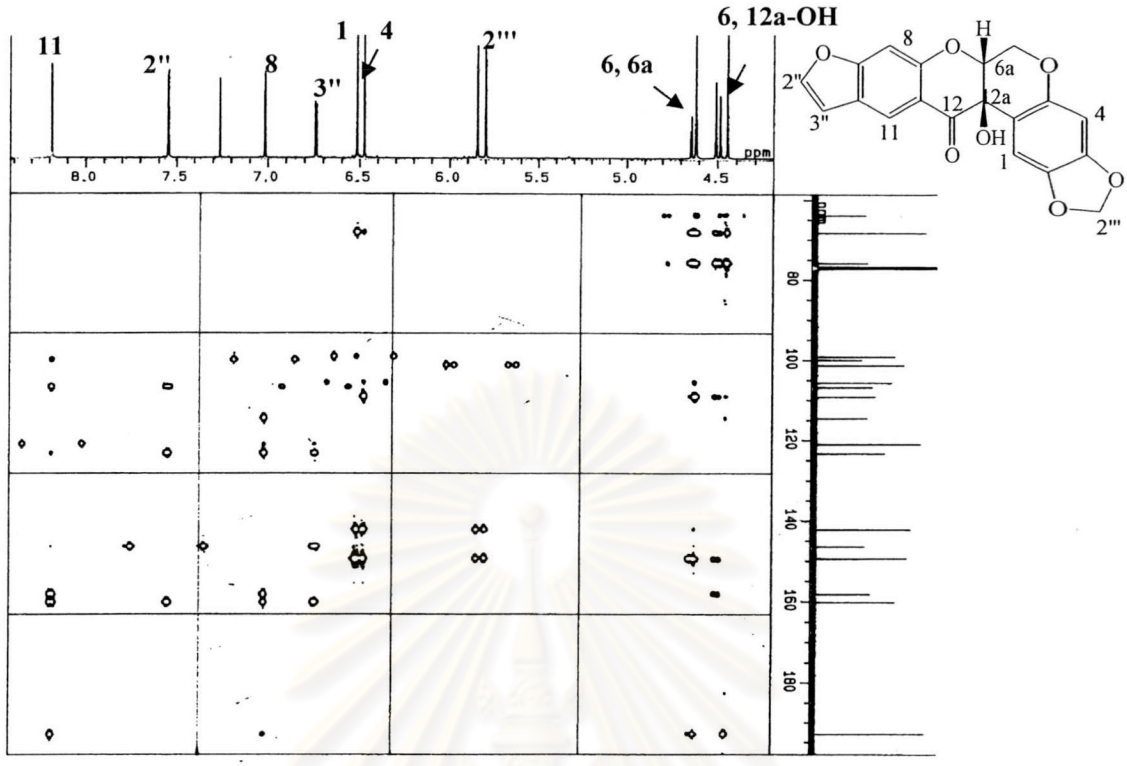

Figure 47 HMBC spectrum of Compound **8** ($CDCl_3$)

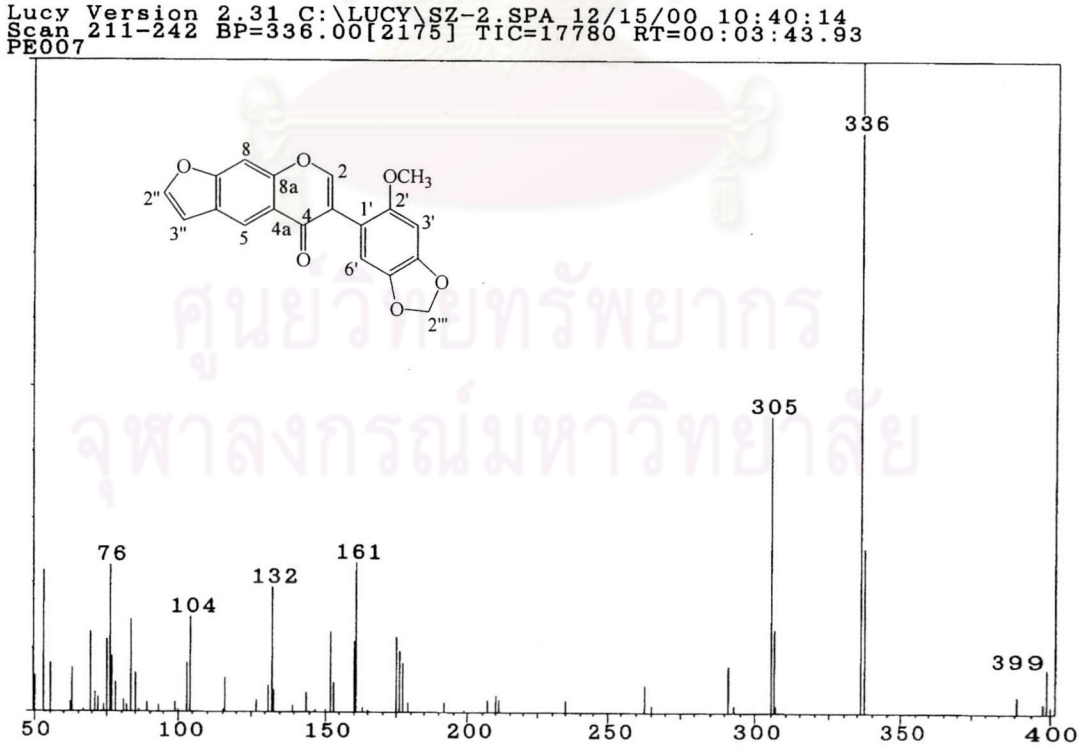

Figure 48 EI Mass spectrum of Compound **2**

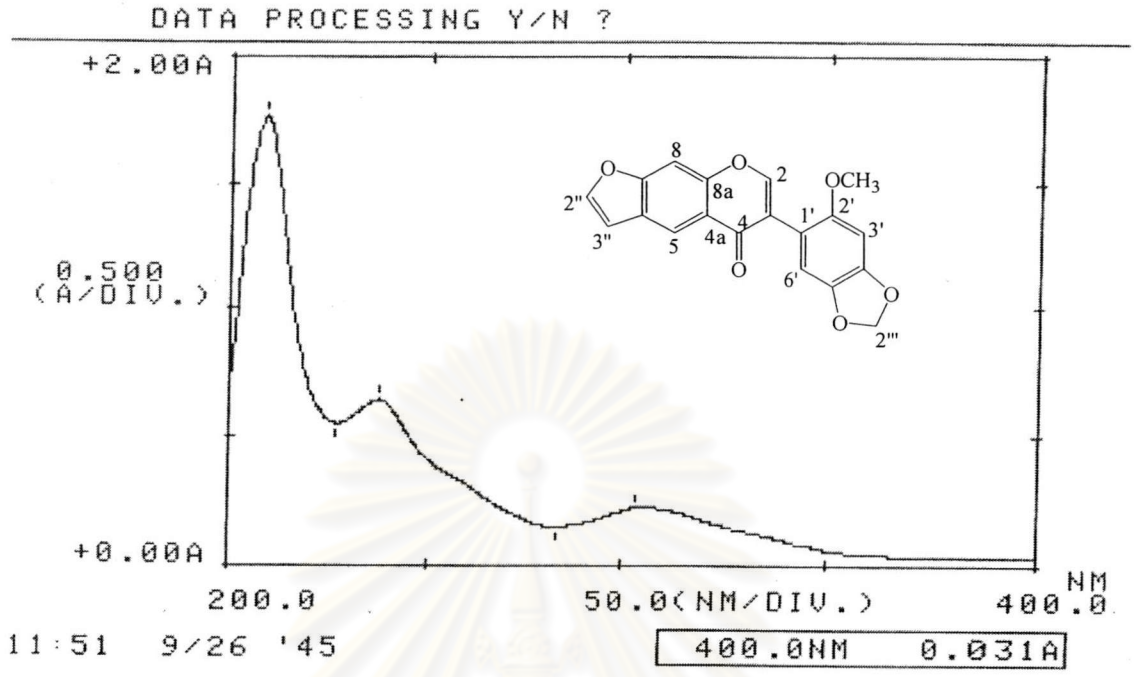

Figure 49 UV spectrum of Compound **2** (MeOH)

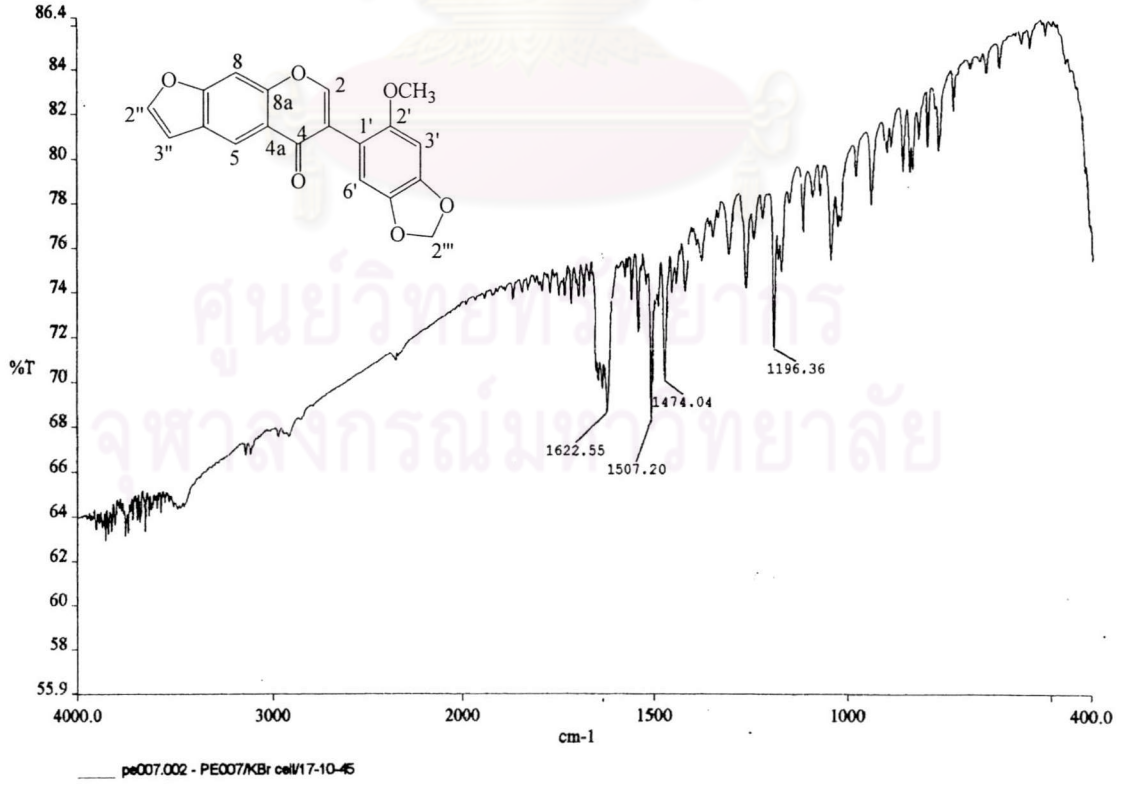

Figure 50 IR spectrum of Compound **2** (Film)

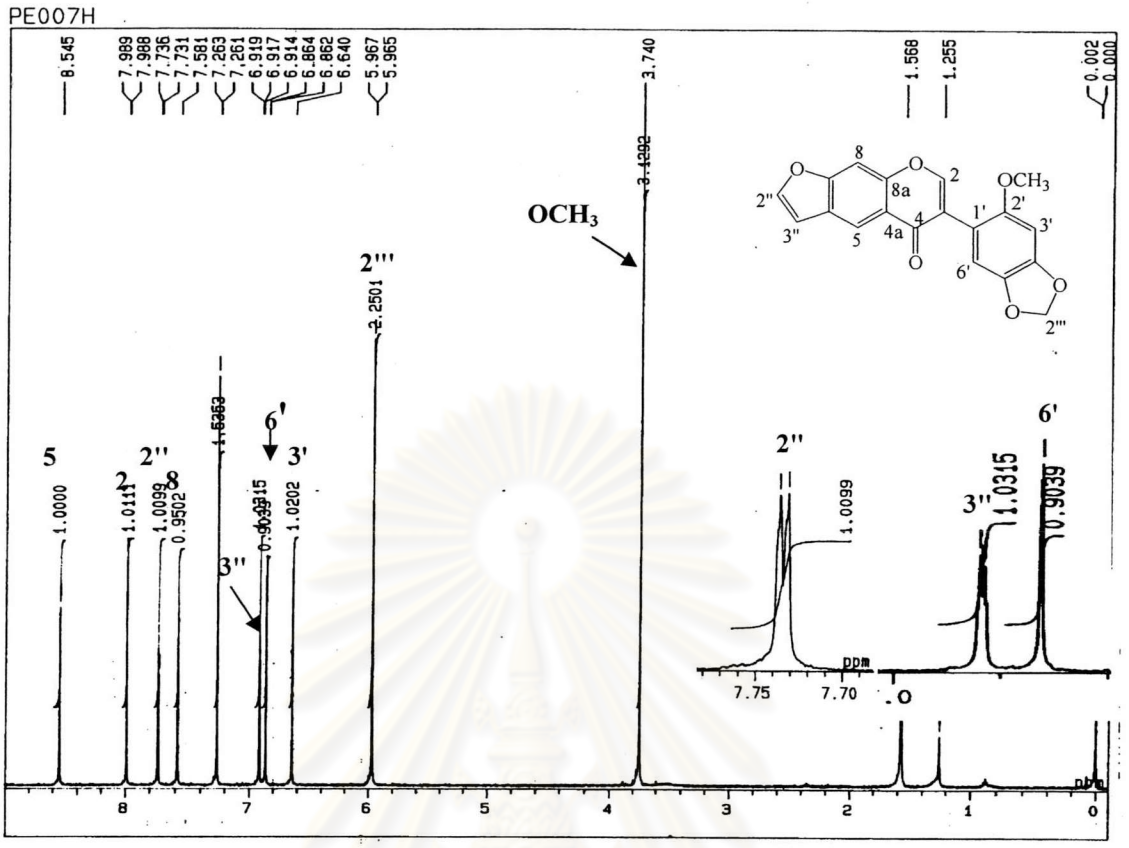

Figure 51 ^{1}H-NMR (500 MHz) spectrum of Compound **2** ($CDCl_3$)

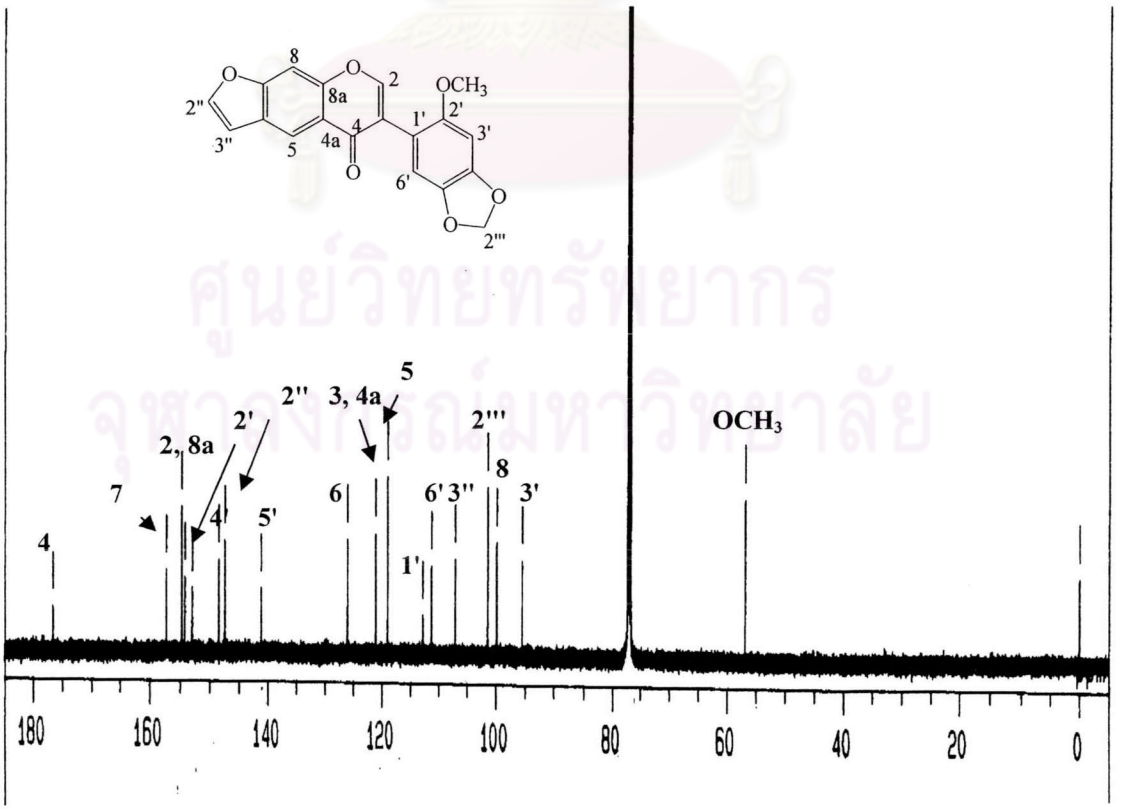

Figure 52 ^{13}C-NMR (125 MHz) spectrum of Compound **2** ($CDCl_3$)

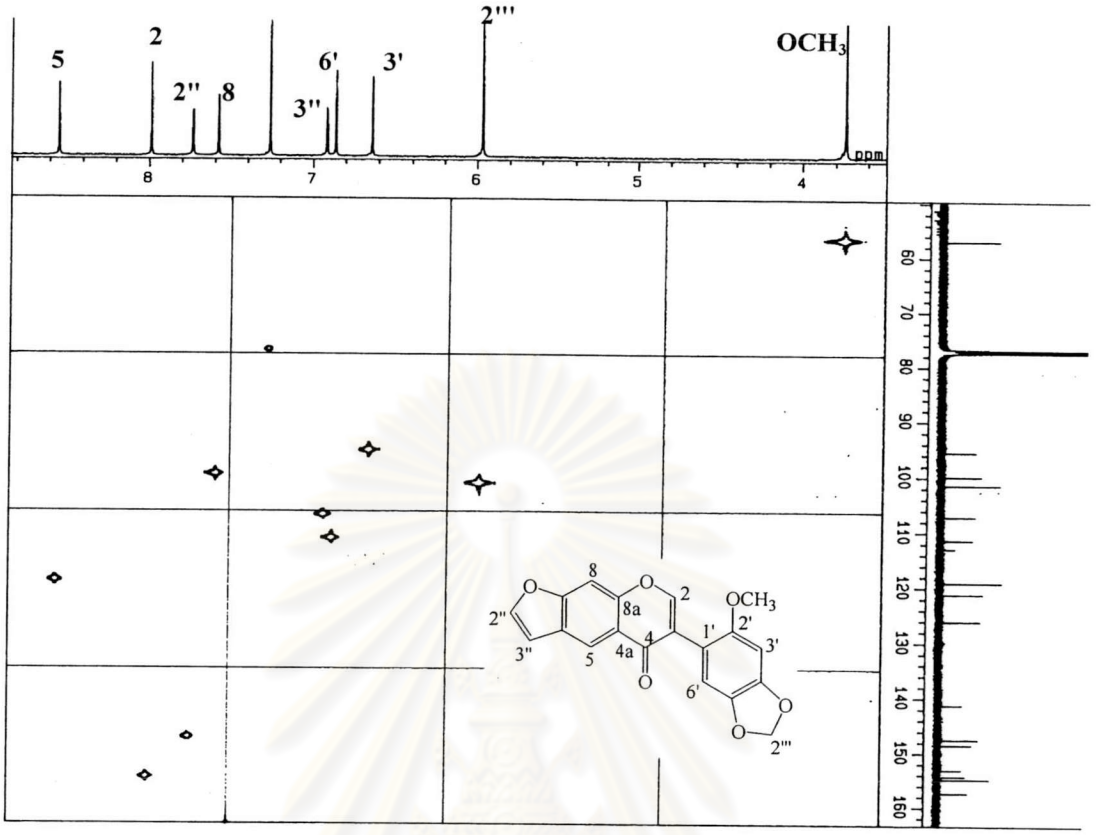

Figure 53 HMQC spectrum of Compound **2** ($CDCl_3$)

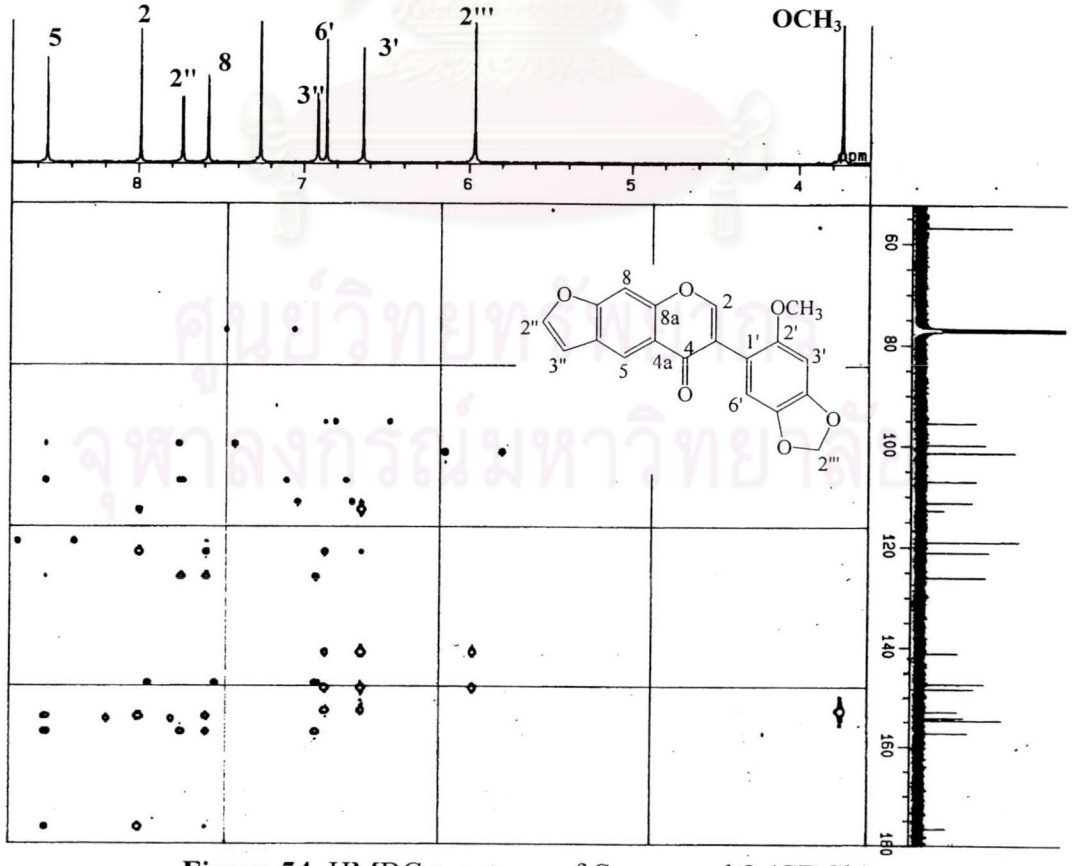

Figure 54 HMBC spectrum of Compound **2** ($CDCl_3$)

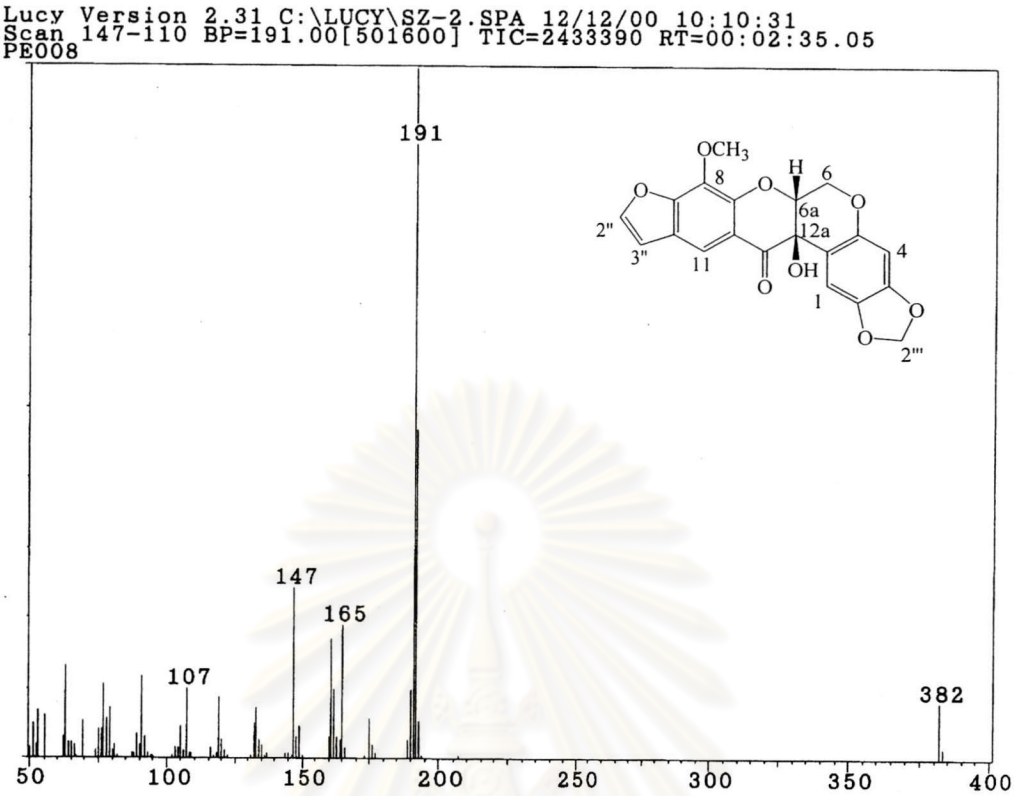

Figure 55 EI Mass spectrum of Compound **11**

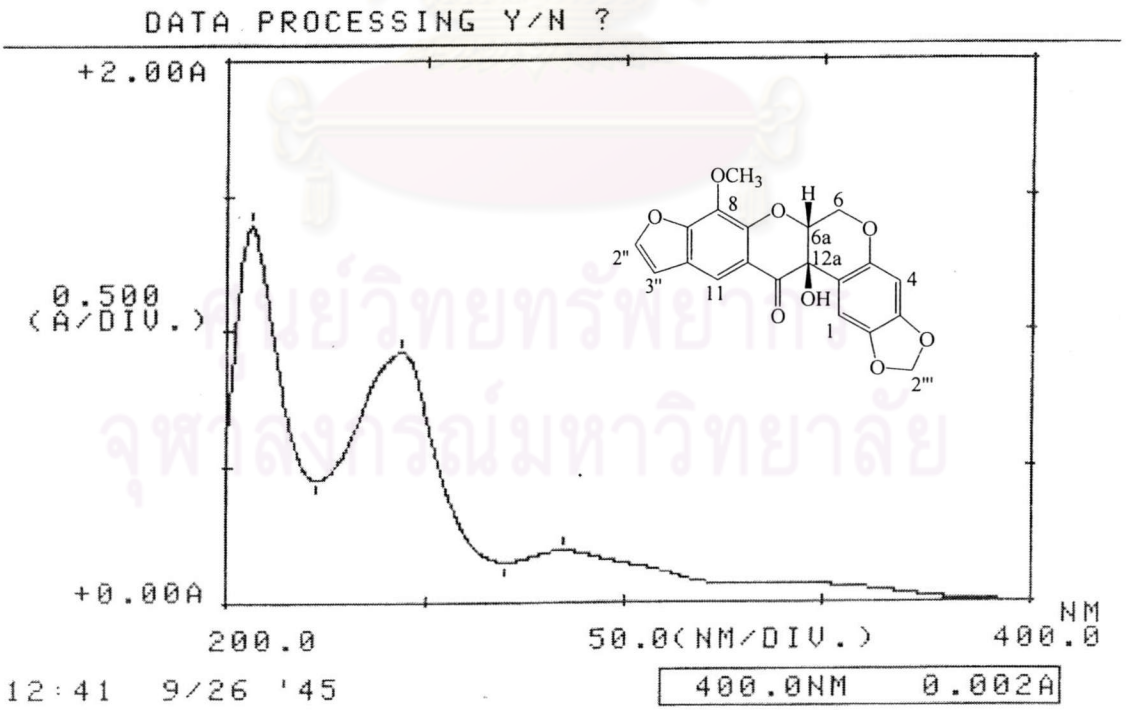

Figure 56 UV spectrum of Compound **11** (MeOH)

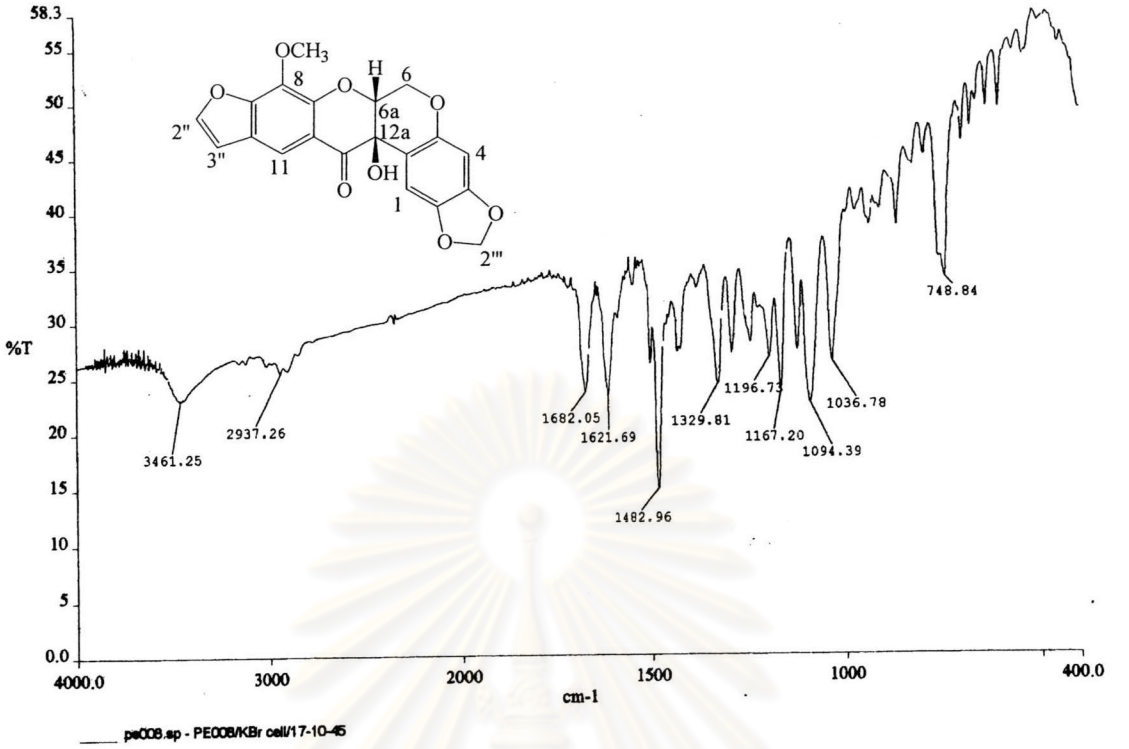

Figure 57 IR spectrum of Compound **11** (Film)

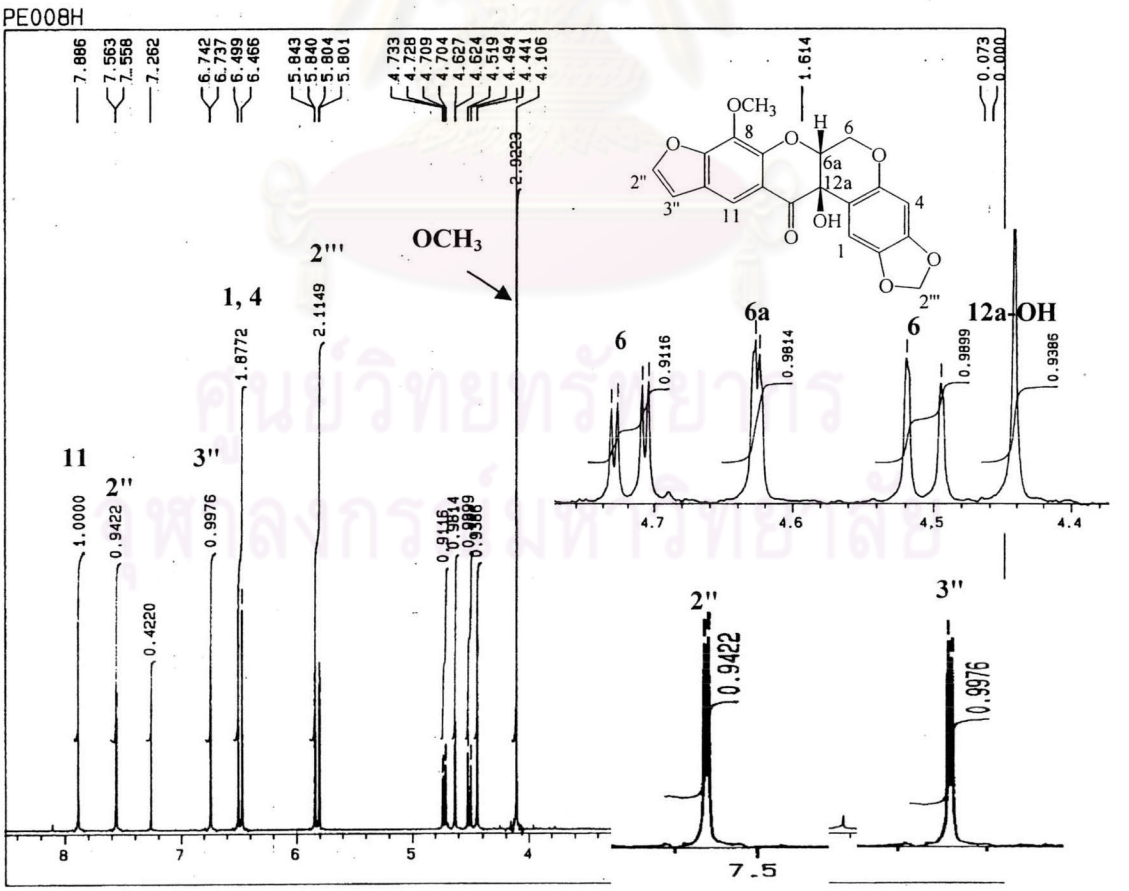

Figure 58 ^{1}H-NMR (500 MHz) spectrum of Compound **11** ($CDCl_3$)

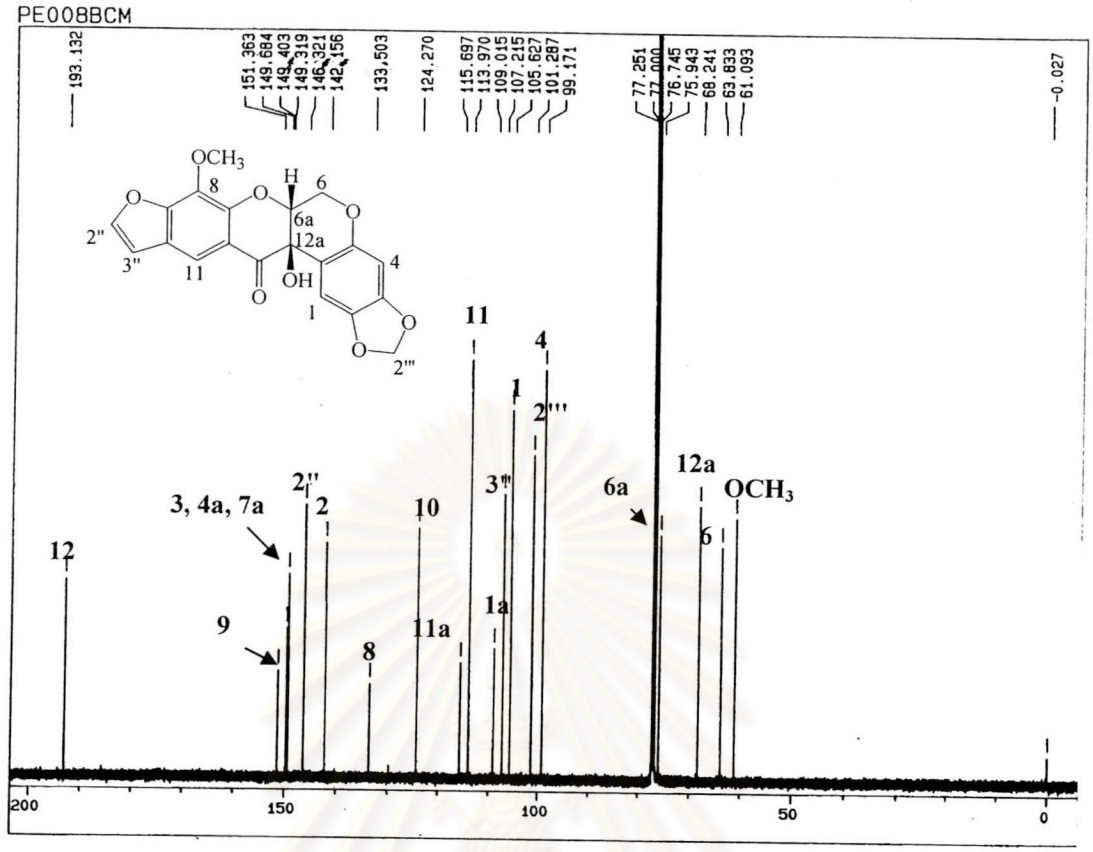

Figure 59 ^{13}C-NMR (150 MHz) spectrum of Compound **11** ($CDCl_3$)

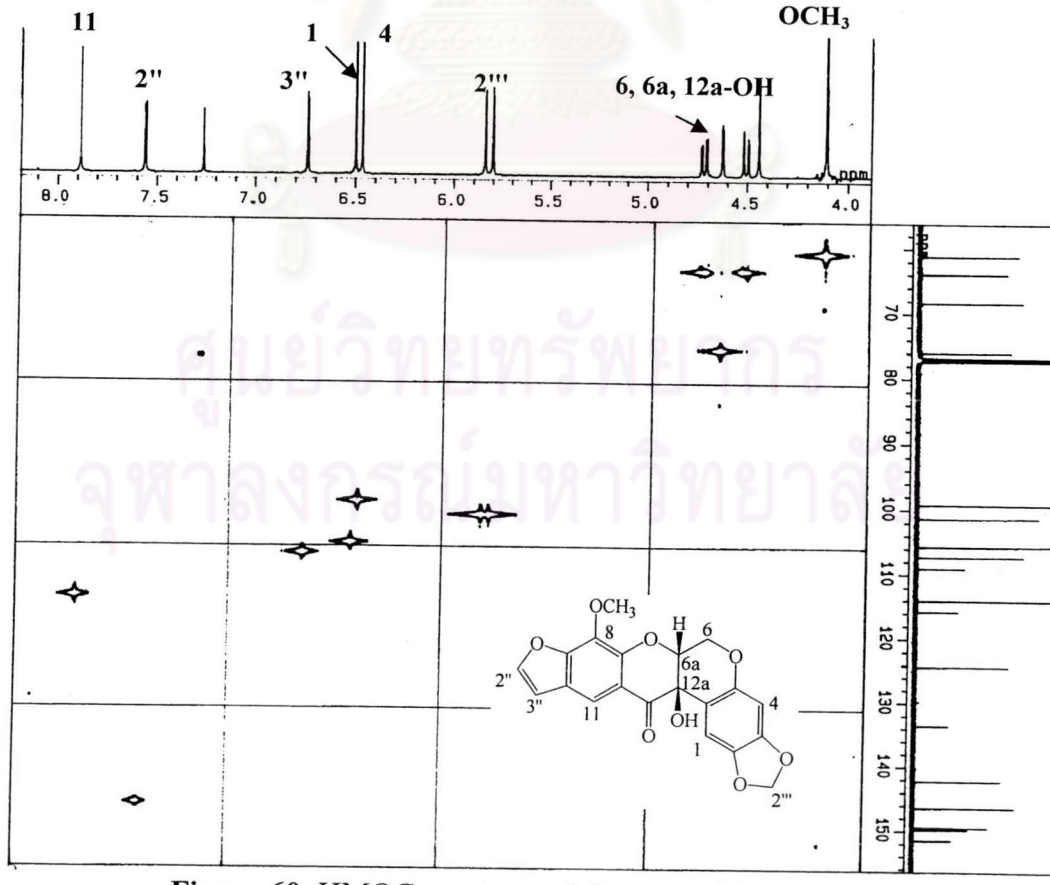

Figure 60 HMQC spectrum of Compound **11** ($CDCl_3$)

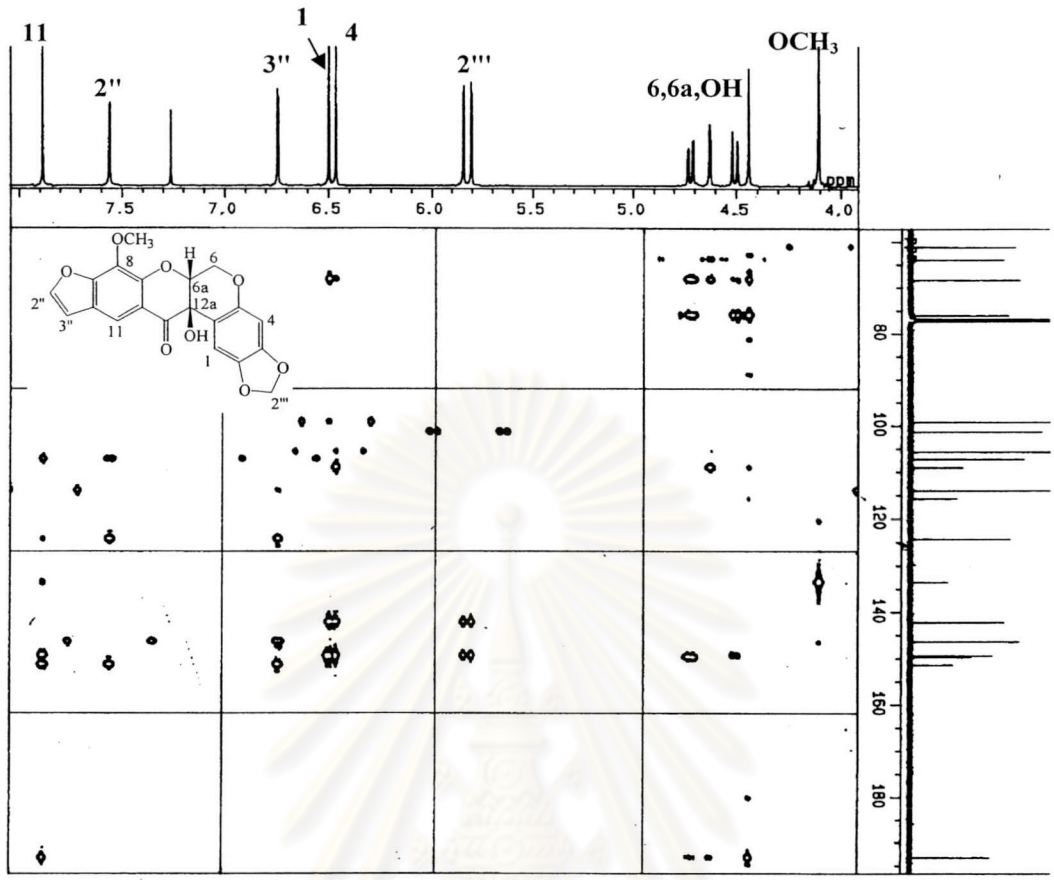

Figure 61 HMBC spectrum of Compound **11** ($CDCl_3$)

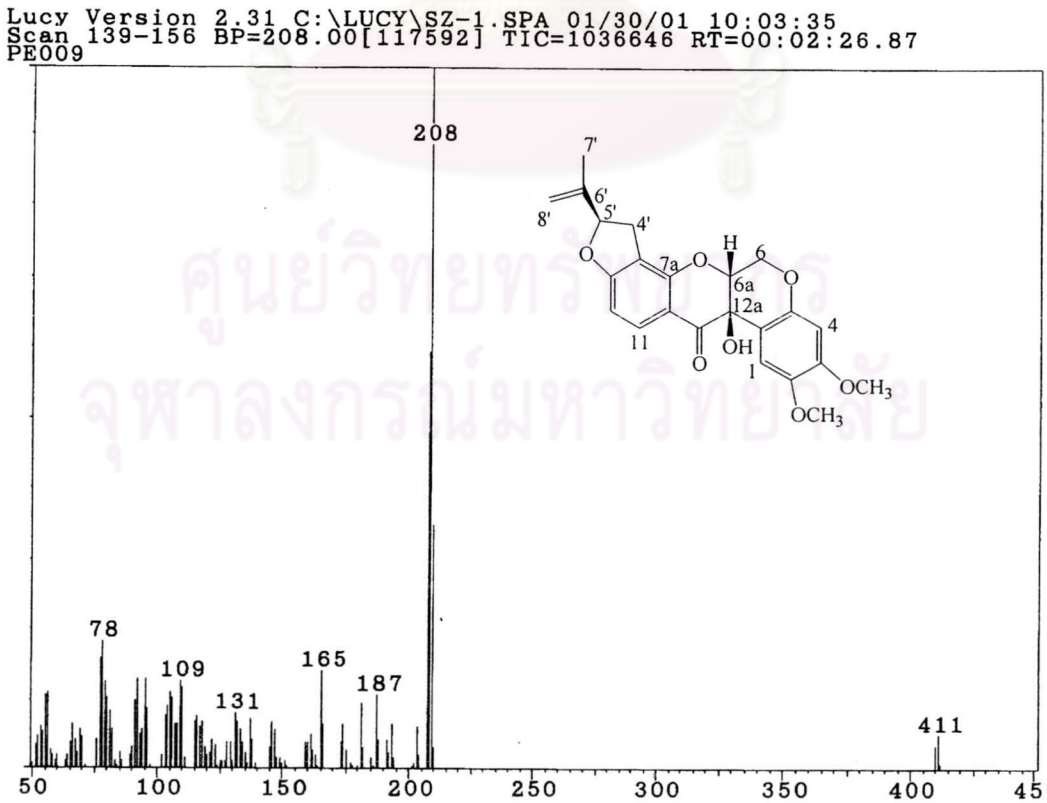

Figure 62 EI Mass spectrum of Compound **12**

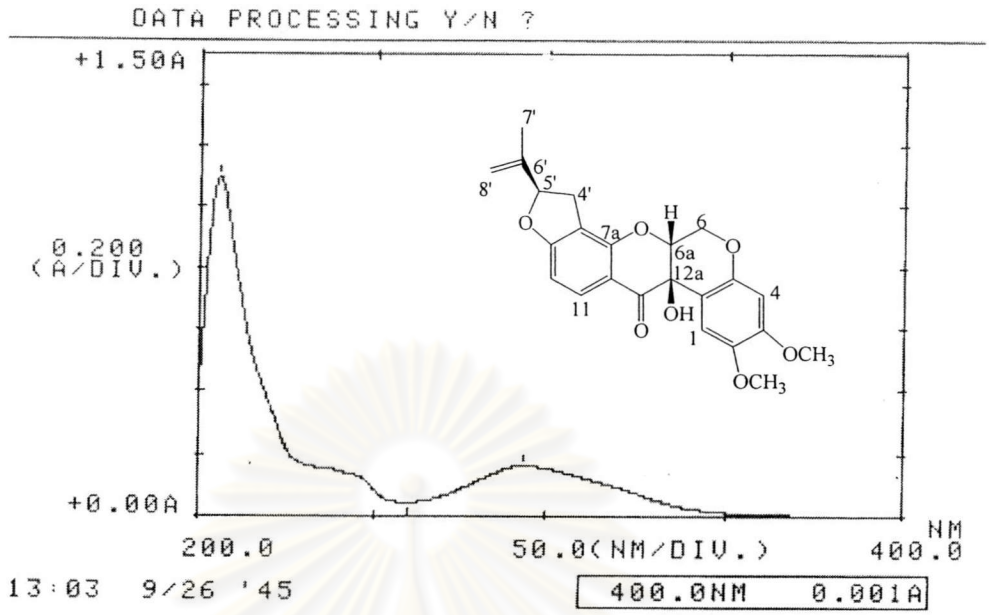

Figure 63 UV spectrum of Compound **12** (MeOH)

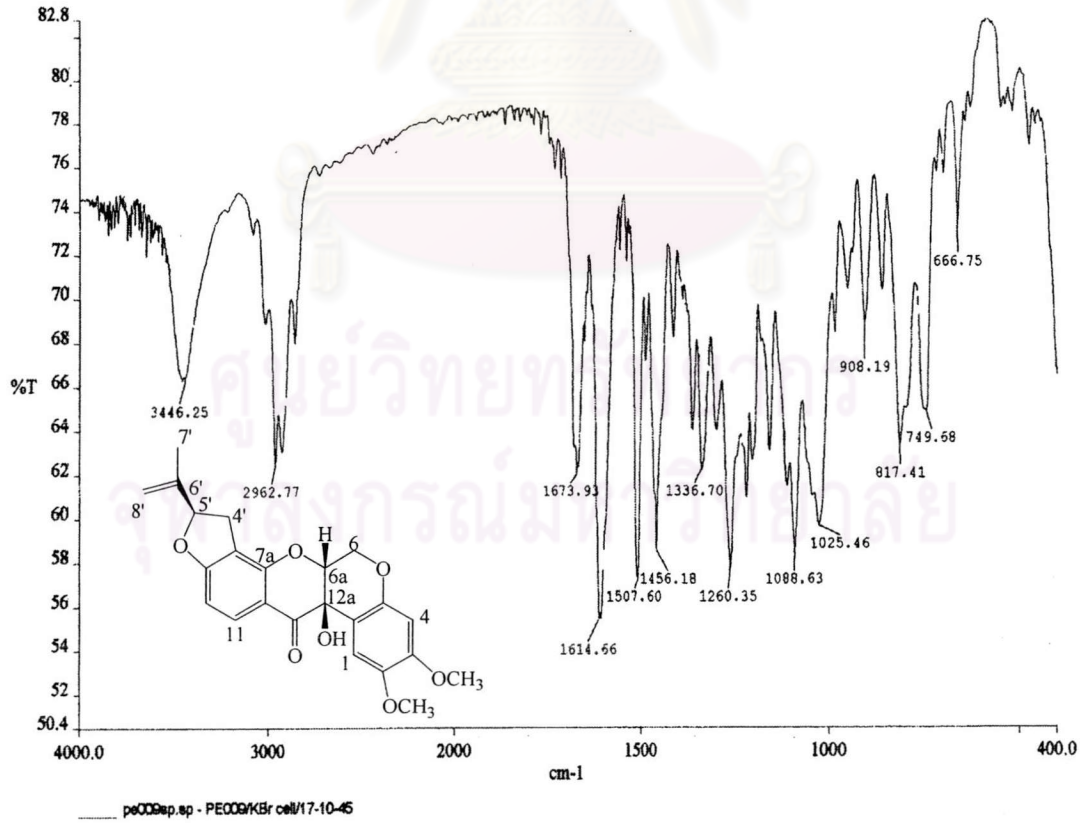

Figure 64 IR spectrum of Compound **12** (Film)

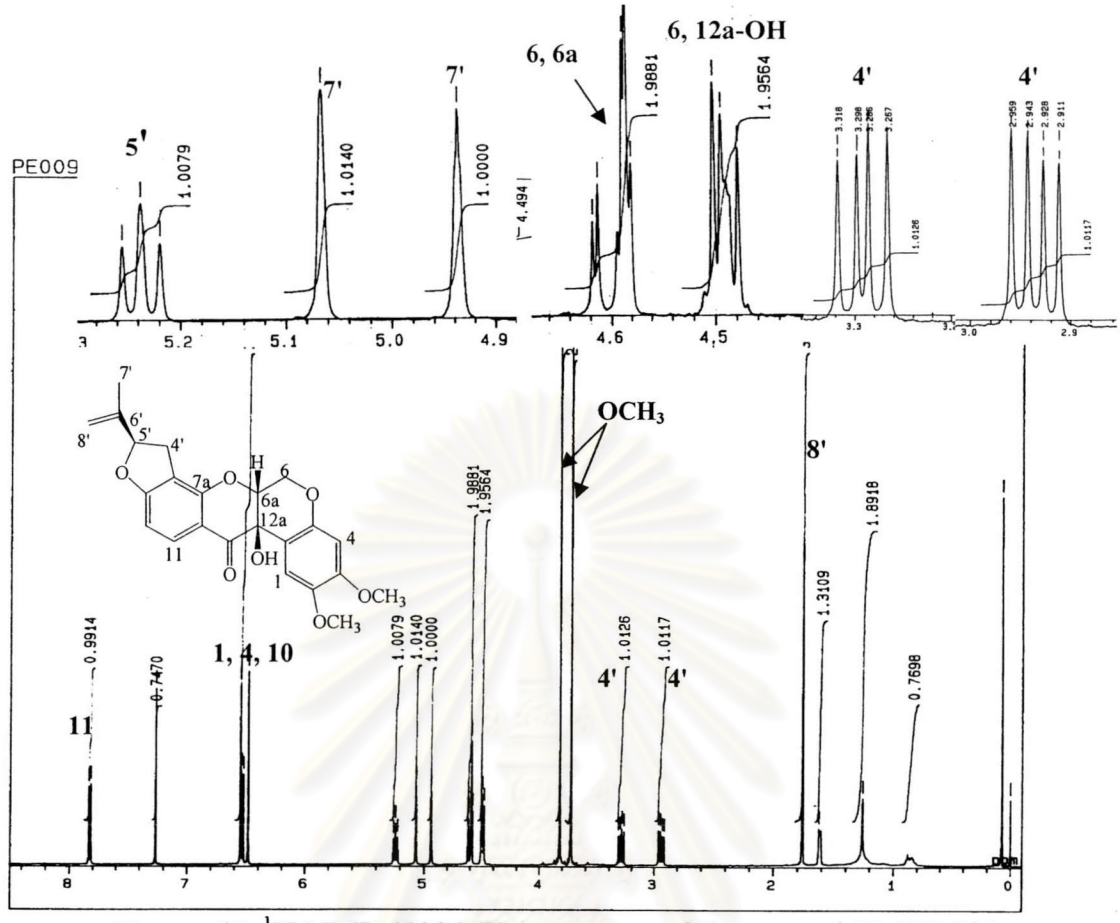

Figure 65 ^{1}H-NMR (500 MHz) spectrum of Compound **12** ($CDCl_3$)

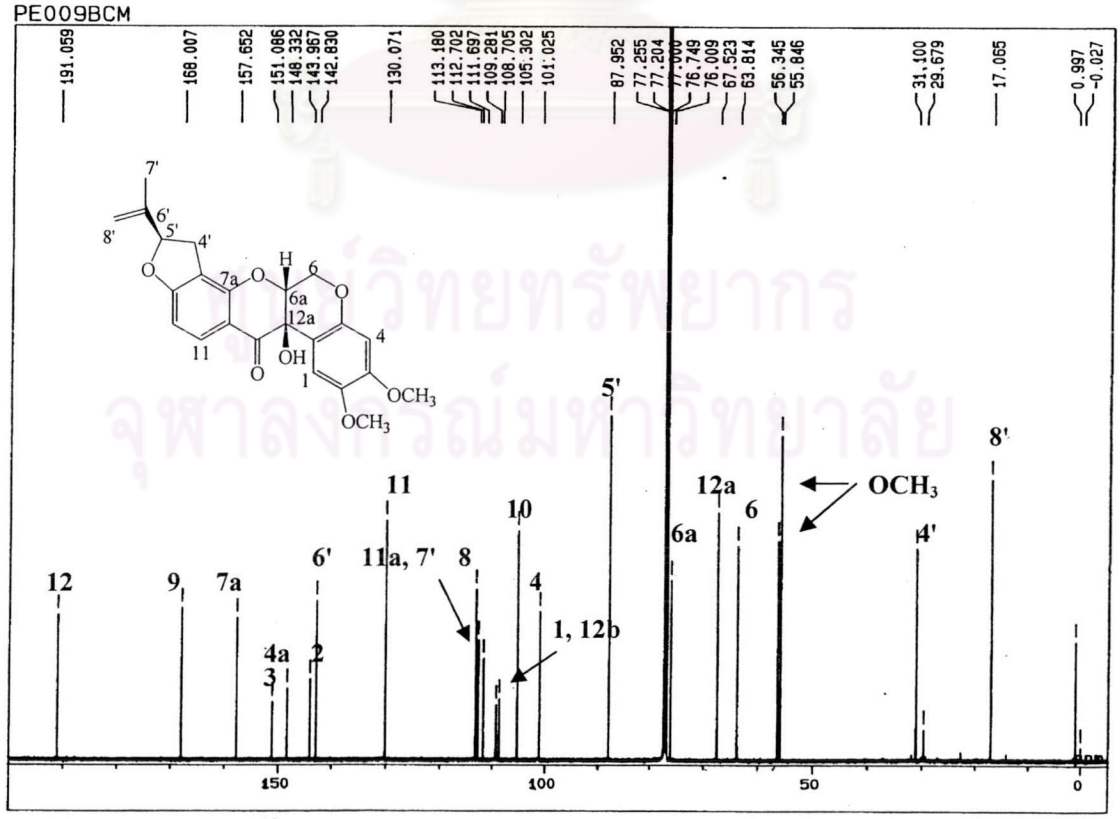

Figure 66 ^{13}C-NMR (150 MHz) spectrum of Compound **12** ($CDCl_3$)

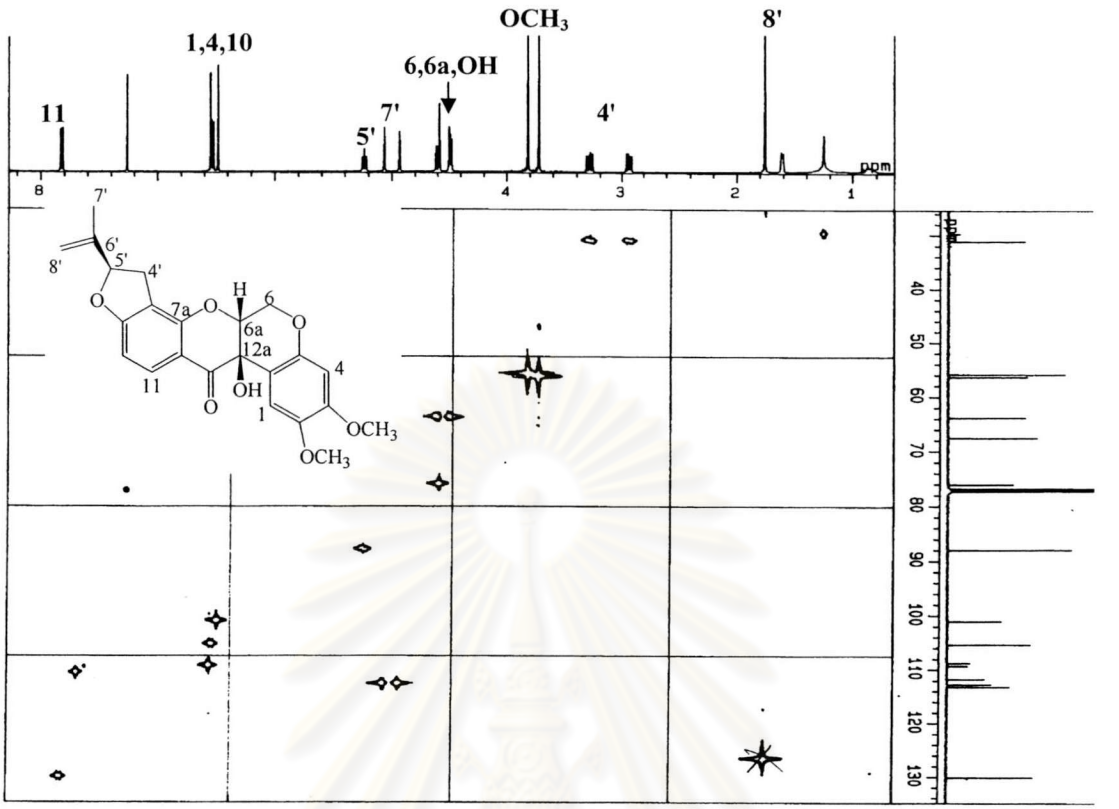

Figure 67 HMQC spectrum of Compound **12** ($CDCl_3$)

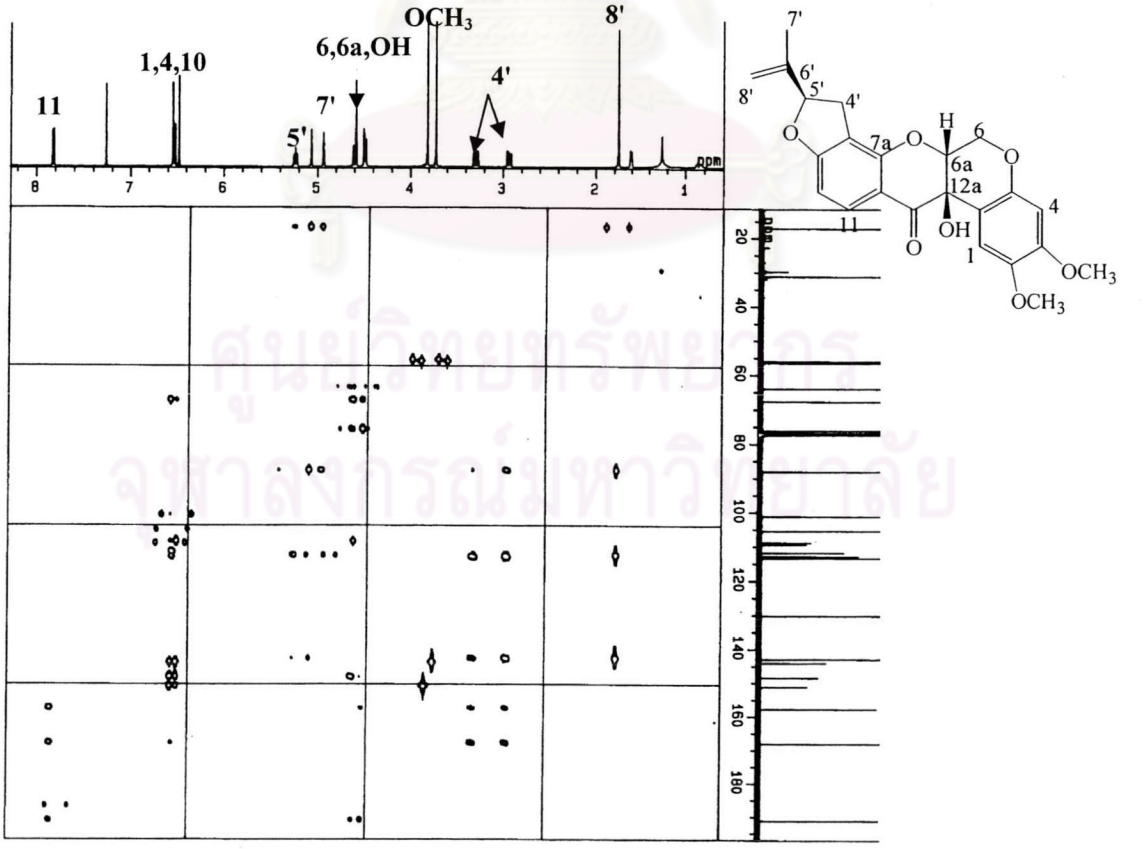

Figure 68 HMBC spectrum of Compound **12** ($CDCl_3$)

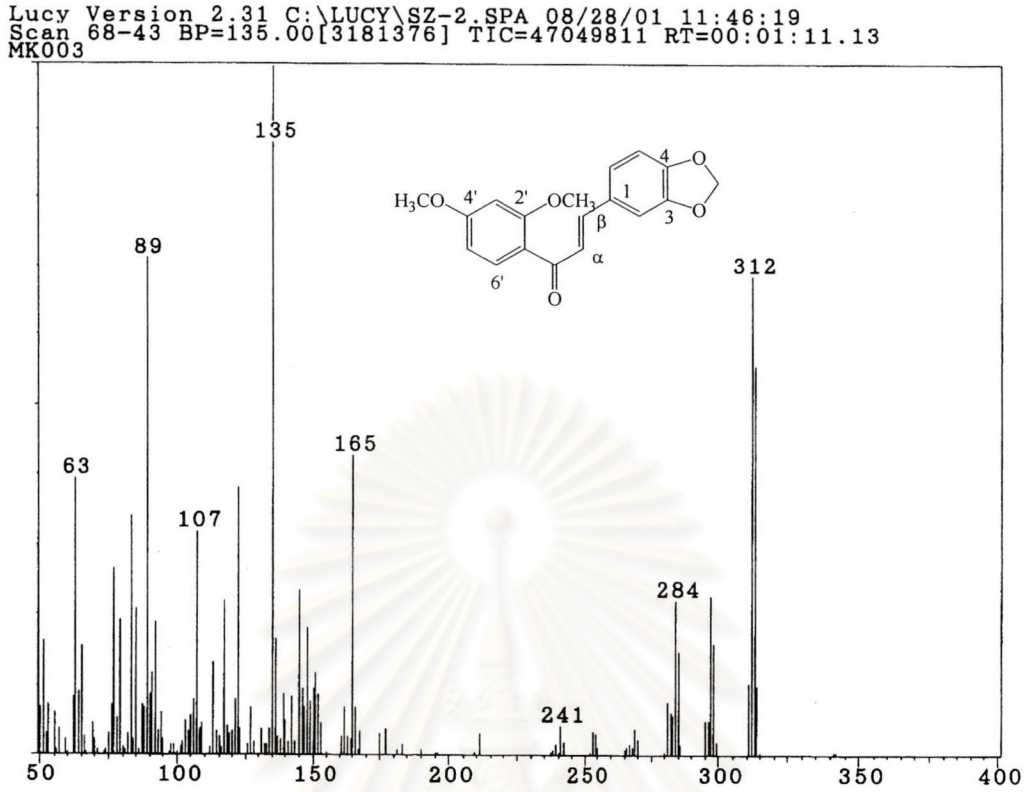

Figure 69 EI Mass spectrum of Compound **279**

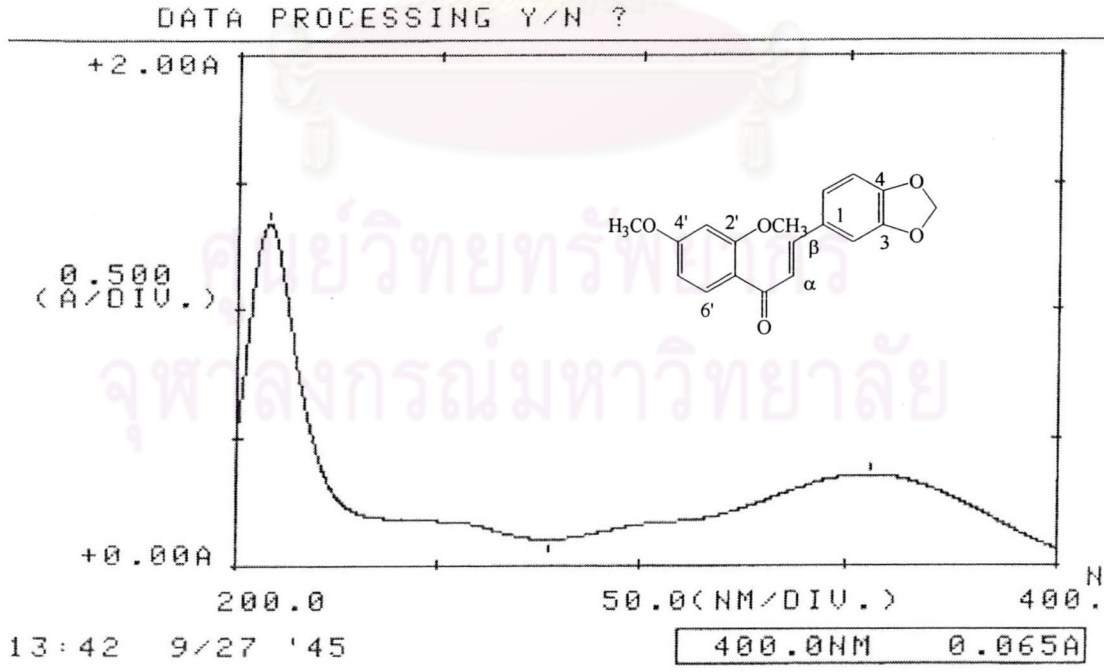

Figure 70 UV spectrum of Compound **279** (MeOH)

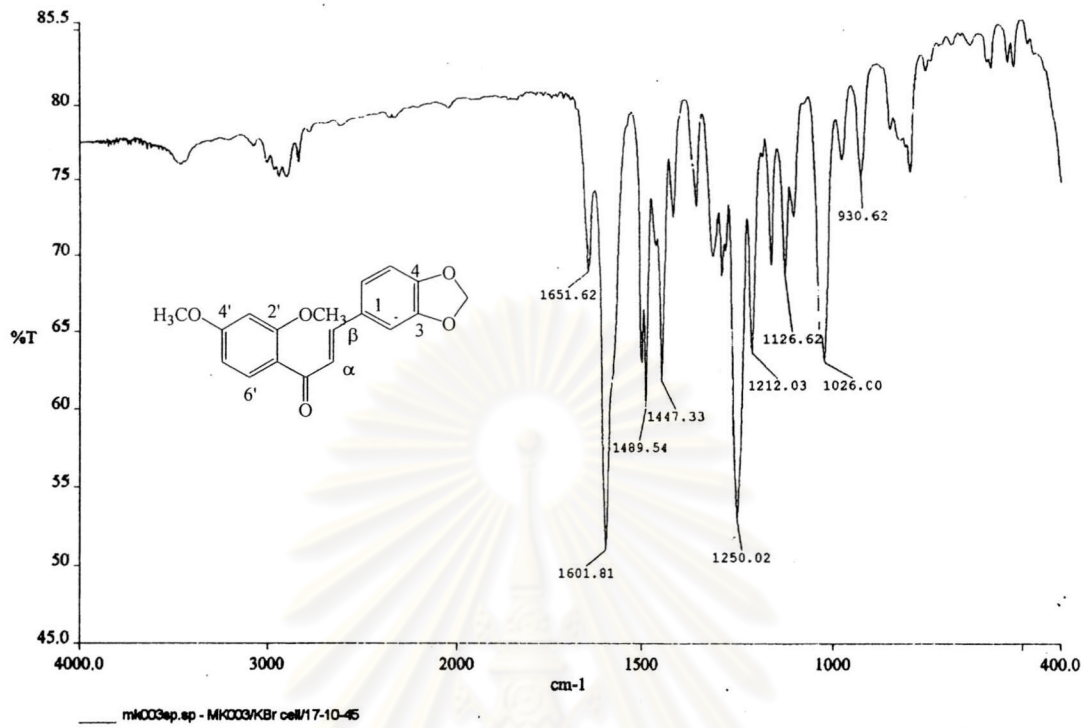

Figure 71 IR spectrum of Compound **279** (Film)

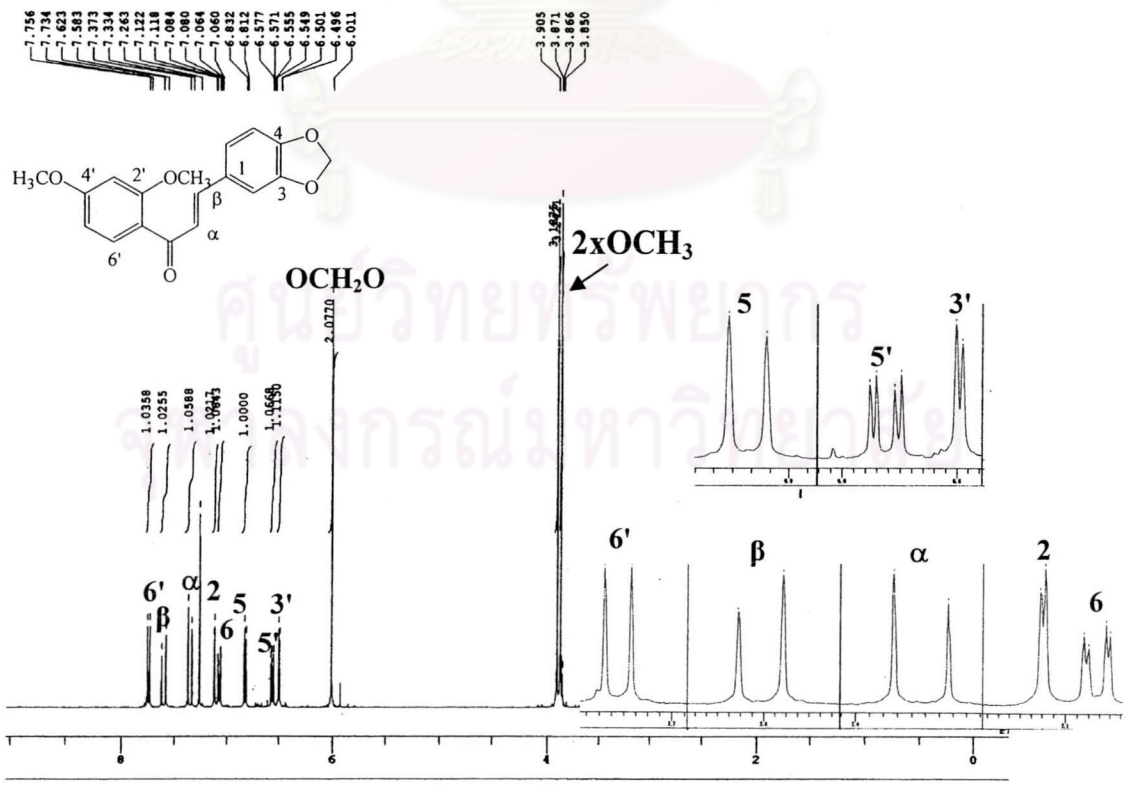

Figure 72 ^{1}H-NMR (500 MHz) spectrum of Compound **279** ($CDCl_3$)

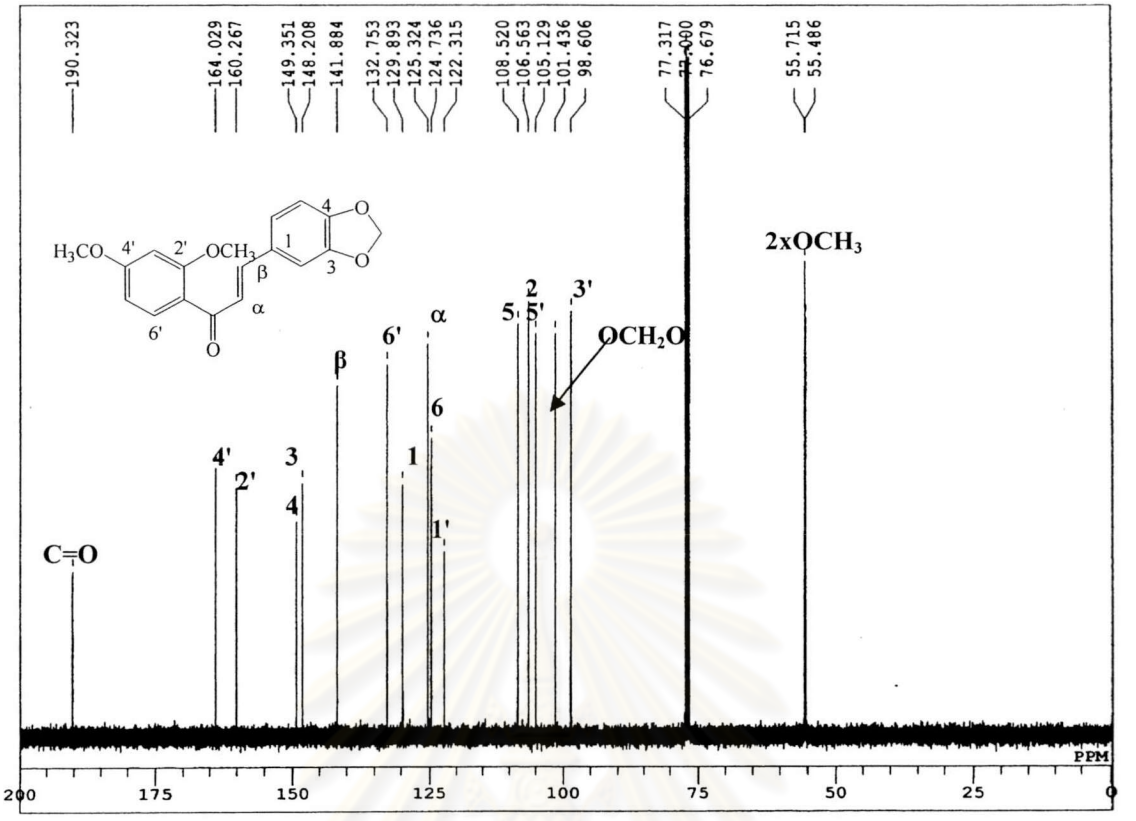

Figure 73 ^{13}C-NMR (150 MHz) spectrum of Compound **279** ($CDCl_3$)

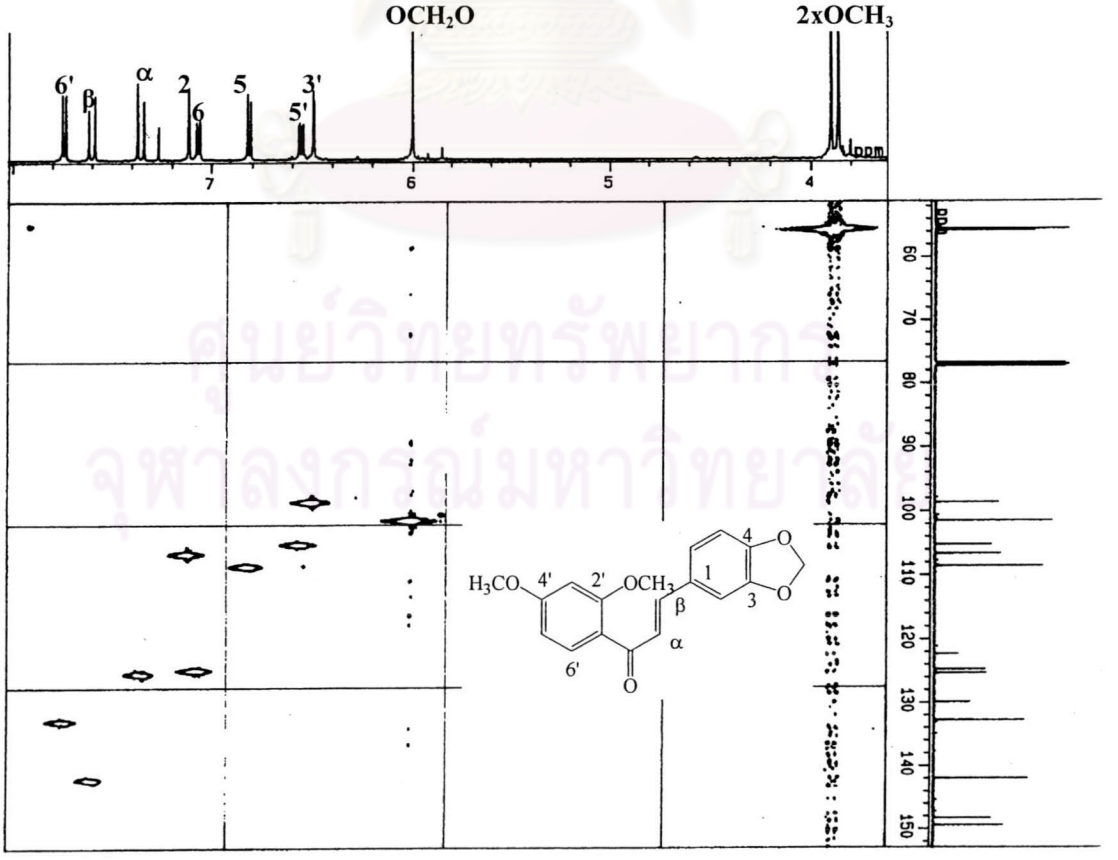

Figure 74 HMQC spectrum of Compound **279** ($CDCl_3$)

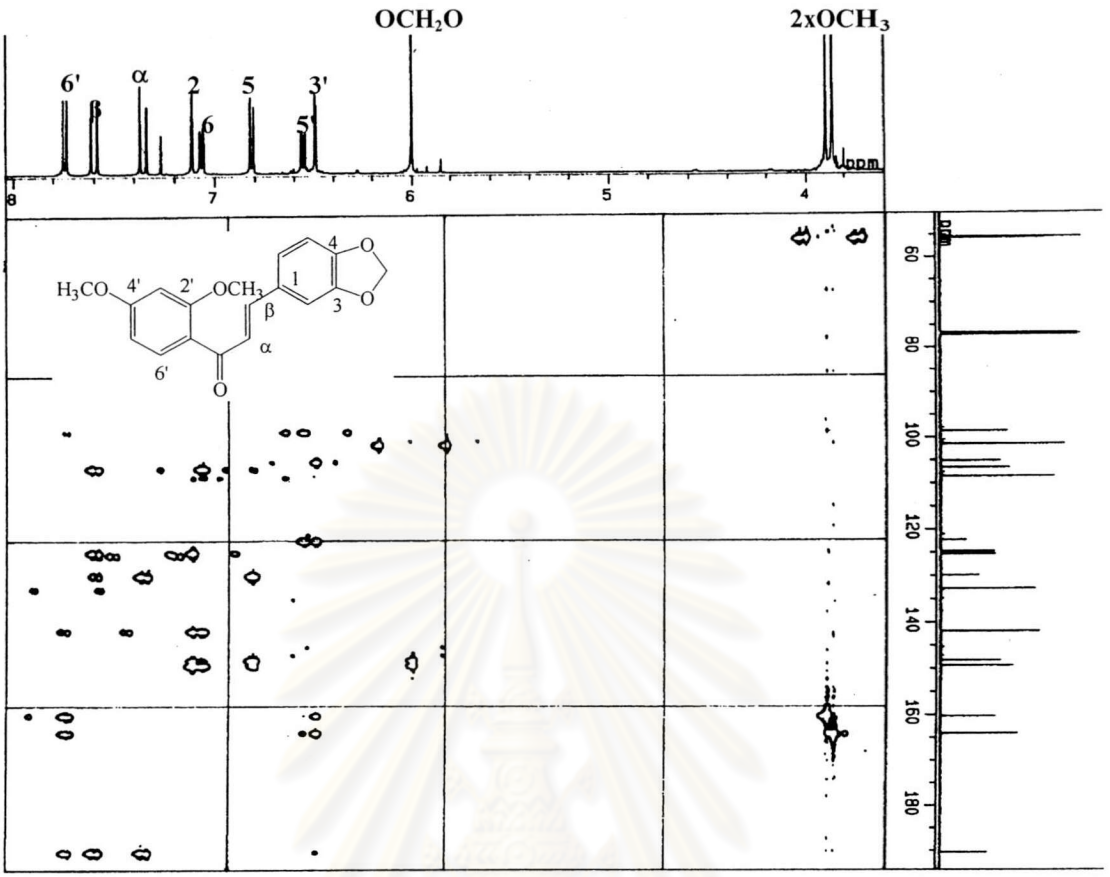

Figure 75 HMBC spectrum of Compound **279** ($CDCl_3$)

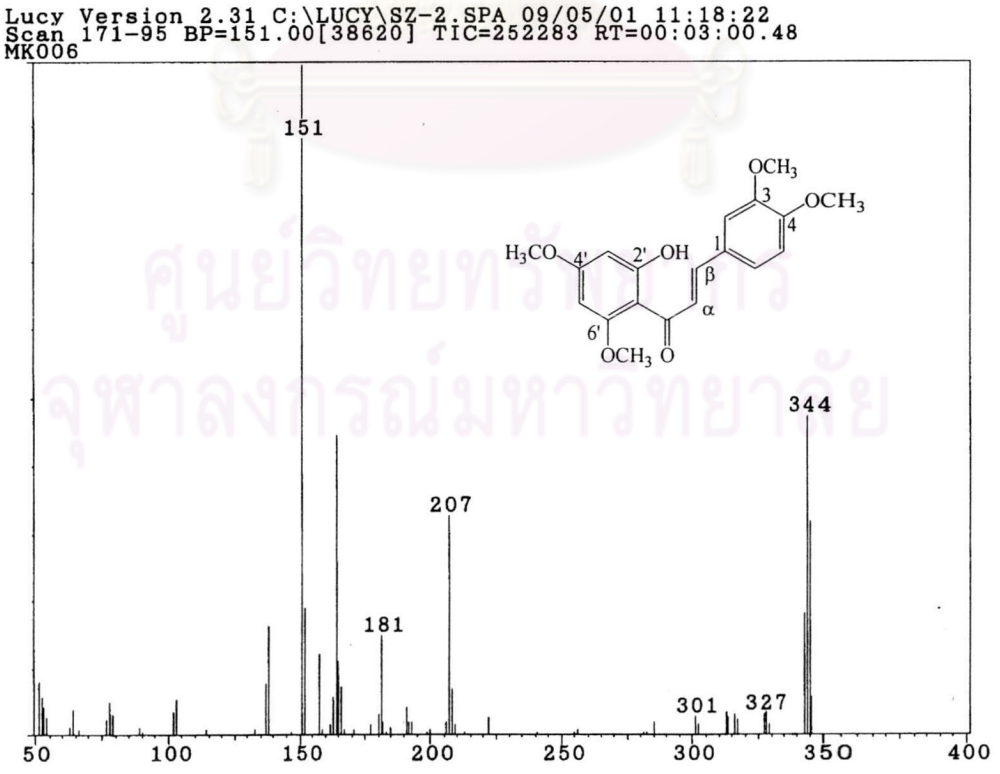

Figure 76 EI Mass spectrum of Compound **280**

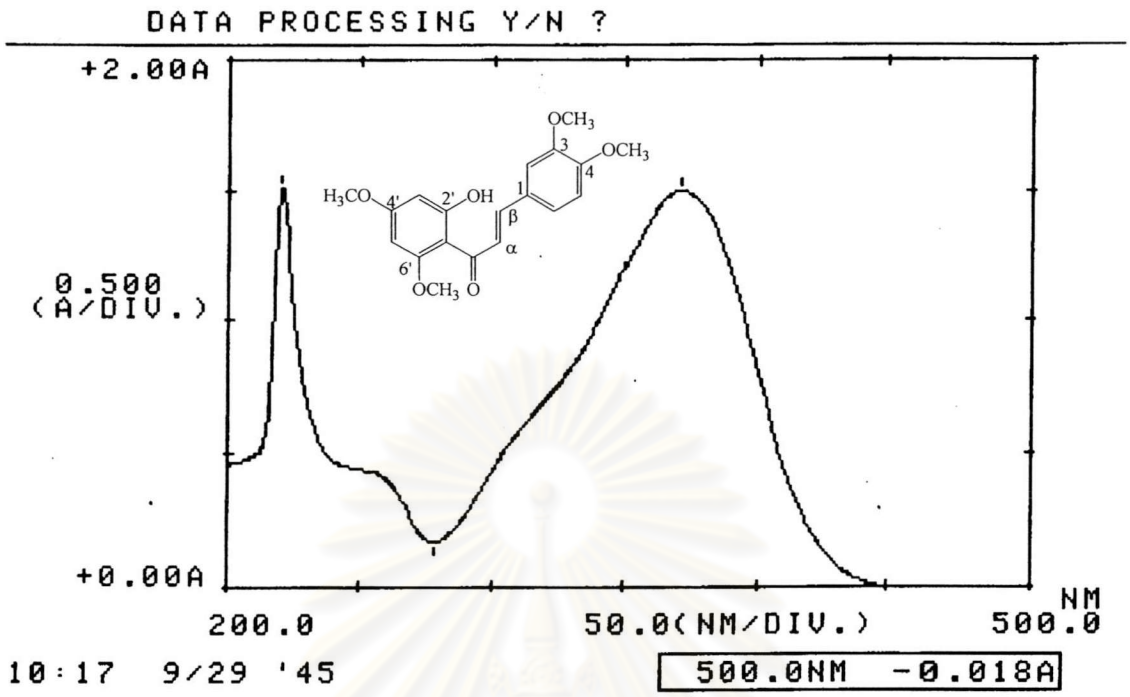

Figure 77 UV spectrum of Compound **280** (MeOH)

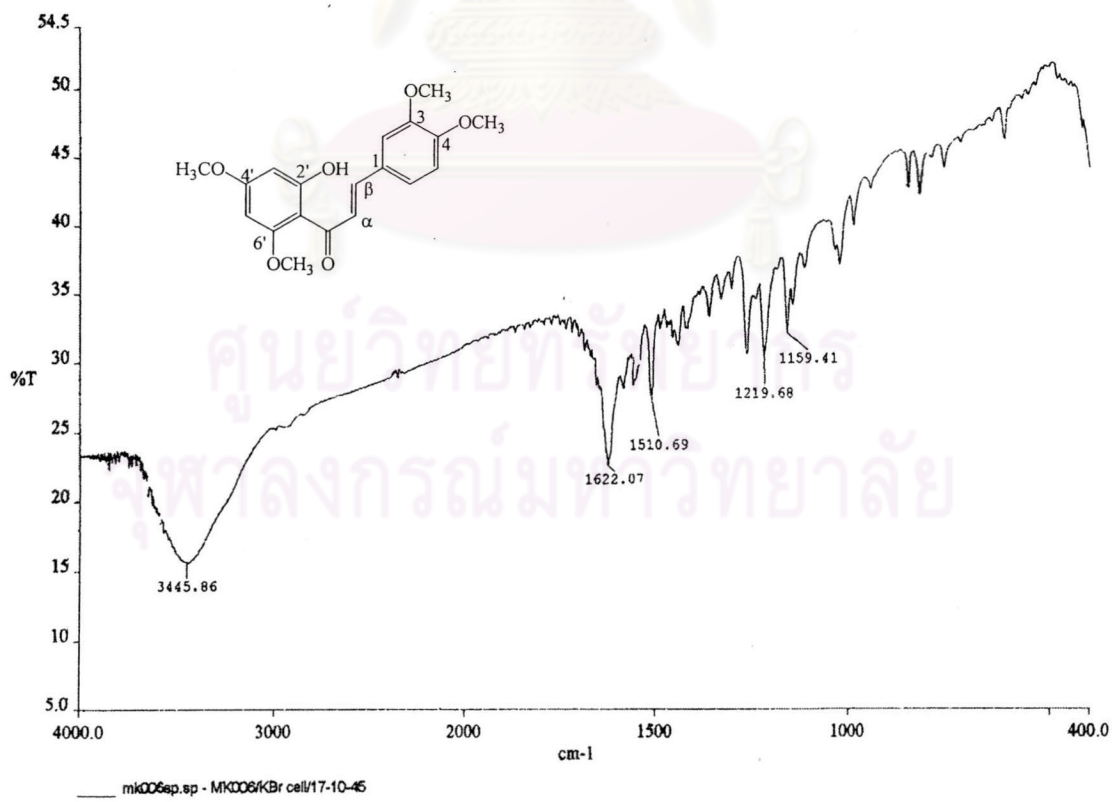

Figure 78 IR spectrum of Compound **280** (Film)

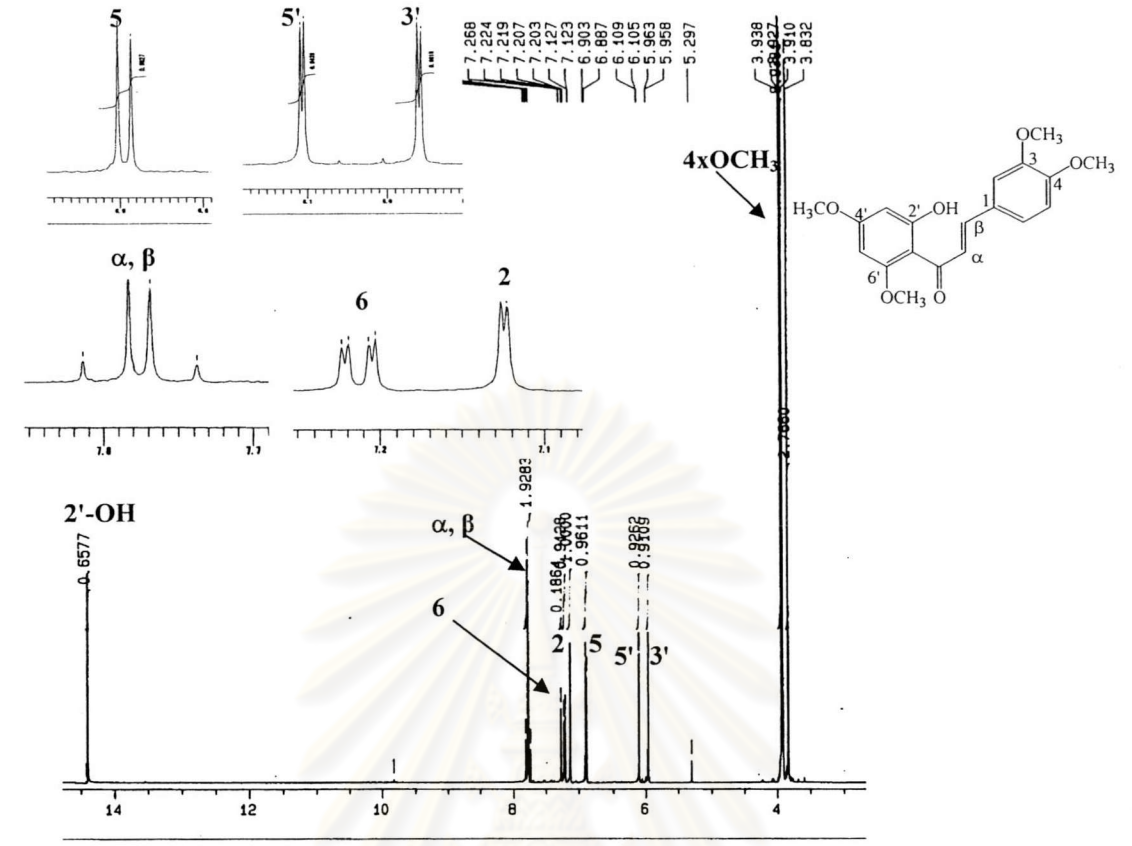

Figure 79 ^{1}H-NMR (500 MHz) spectrum of Compound **280** ($CDCl_3$)

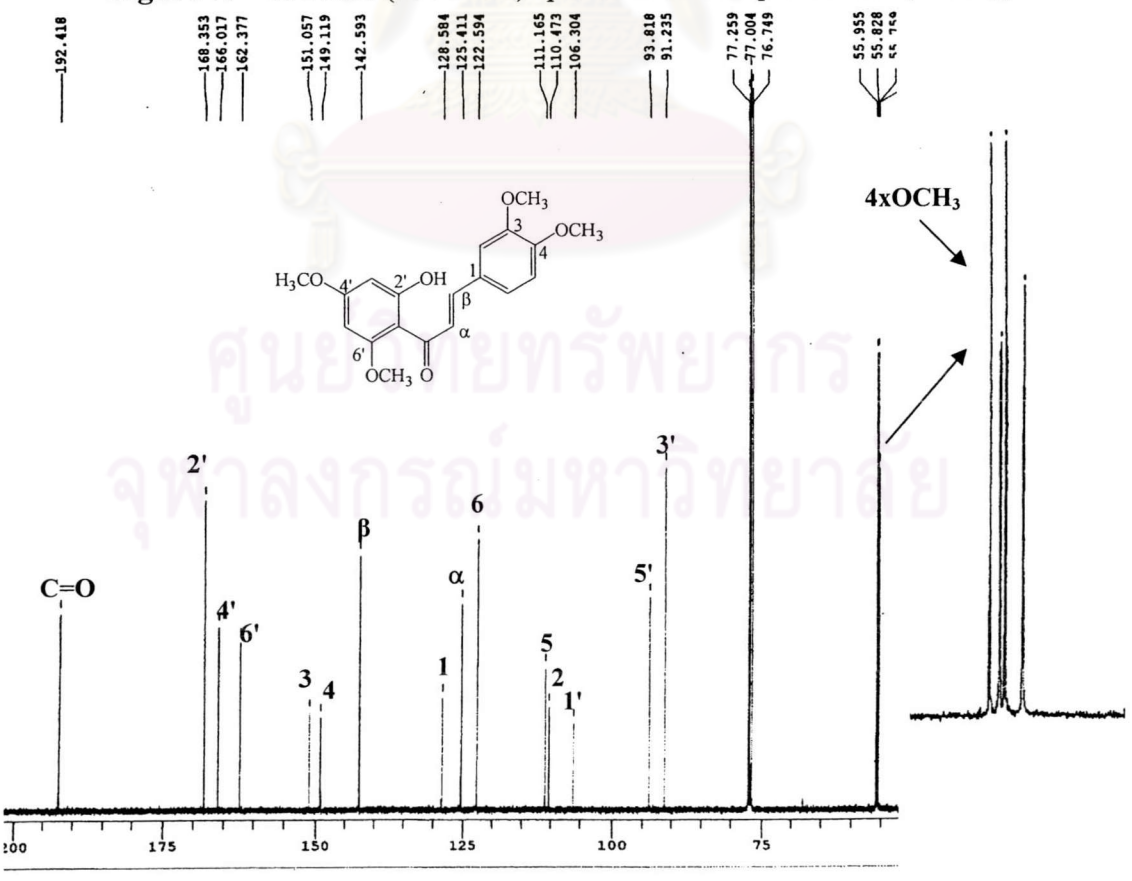

Figure 80 ^{13}C-NMR (150 MHz) spectrum of Compound **280** ($CDCl_3$)

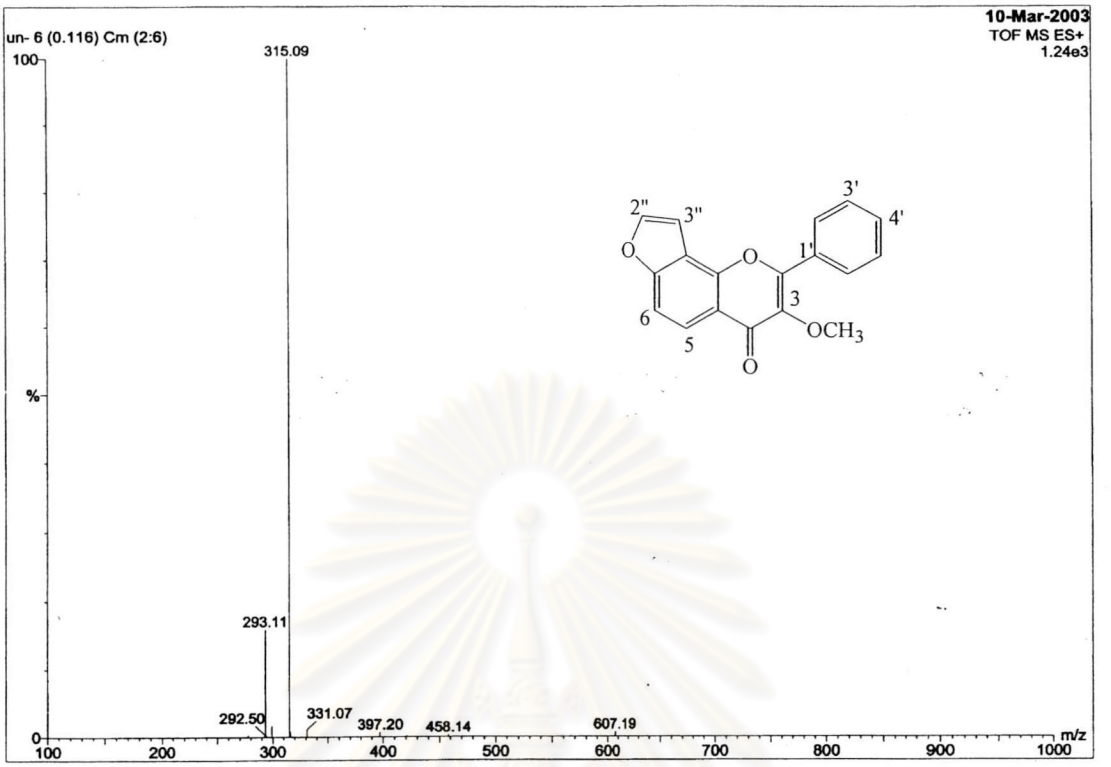

Figure 81 ESI Mass spectrum of Compound **115**

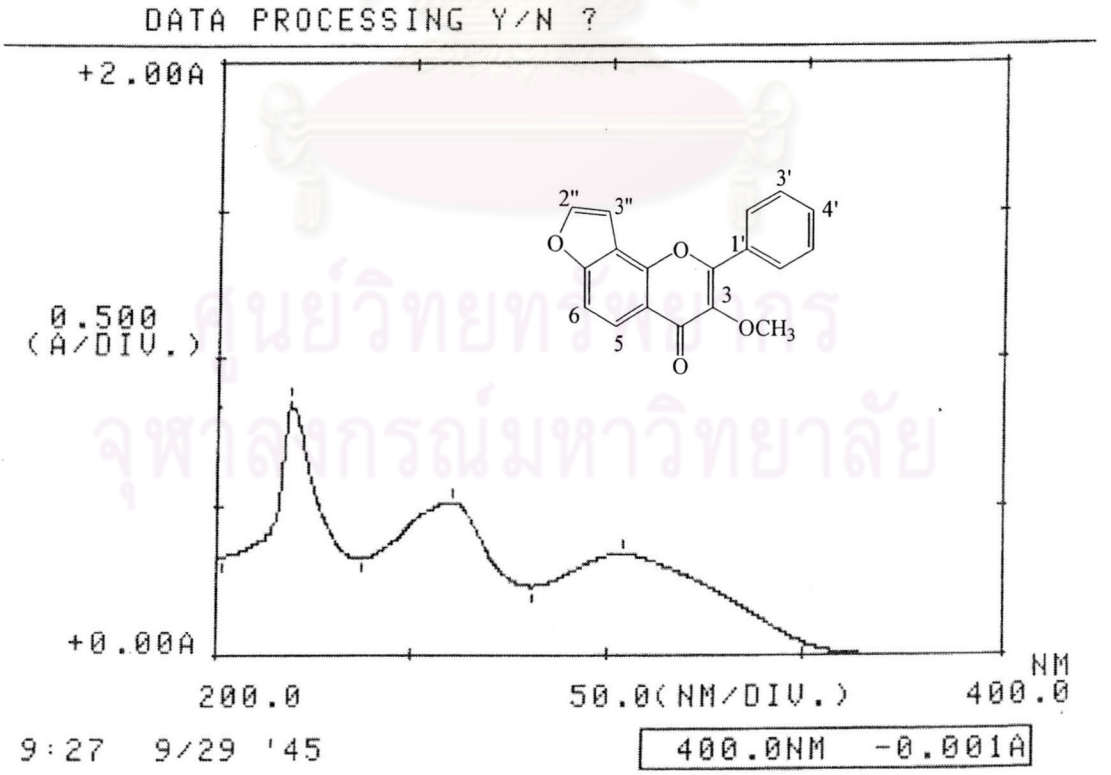

Figure 82 UV spectrum of Compound **115** (MeOH)

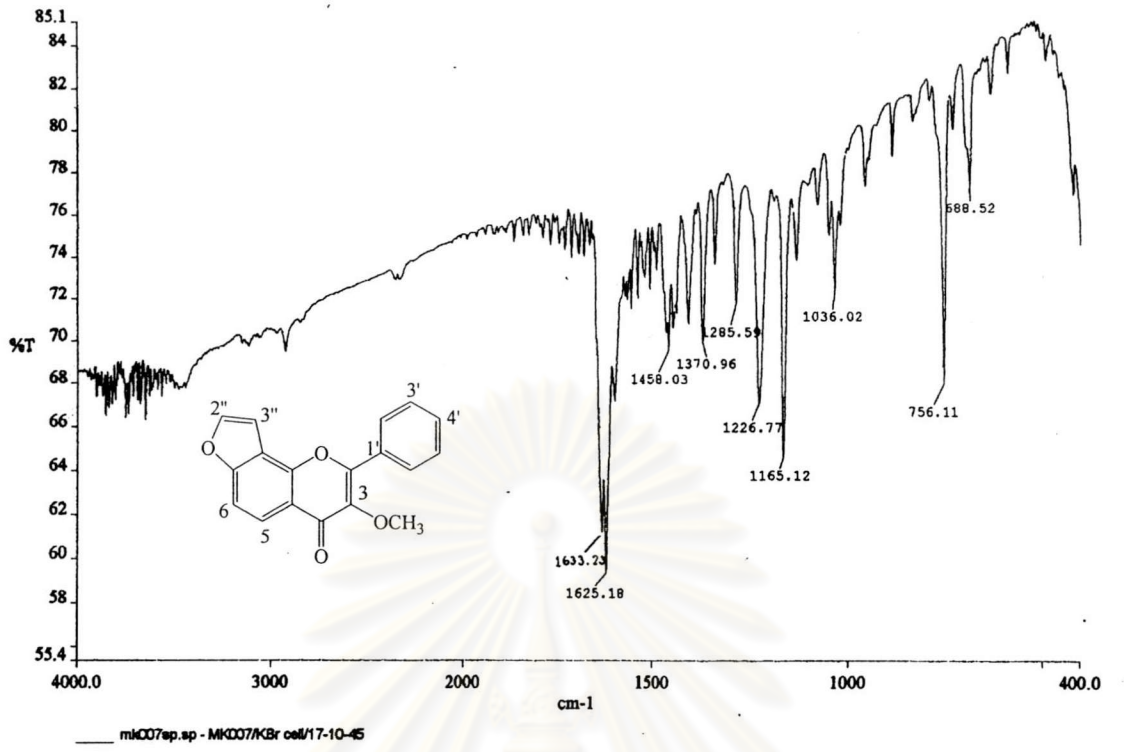

Figure 83 IR spectrum of Compound **115** (Film)

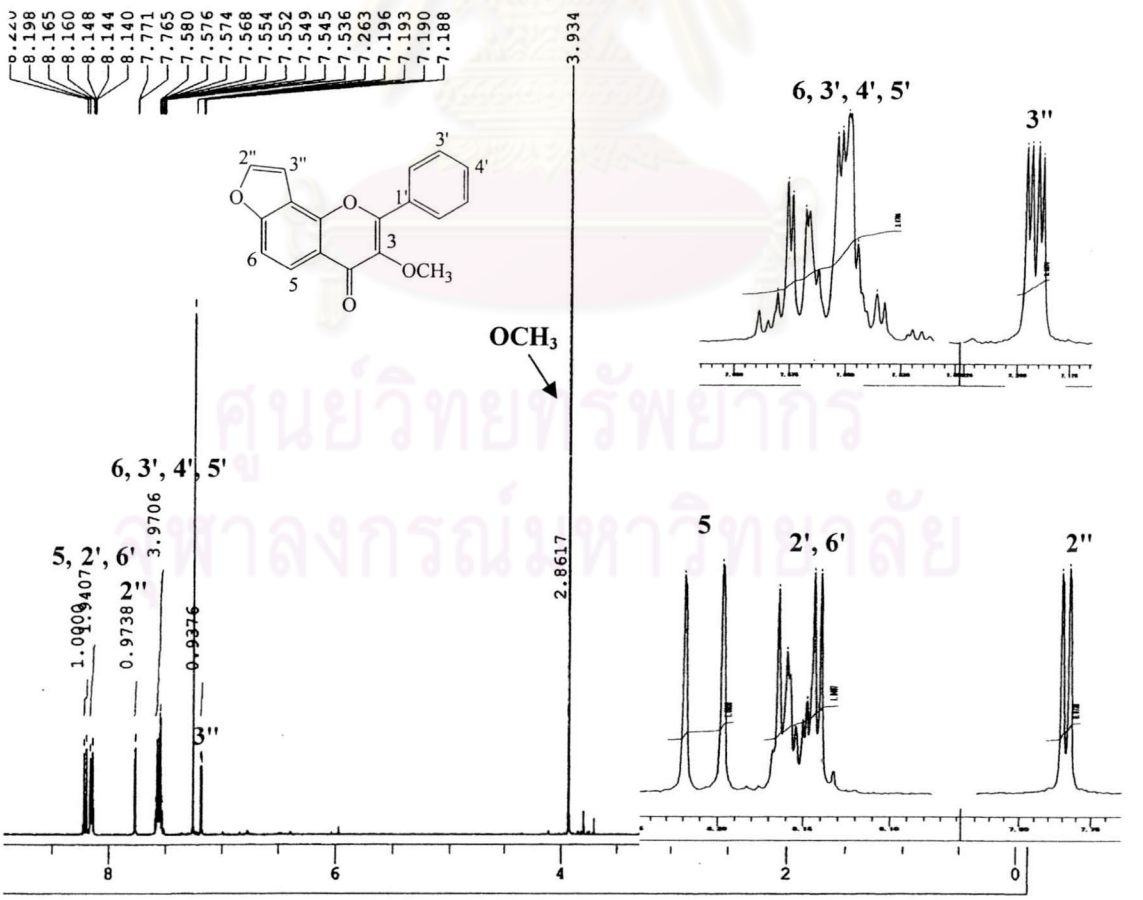

Figure 84 ^{1}H-NMR (400 MHz) spectrum of Compound **115** ($CDCl_3$)

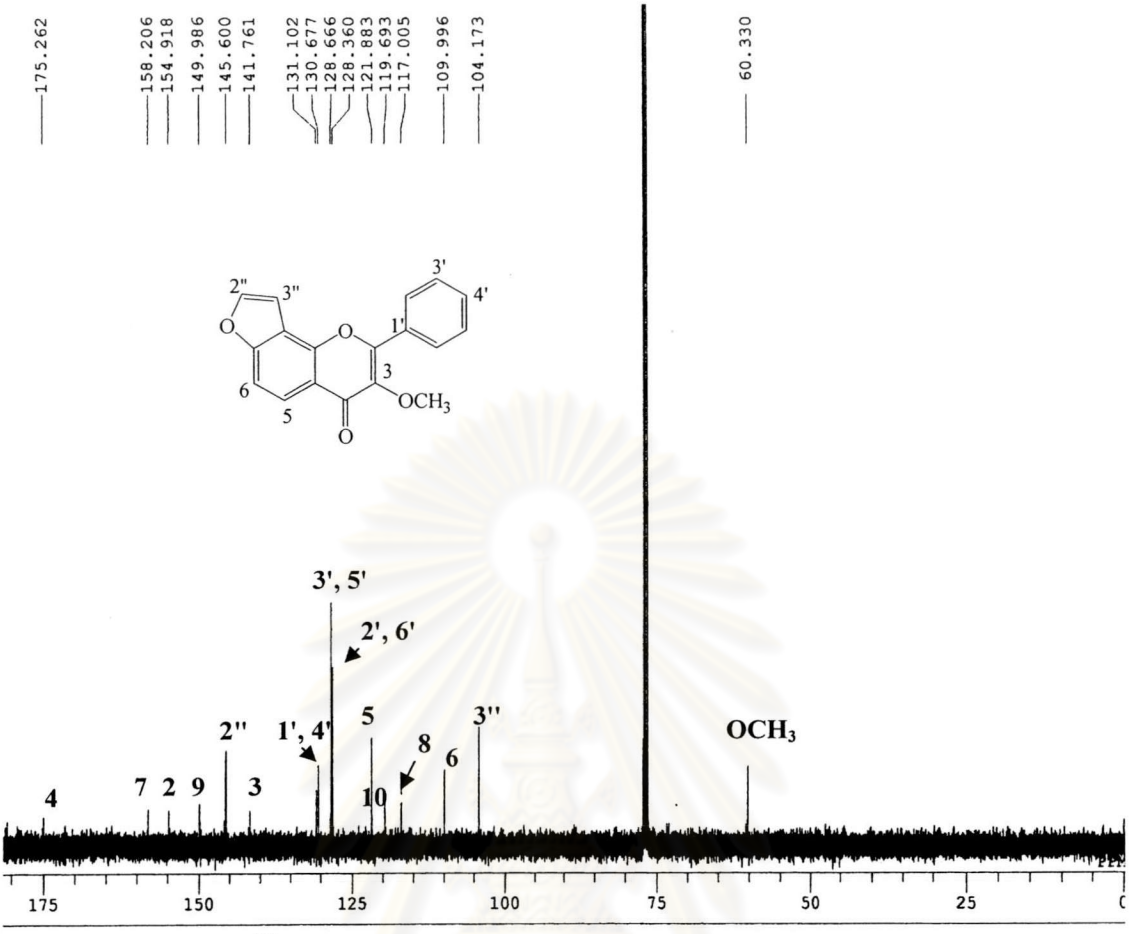

Figure 85 ^{13}C-NMR (100 MHz) spectrum of Compound **115** ($CDCl_3$)

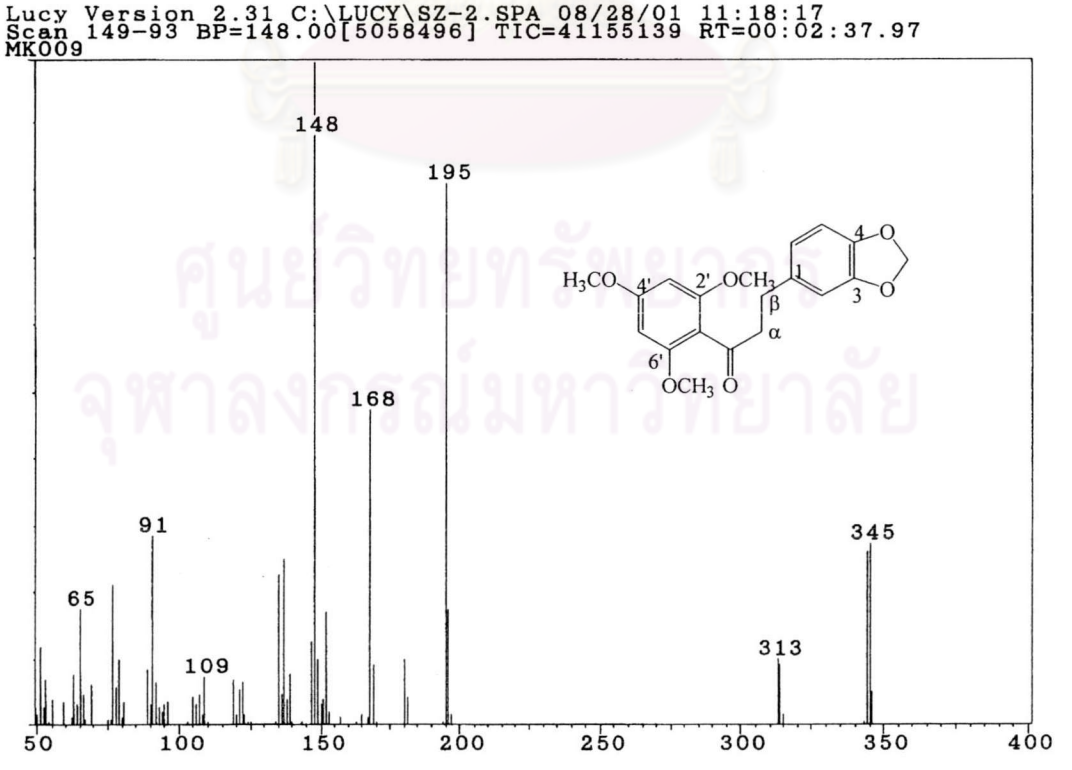

Figure 86 EI Mass spectrum of Compound **281**

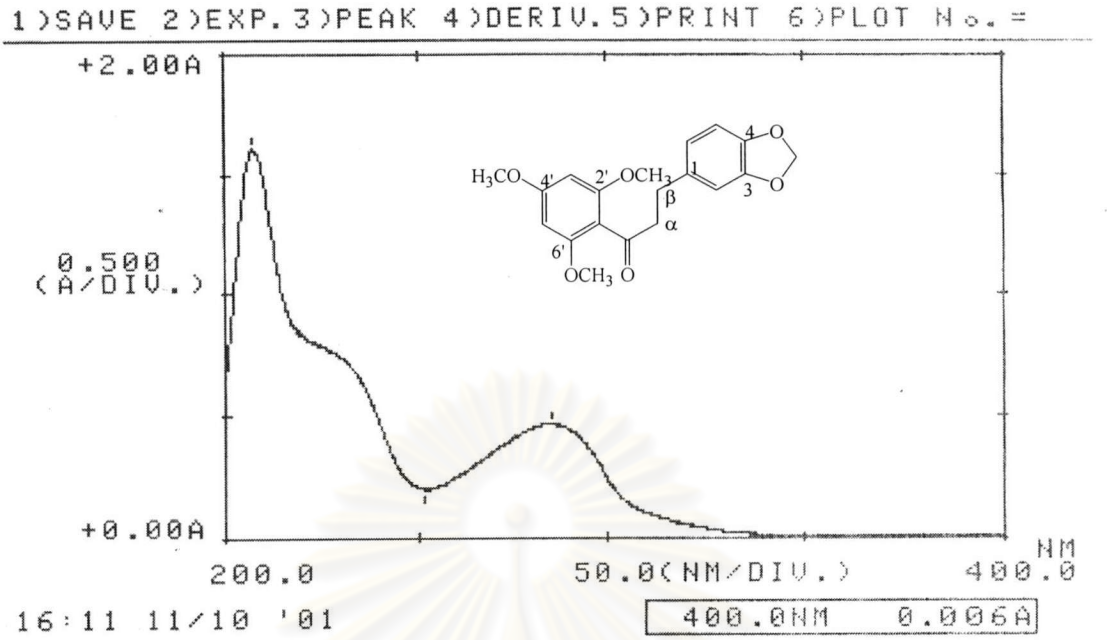

Figure 87 UV spectrum of Compound **281** (MeOH)

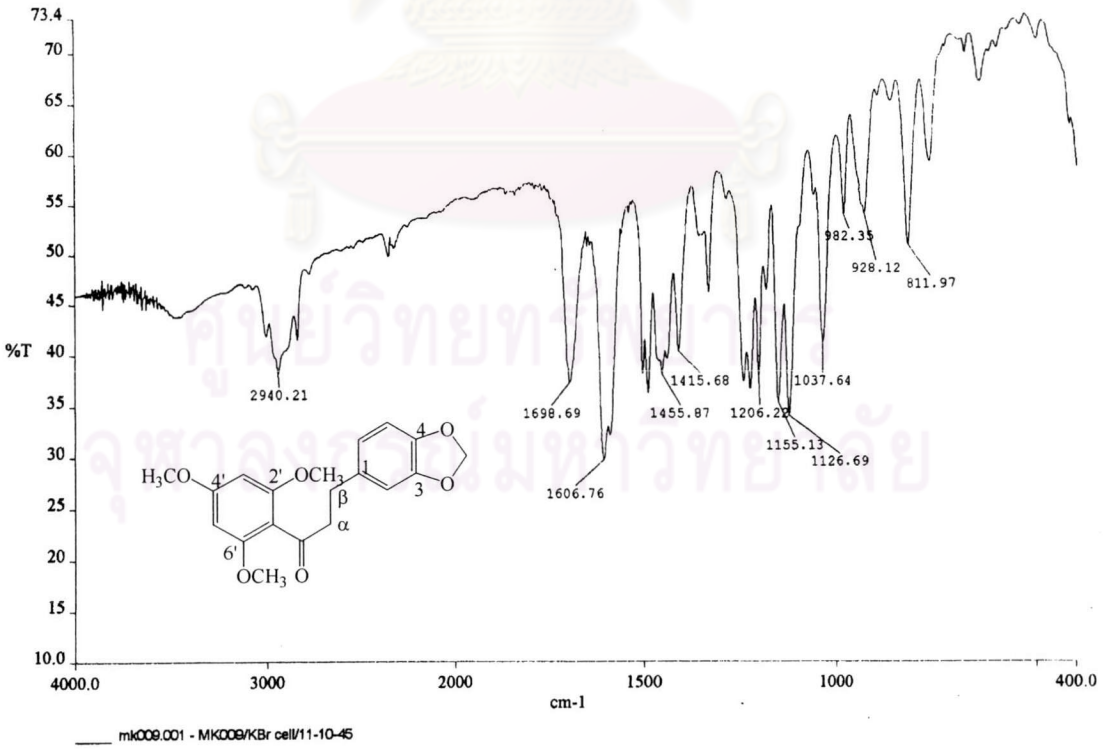

Figure 88 IR spectrum of Compound **281** (Film)

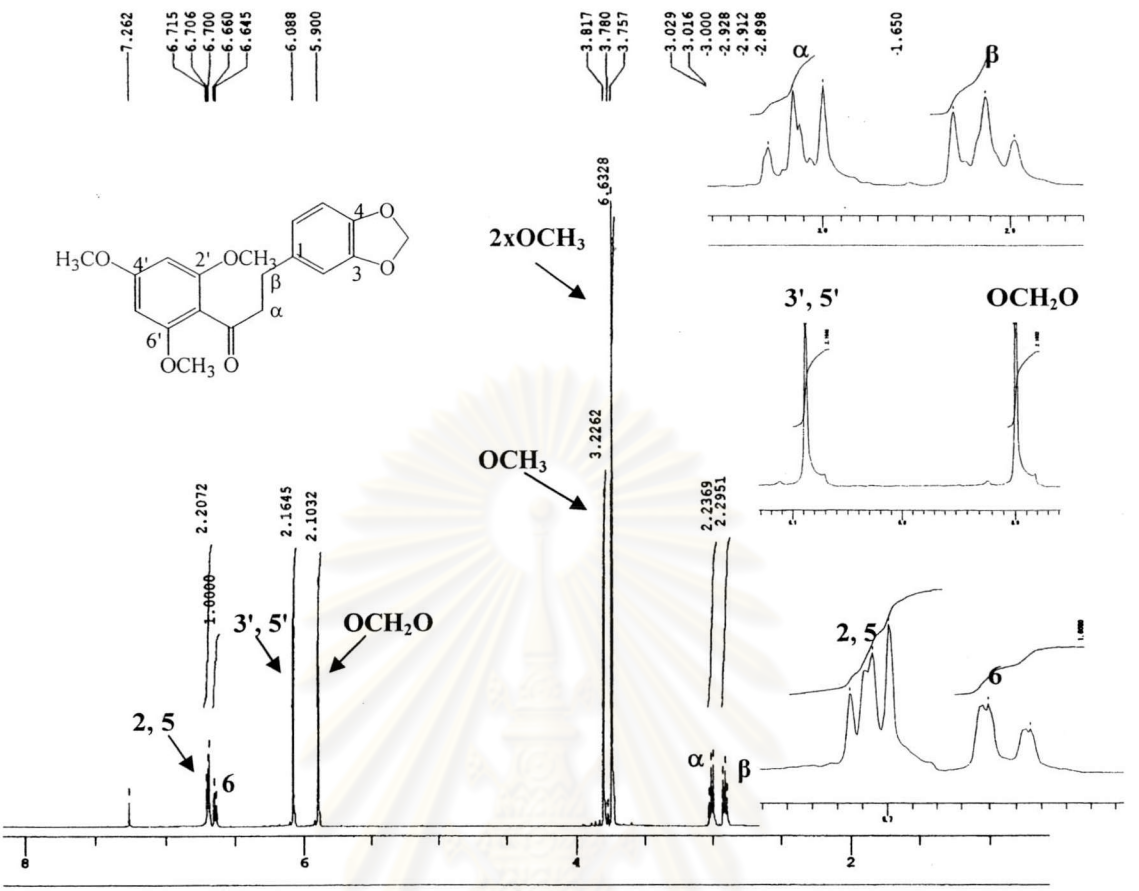

Figure 89 ^{1}H-NMR (500 MHz) spectrum of Compound **281** ($CDCl_3$)

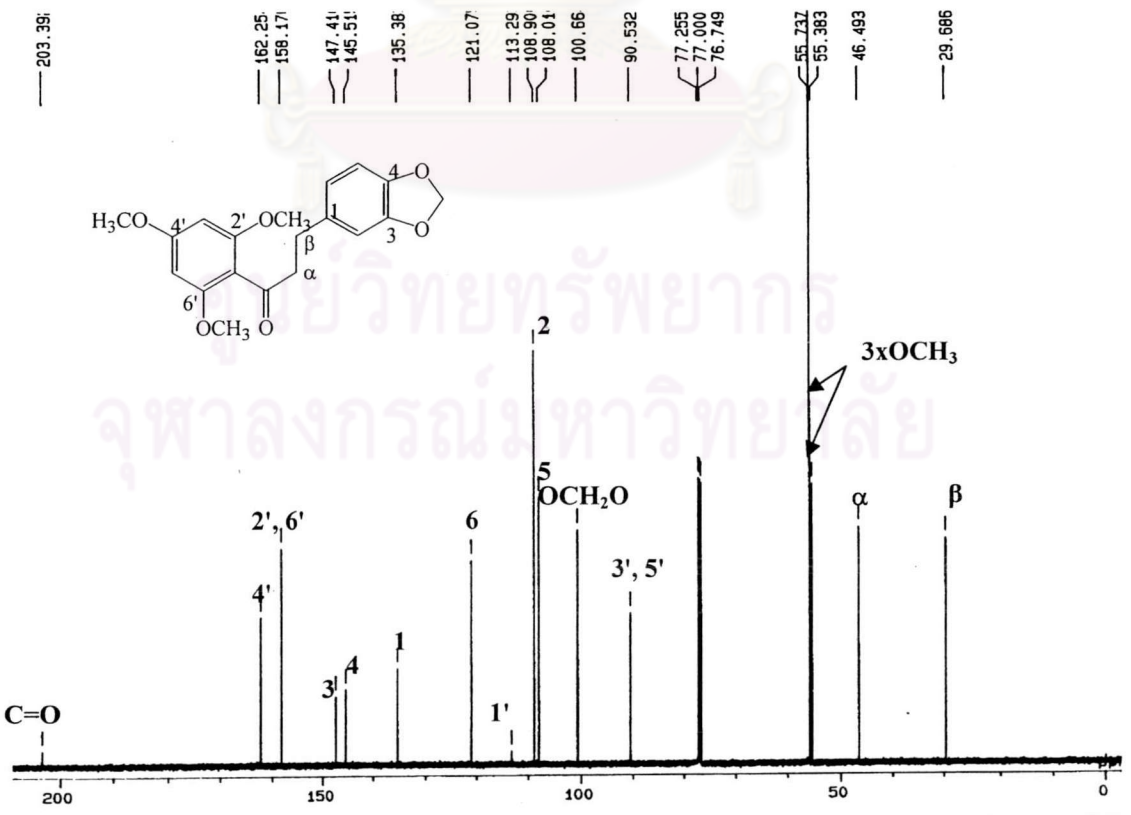

Figure 90 ^{13}C-NMR (125 MHz) spectrum of Compound **281** ($CDCl_3$)

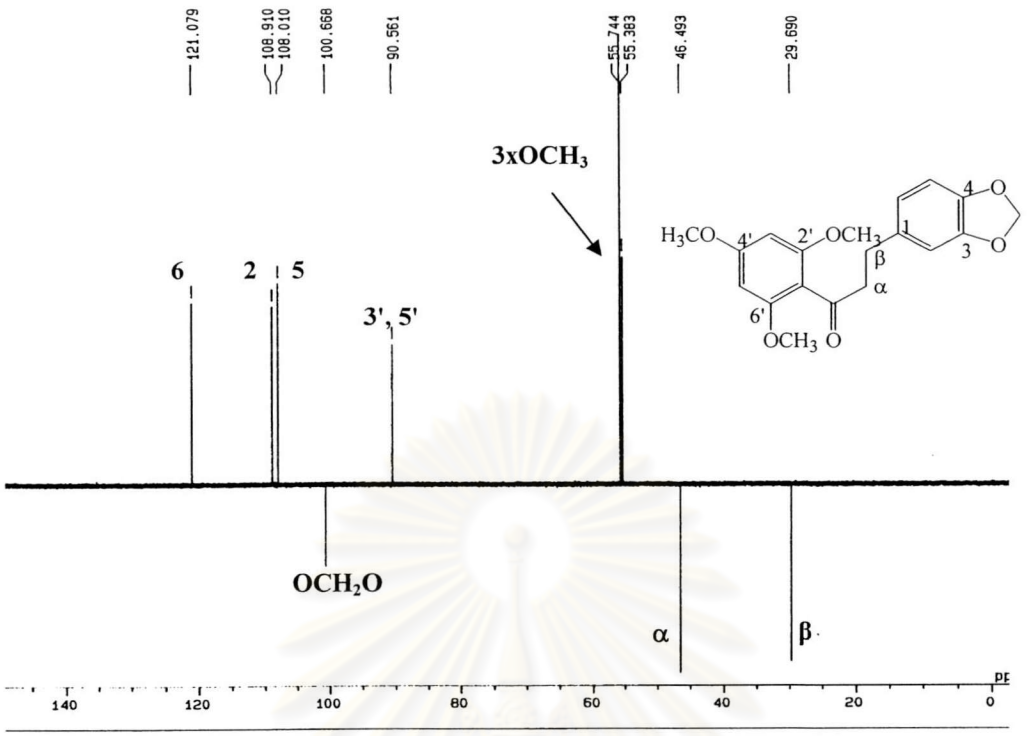

Figure 91 DEPT-135 spectrum of Compound **281**

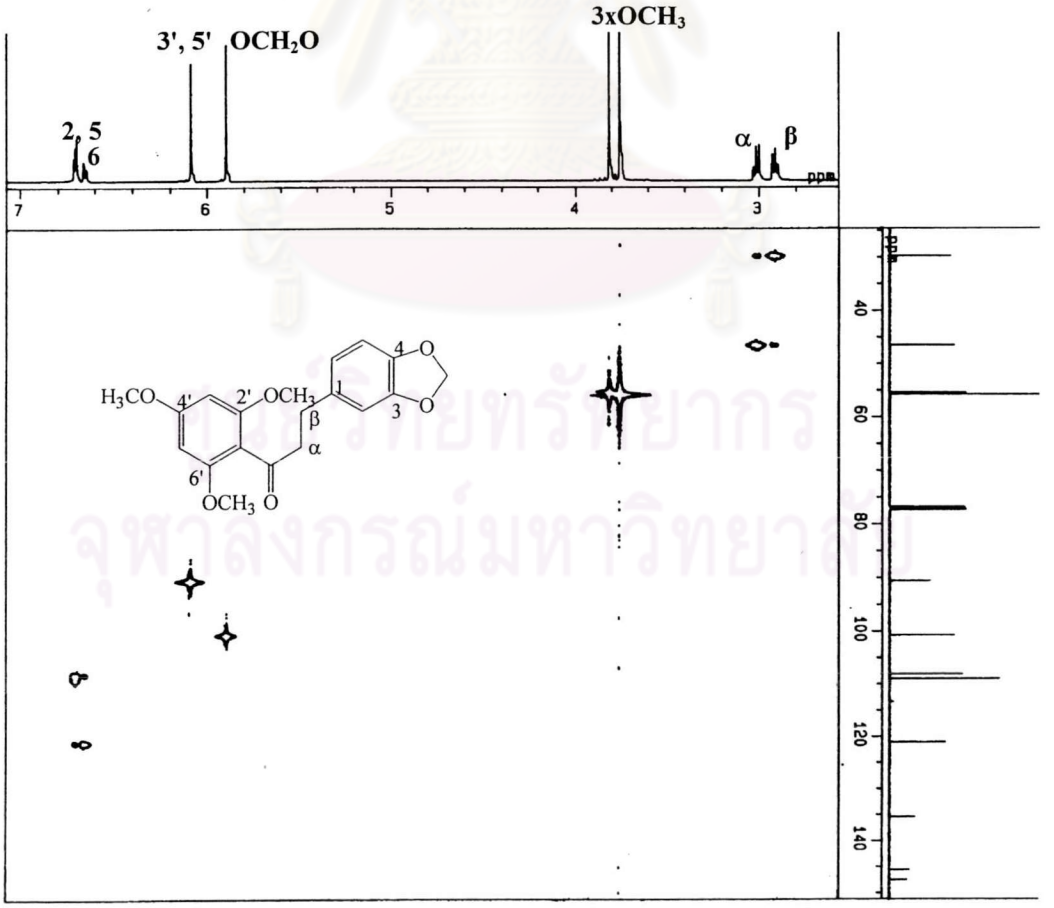

Figure 92 HMQC spectrum of Compound **281**

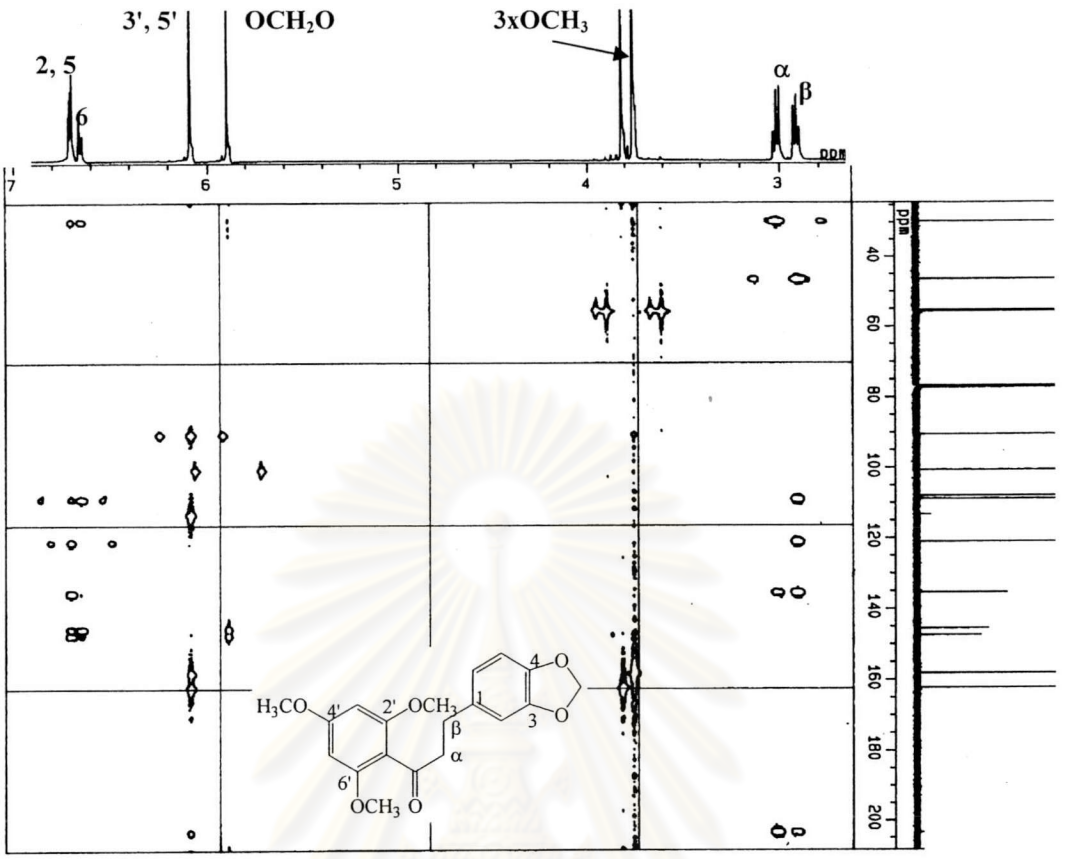

Figure 93 HMBC spectrum of Compound **281**

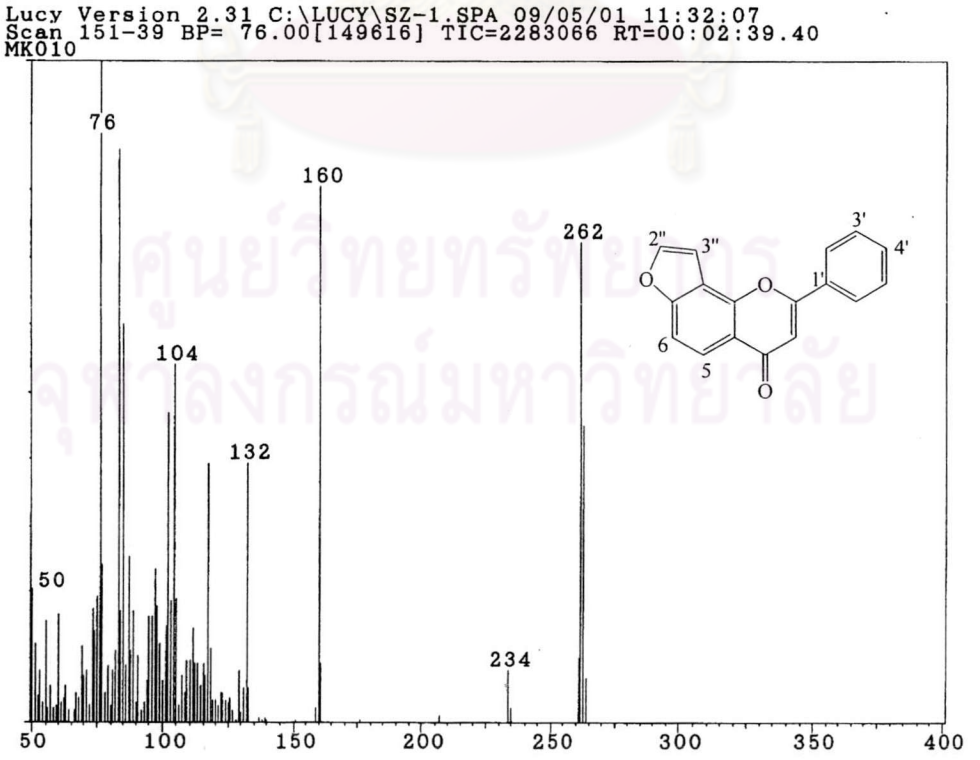

Figure 94 EI Mass spectrum of Compound **103**

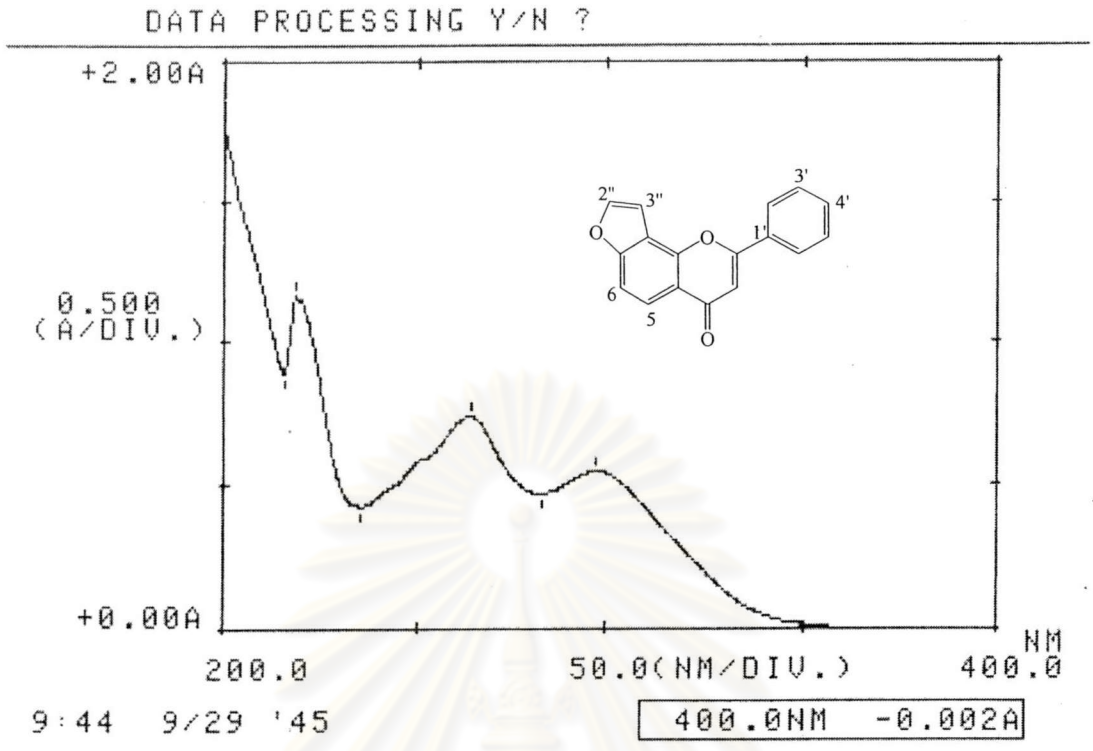

Figure 95 UV spectrum of Compound **103** (MeOH)

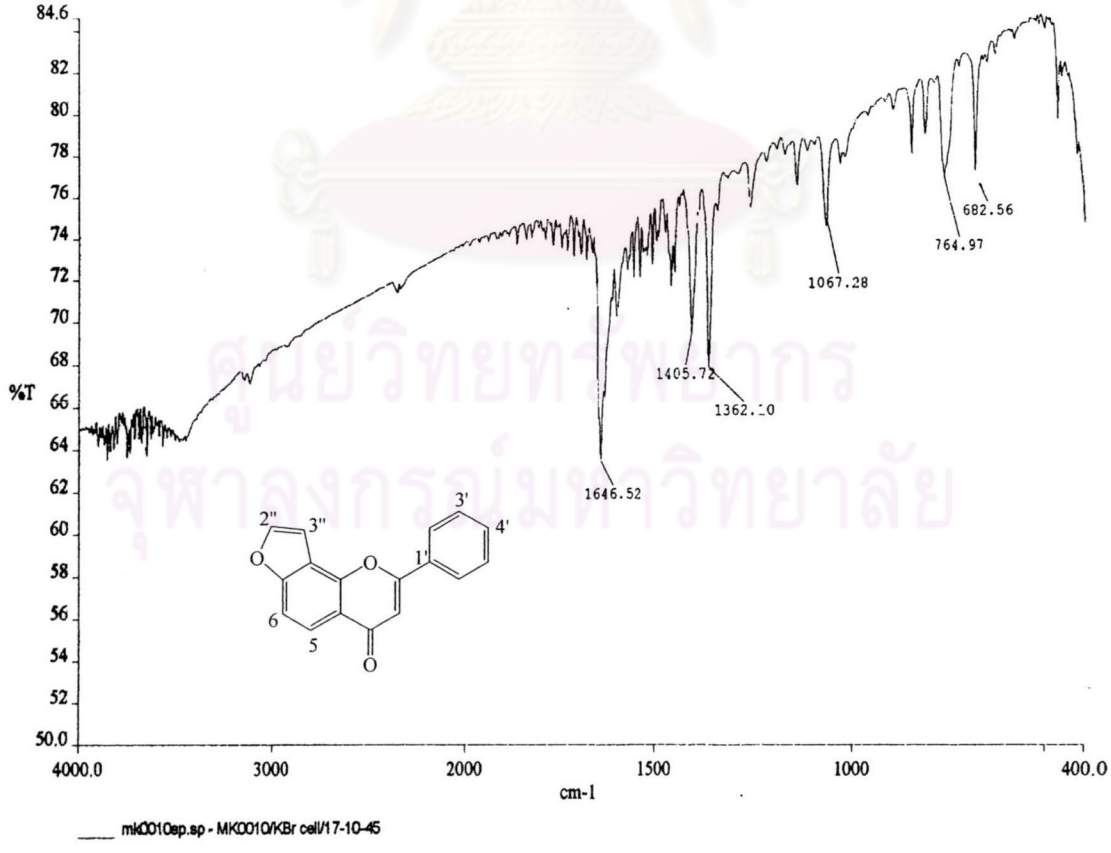

Figure 96 IR spectrum of Compound **103** (Film)

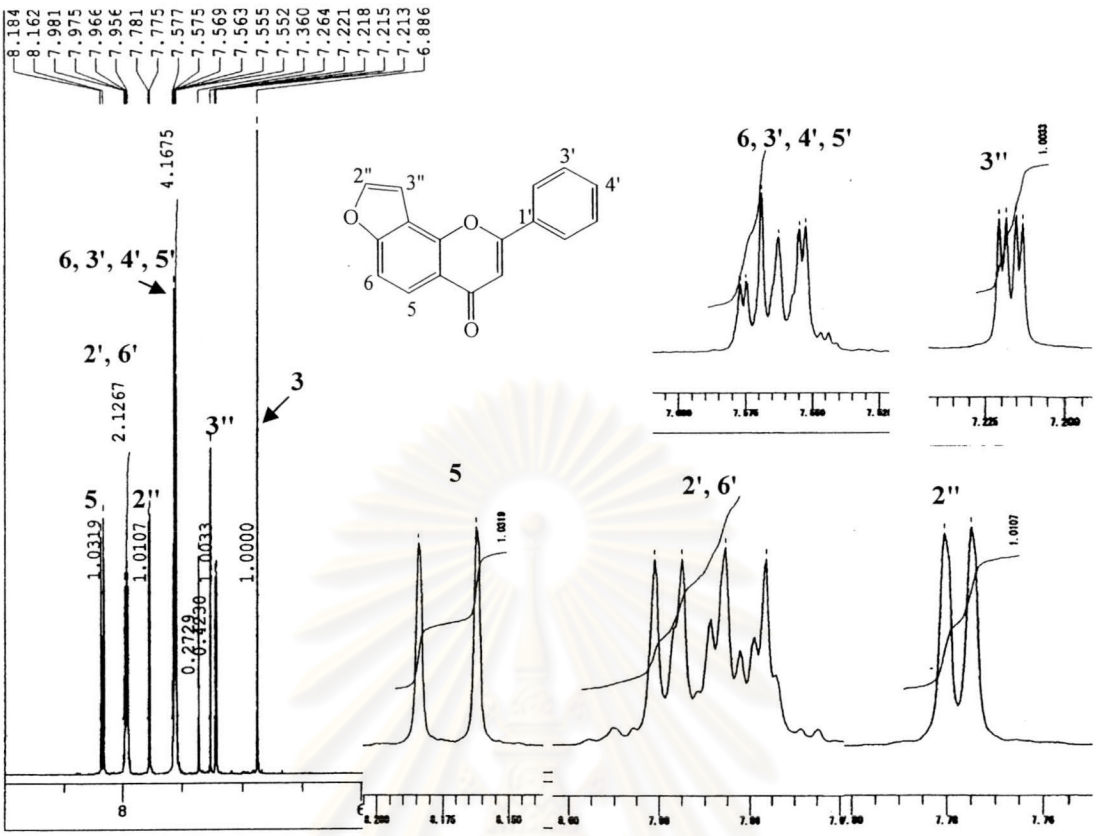

Figure 97 ^{1}H-NMR (400 MHz) spectrum of Compound **103** ($CDCl_3$)

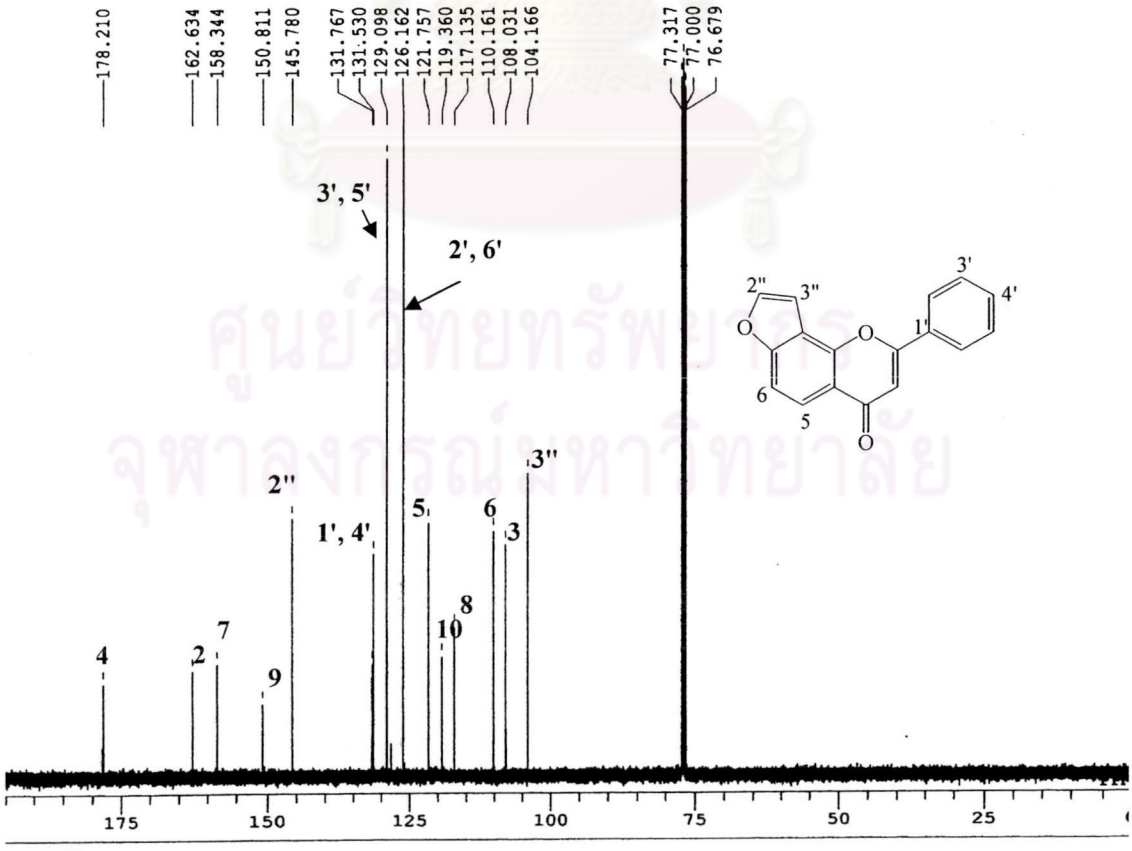

Figure 98 ^{13}C-NMR (100 MHz) spectrum of Compound **103** ($CDCl_3$)

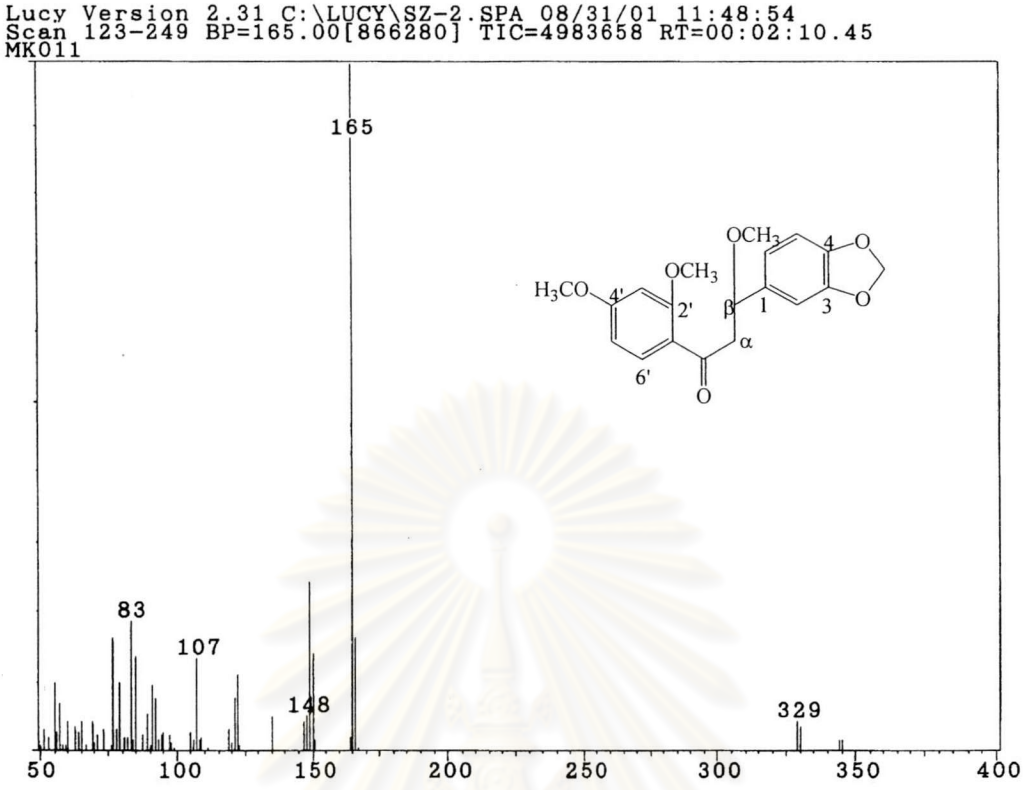

Figure 99 EI Mass spectrum of Compound **102**

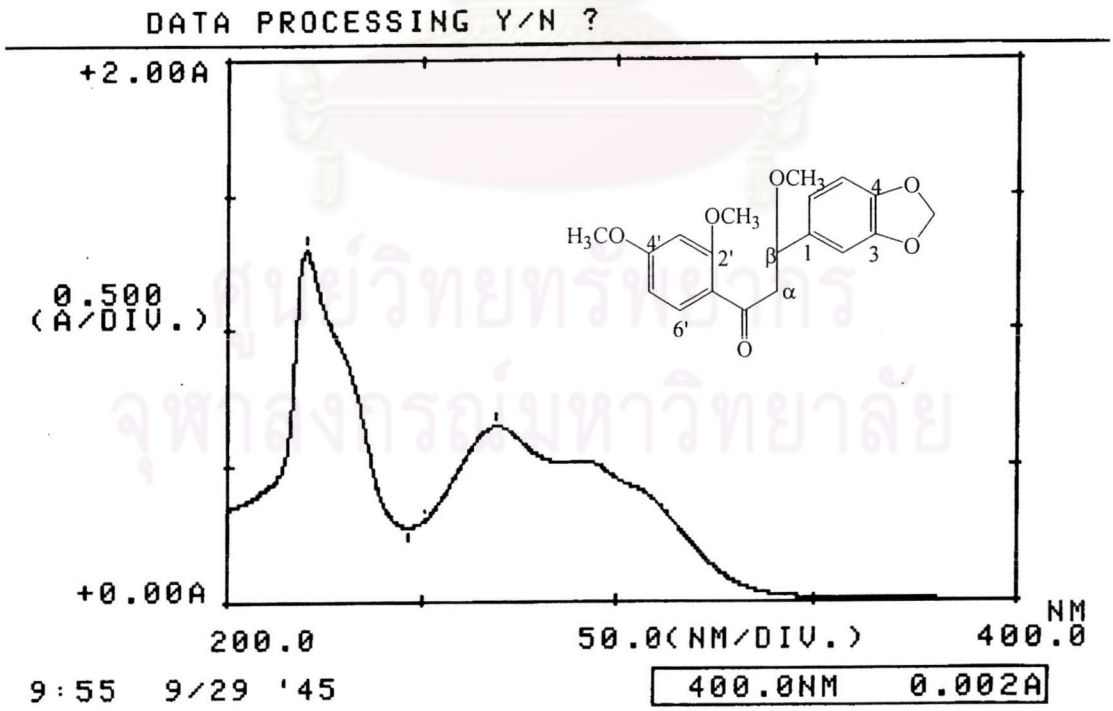

Figure 100 UV spectrum of Compound **102** (MeOH)

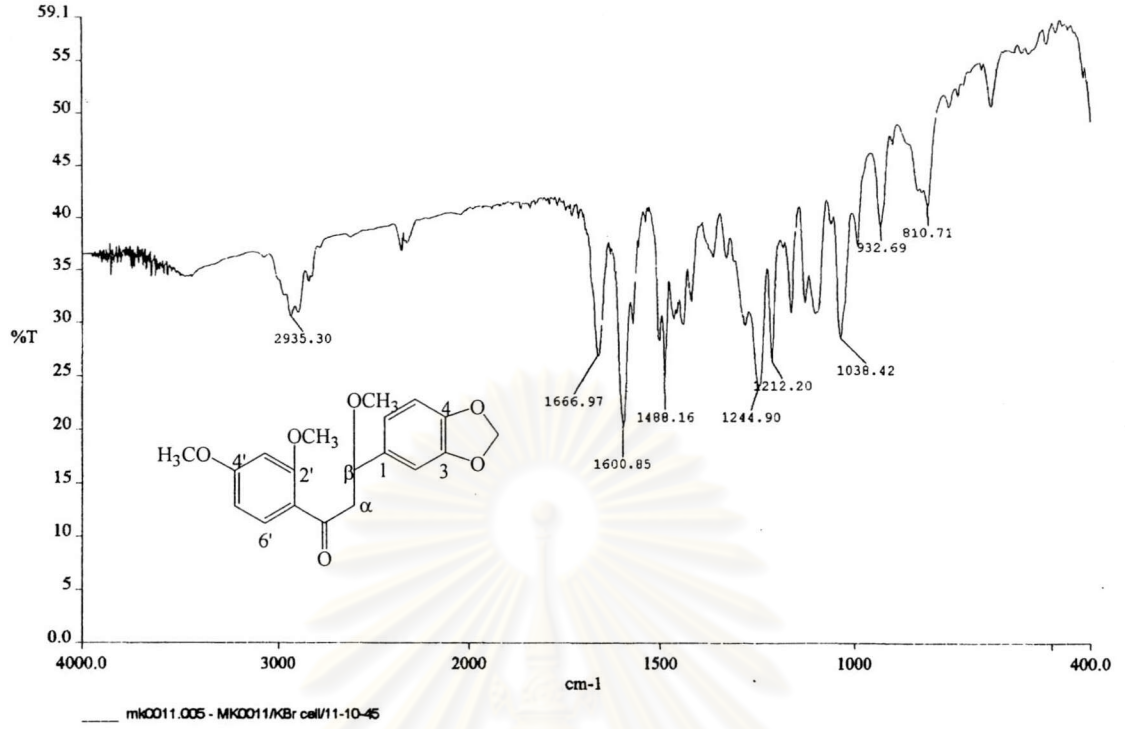

Figure 101 IR spectrum of Compound **102** (Film)

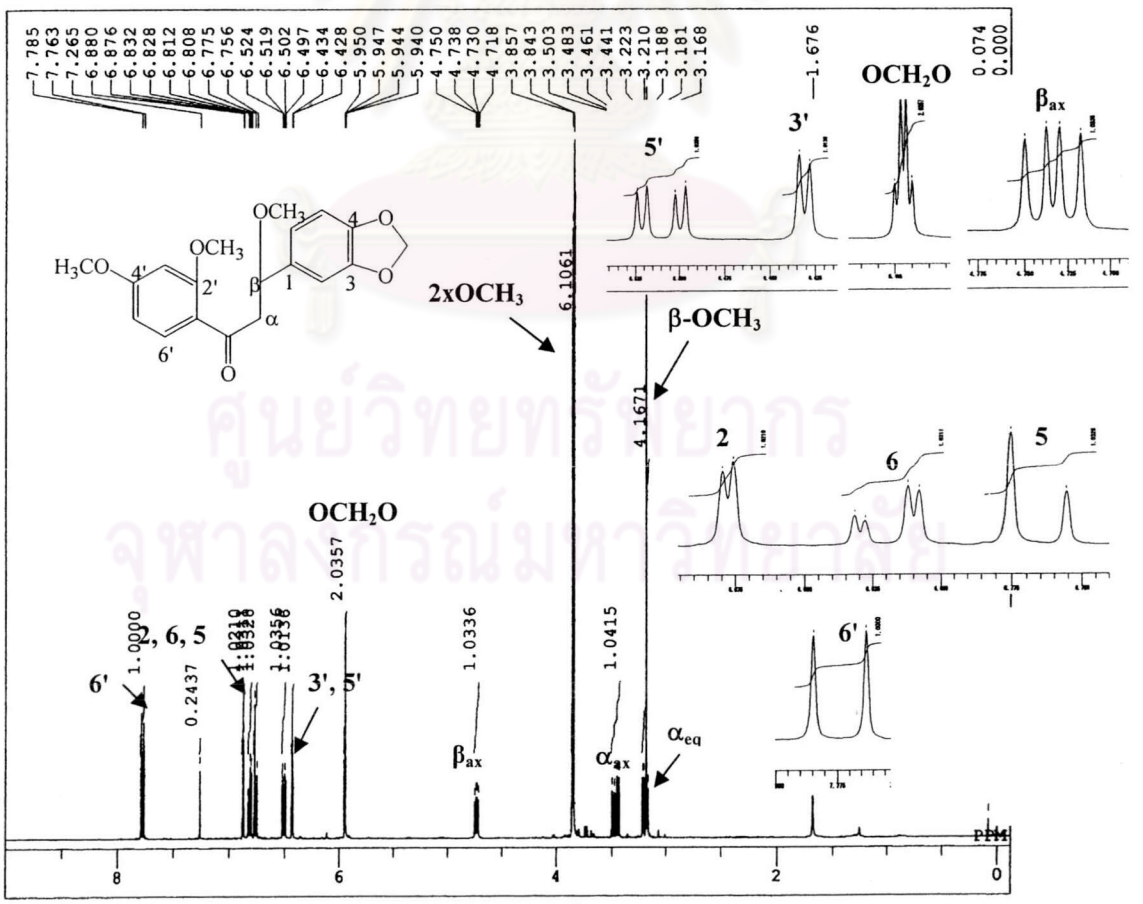

Figure 102 ^{1}H-NMR (400 MHz) spectrum of Compound **102** ($CDCl_3$)

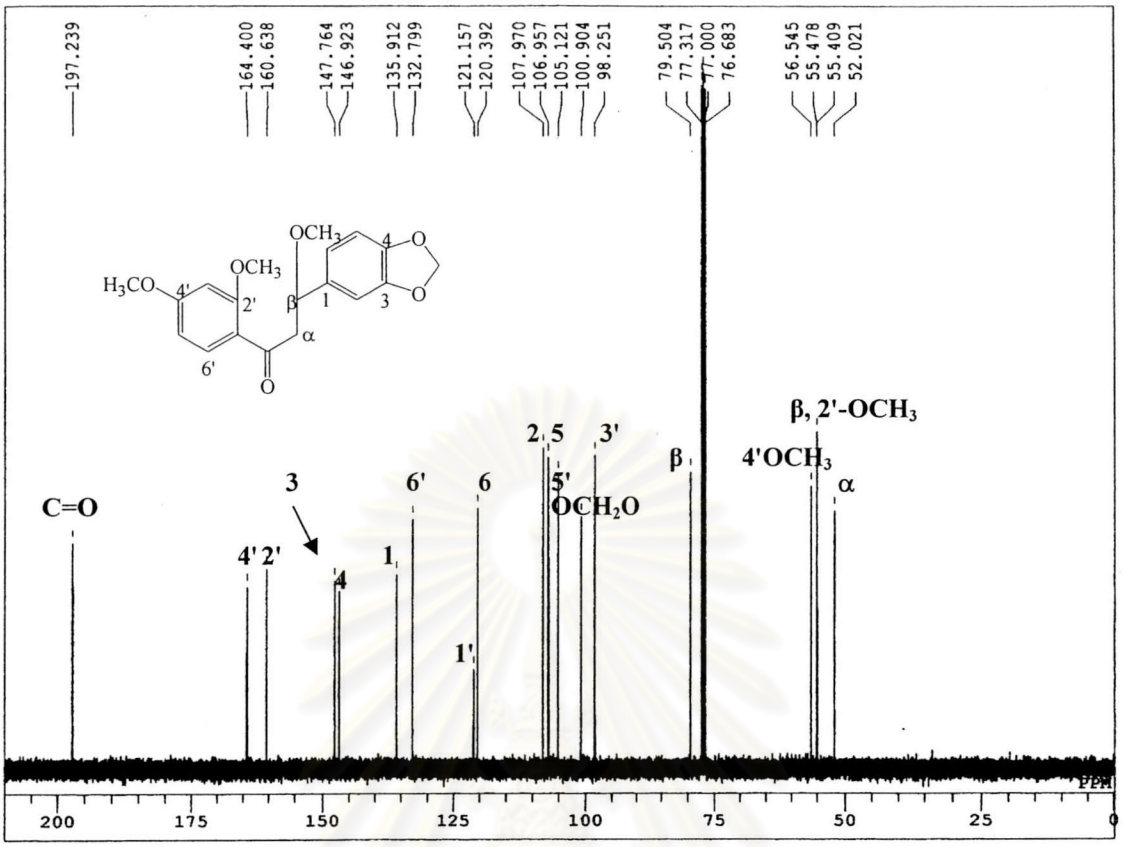

Figure 103 ^{13}C-NMR (100 MHz) spectrum of Compound **102**

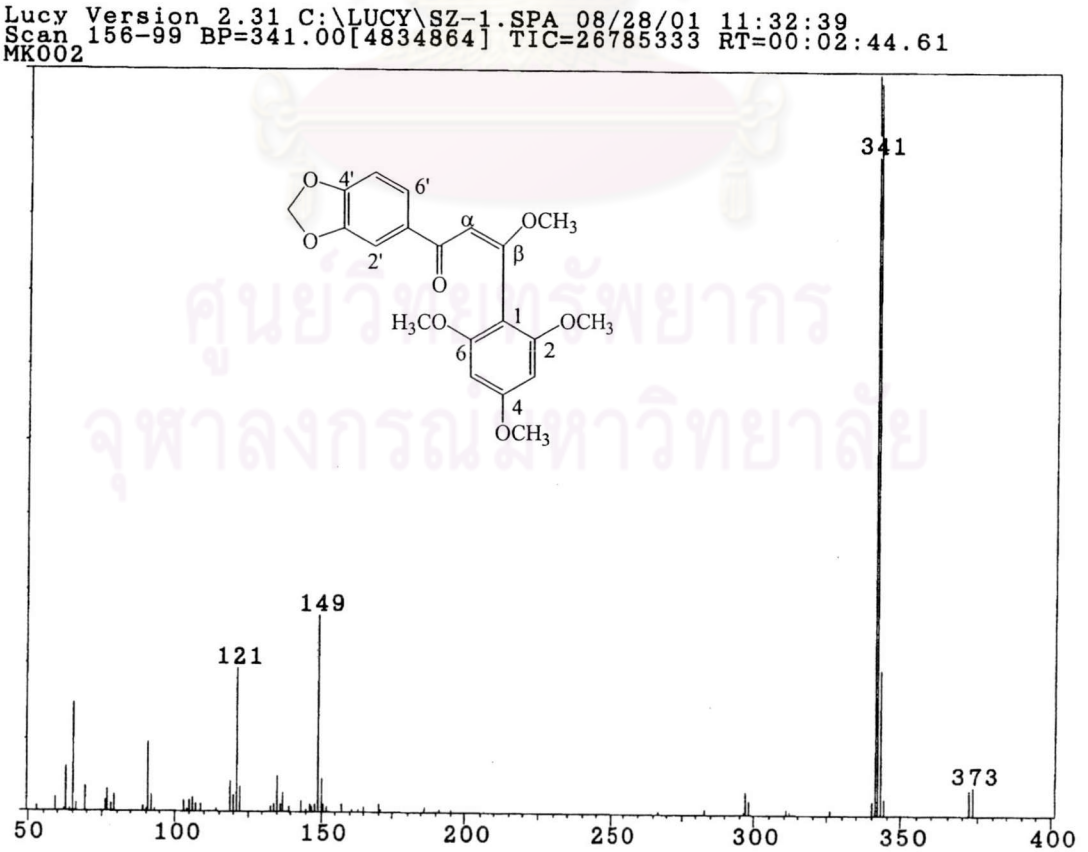

Figure 104 EI Mass spectrum of Compound **282**

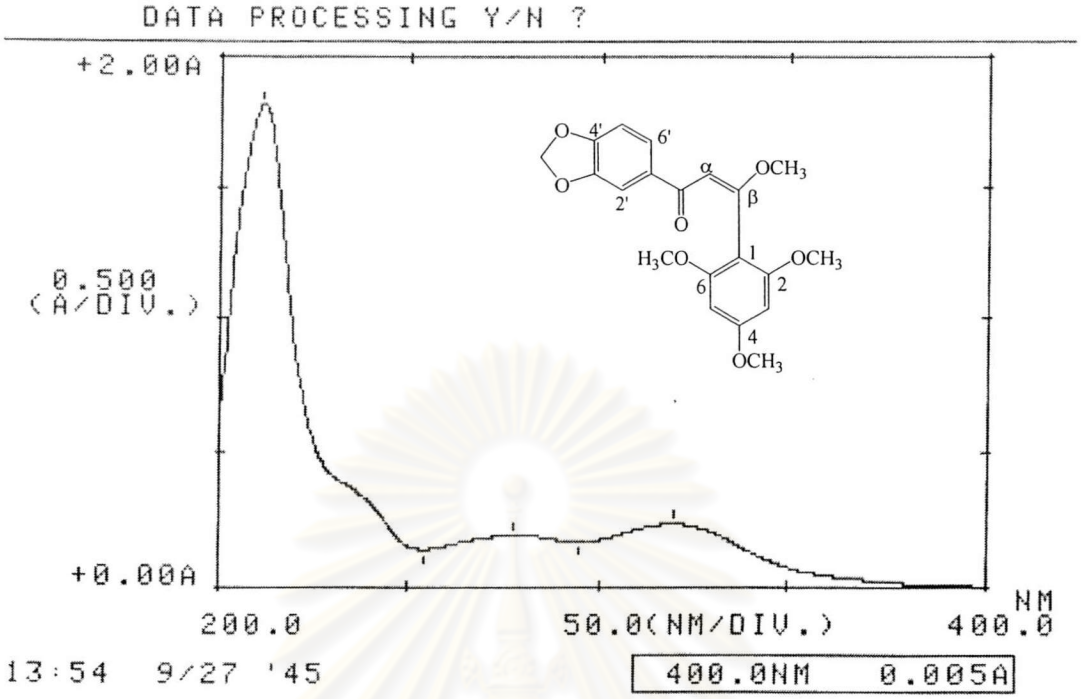

Figure 105 UV spectrum of Compound **282** (MeOH)

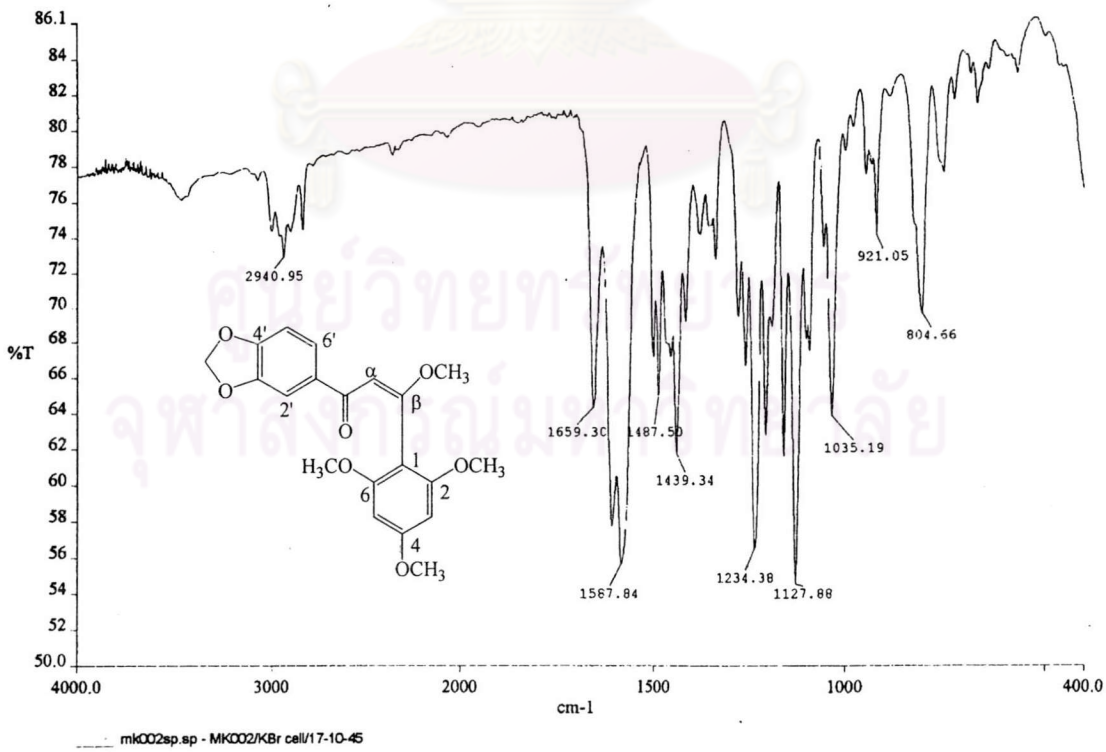

Figure 106 IR spectrum of Compound **282** (Film)

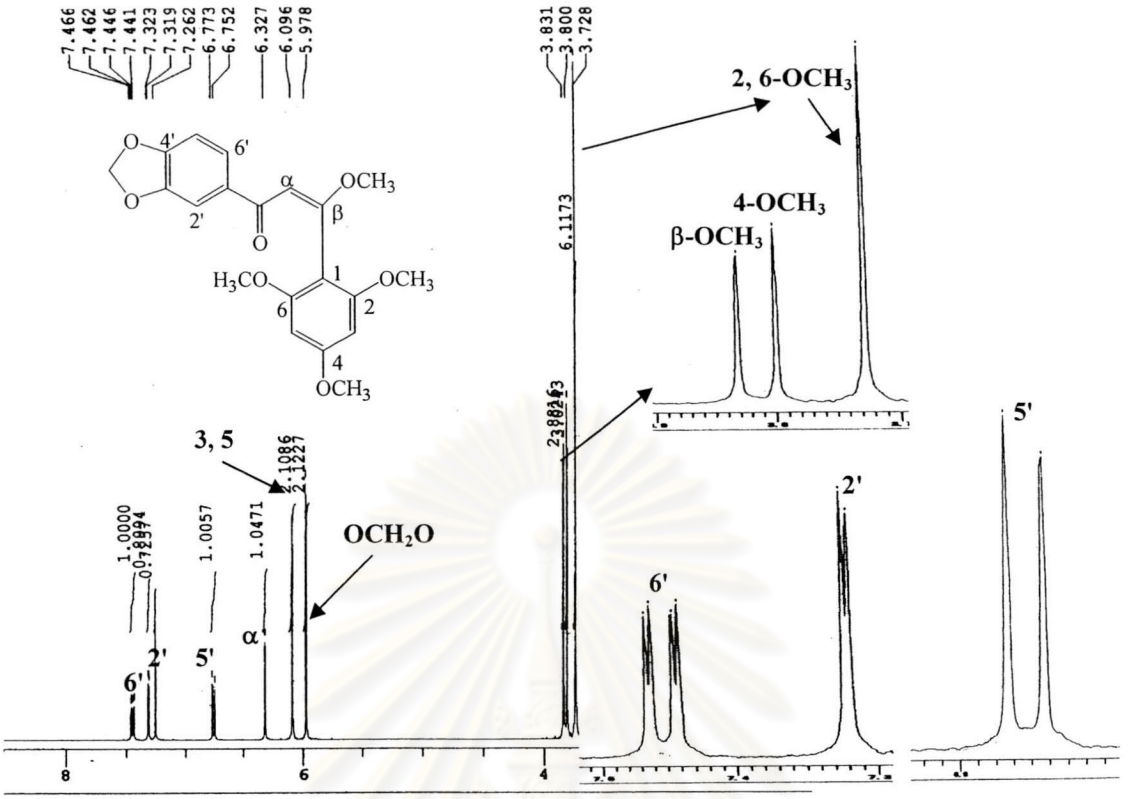

Figure 107 ^{1}H-NMR (400 MHz) spectrum of Compound **282** ($CDCl_3$)

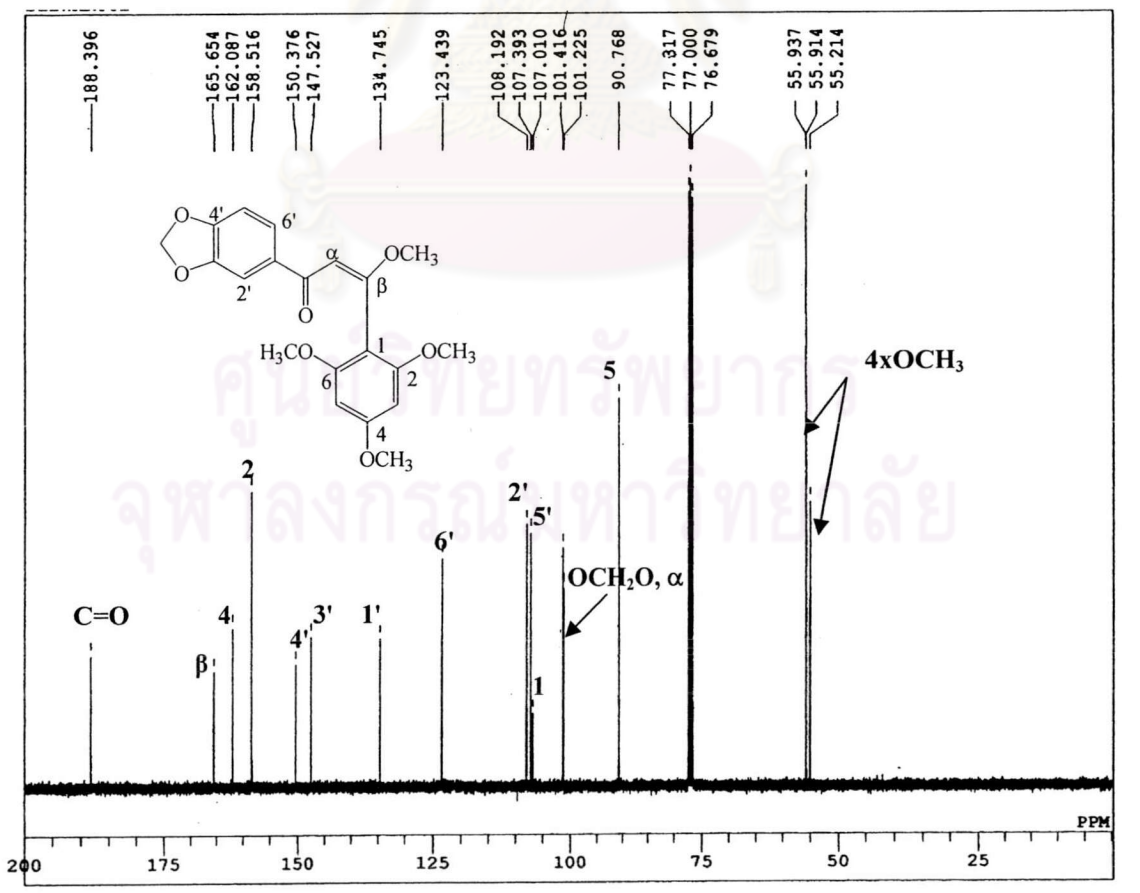

Figure 108 ^{13}C-NMR (100 MHz) spectrum of Compound **282** ($CDCl_3$)

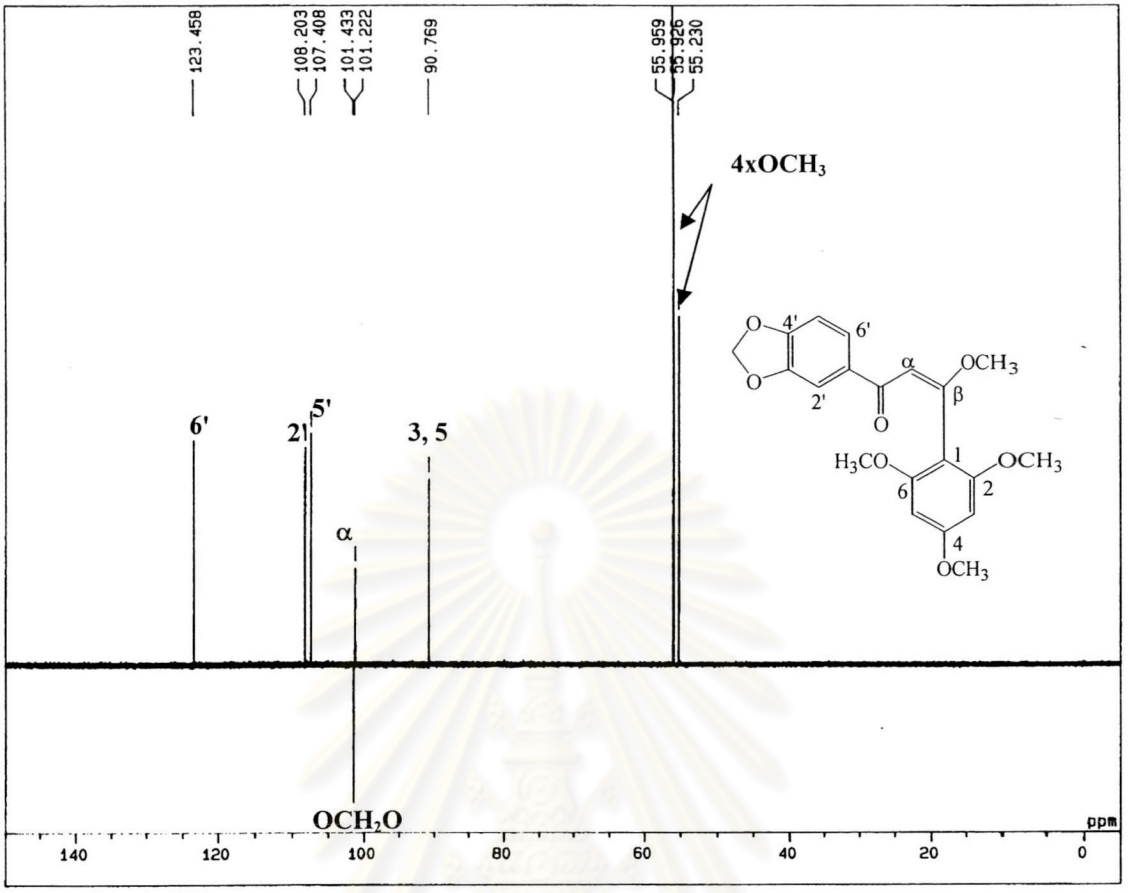

Figure 109 DEPT-135 spectrum of Compound **282** ($CDCl_3$)

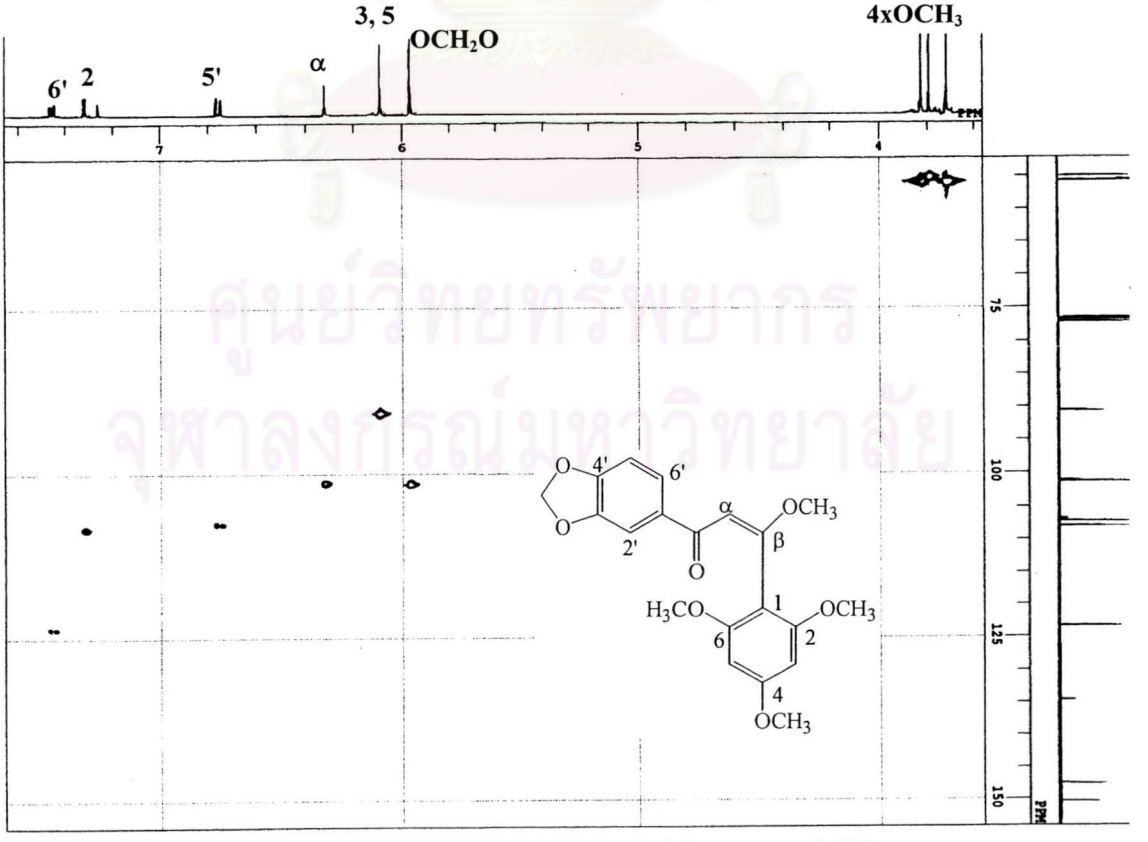

Figure 110 HMQC spectrum of Compound **282**

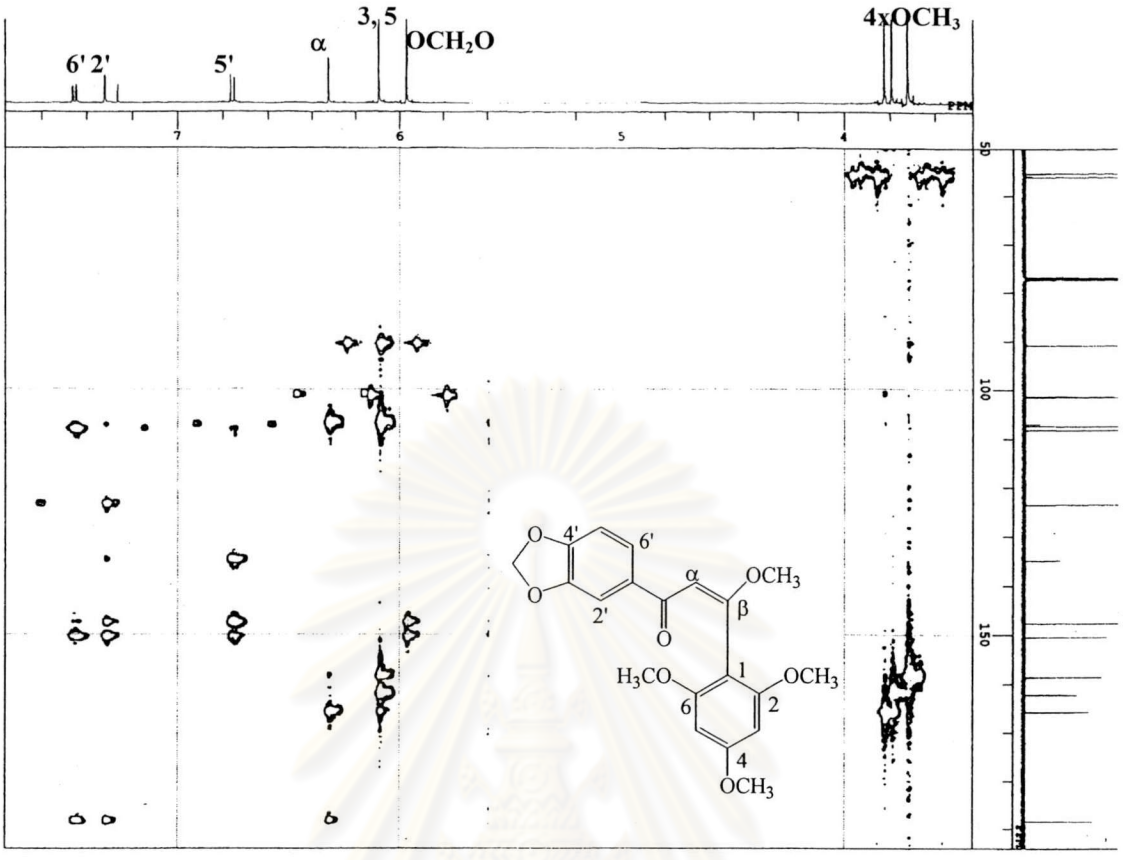

Figure 111 HMBC spectrum of Compound **282**

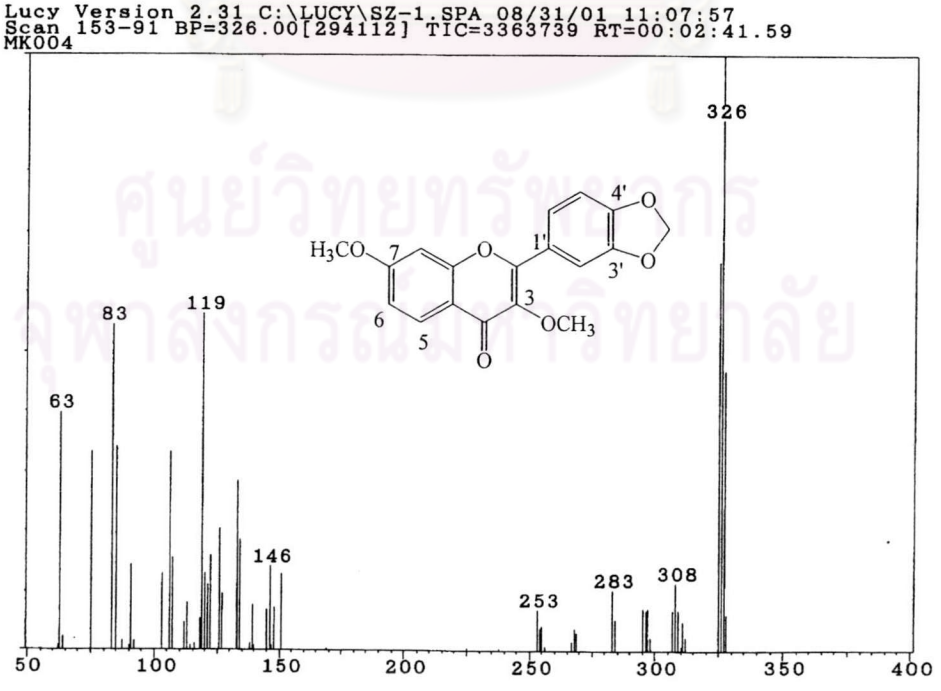

Figure 112 EI Mass spectrum of Compound **284**

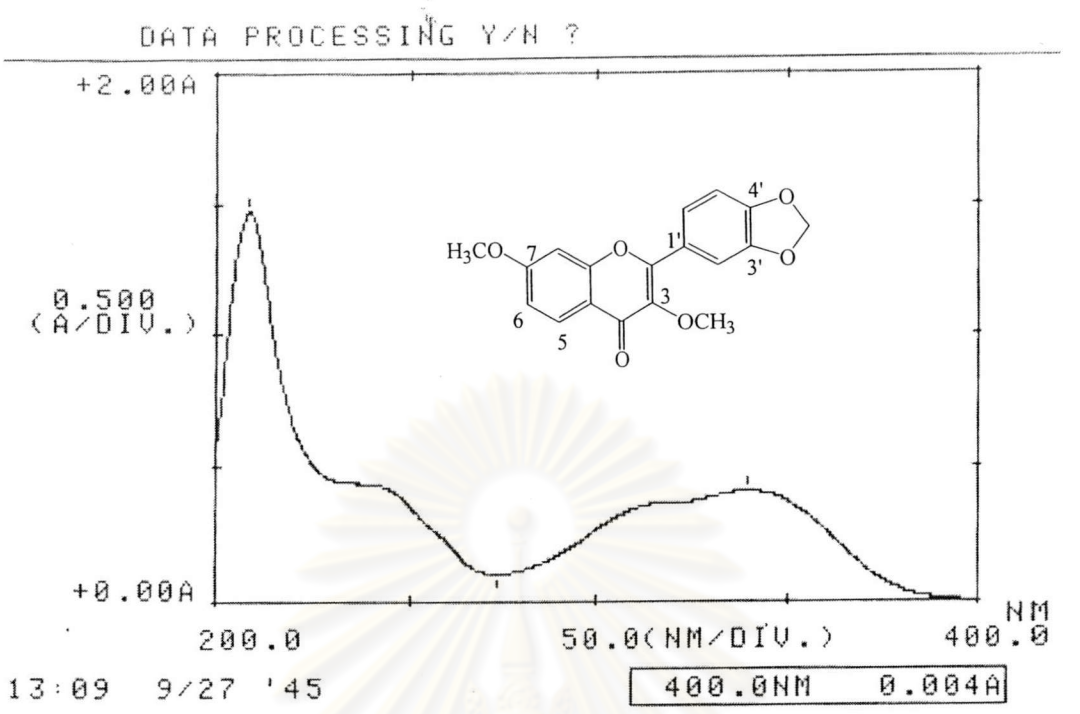

Figure 113 UV spectrum of Compound **284** (MeOH)

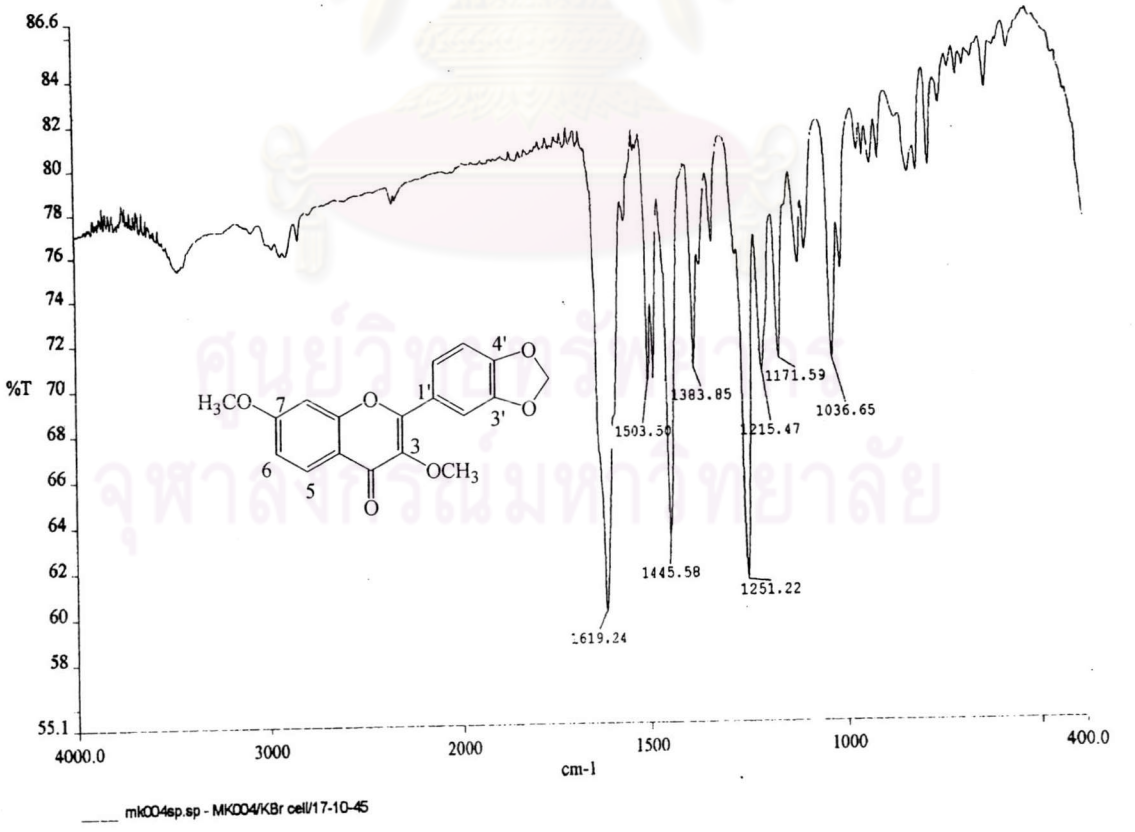

Figure 114 IR spectrum of Compound **284** (Film)

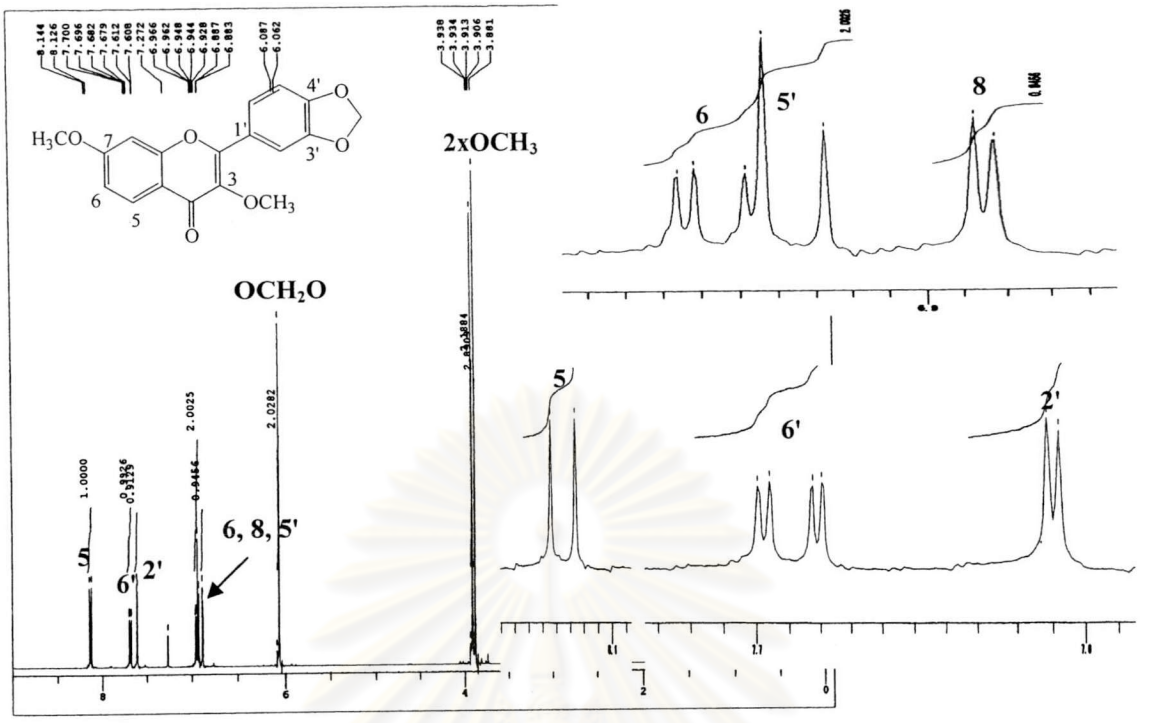

Figure 115 ^{1}H-NMR (500 MHz) spectrum of Compound **284** ($CDCl_3$)

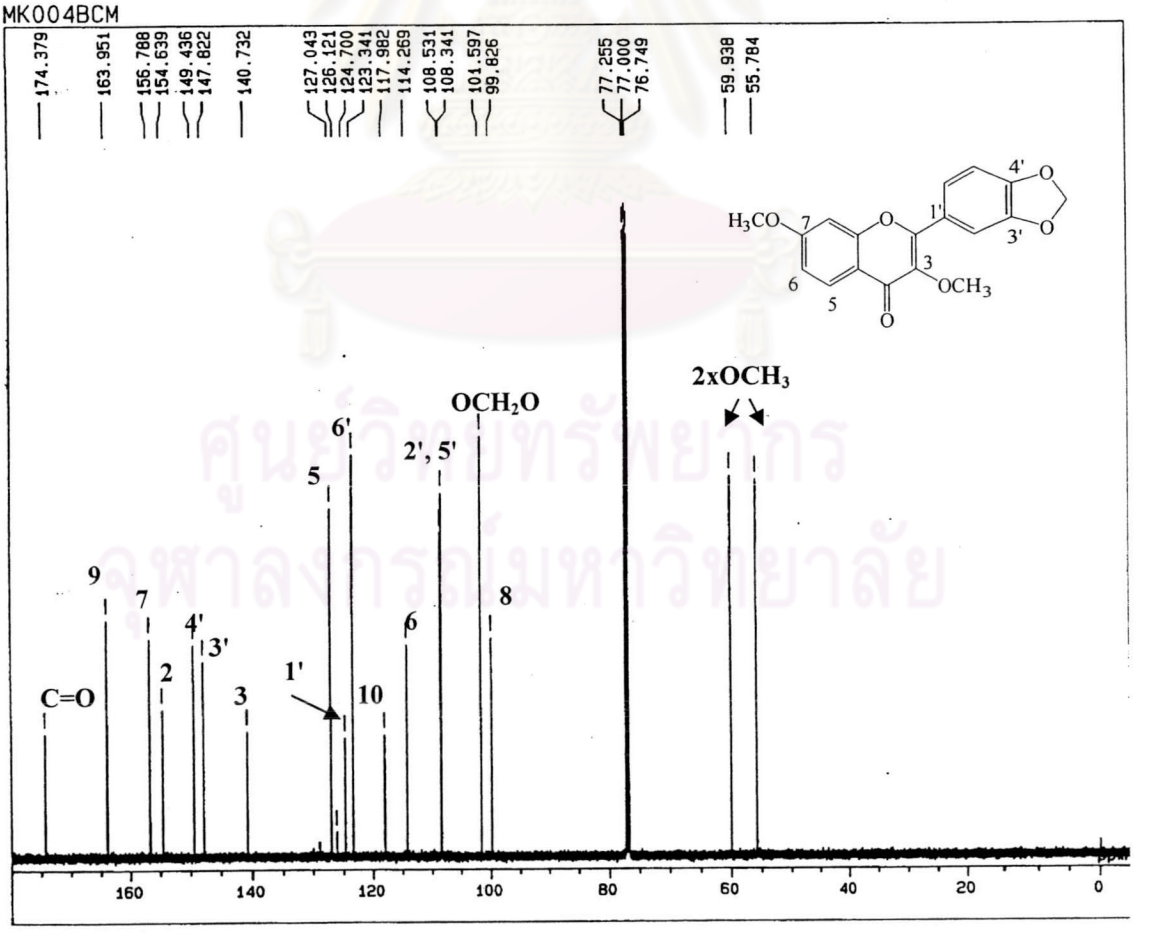

Figure 116 ^{13}C-NMR (125 MHz) spectrum of Compound **284** ($CDCl_3$)

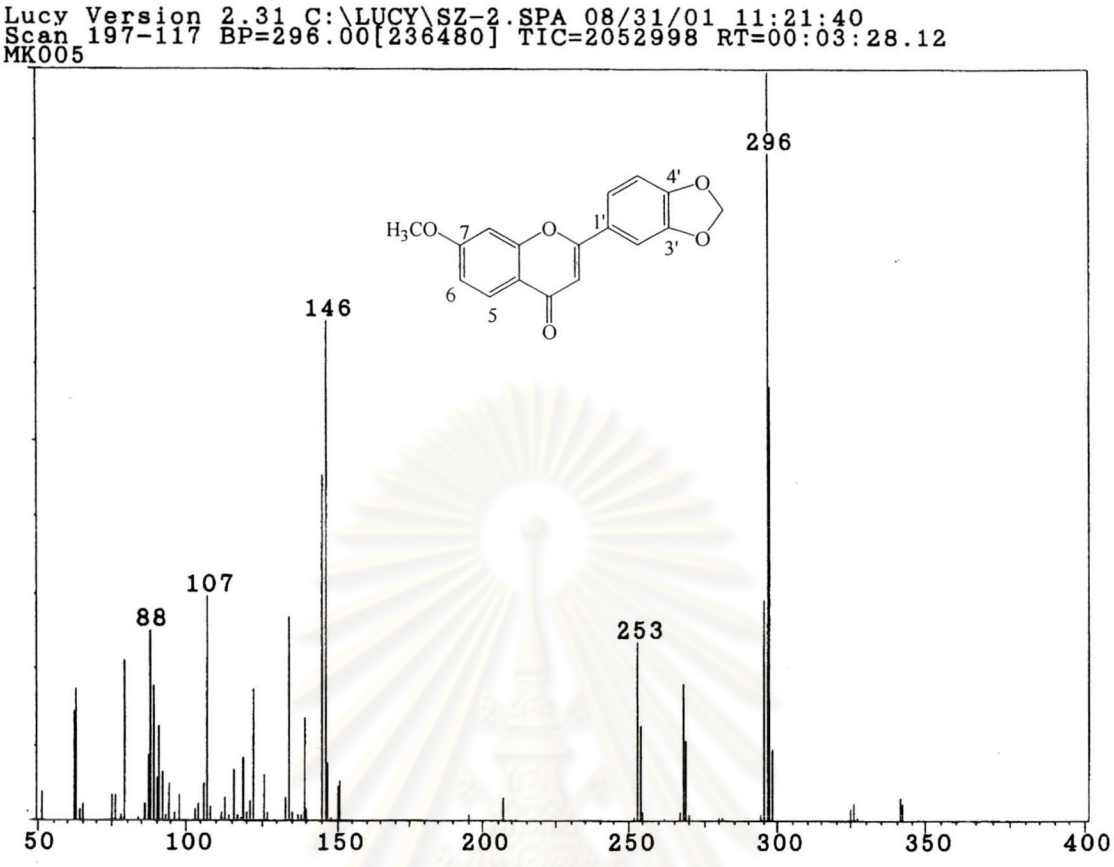

Figure 117 EI Mass spectrum of Compound **68**

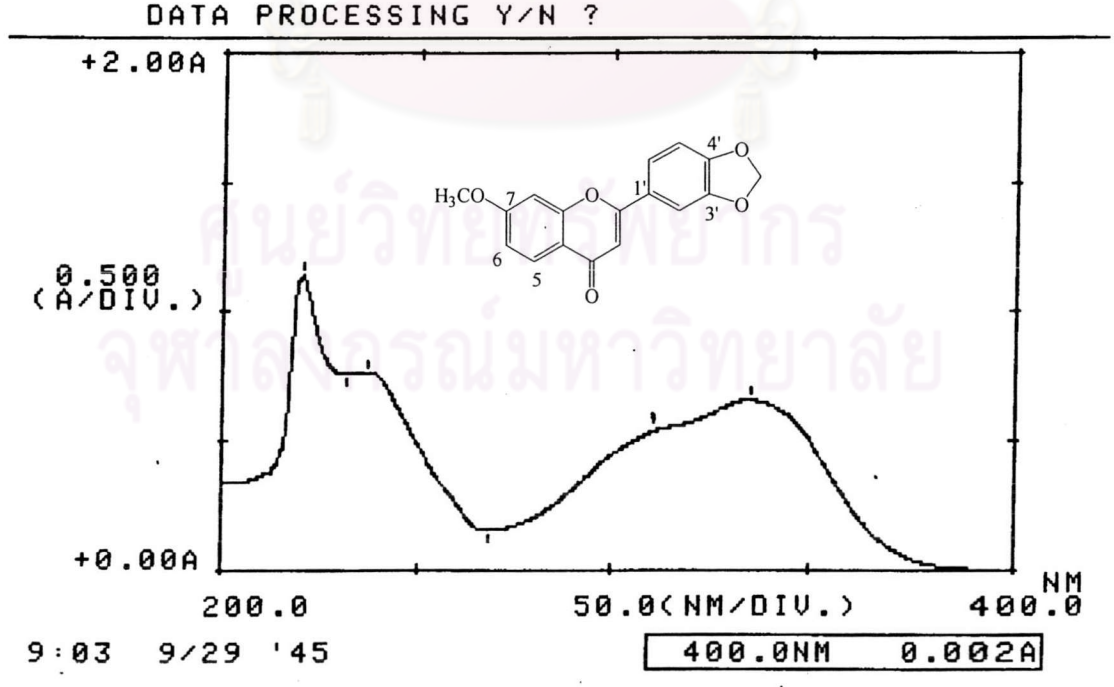

Figure 118 UV spectrum of Compound **68** (MeOH)

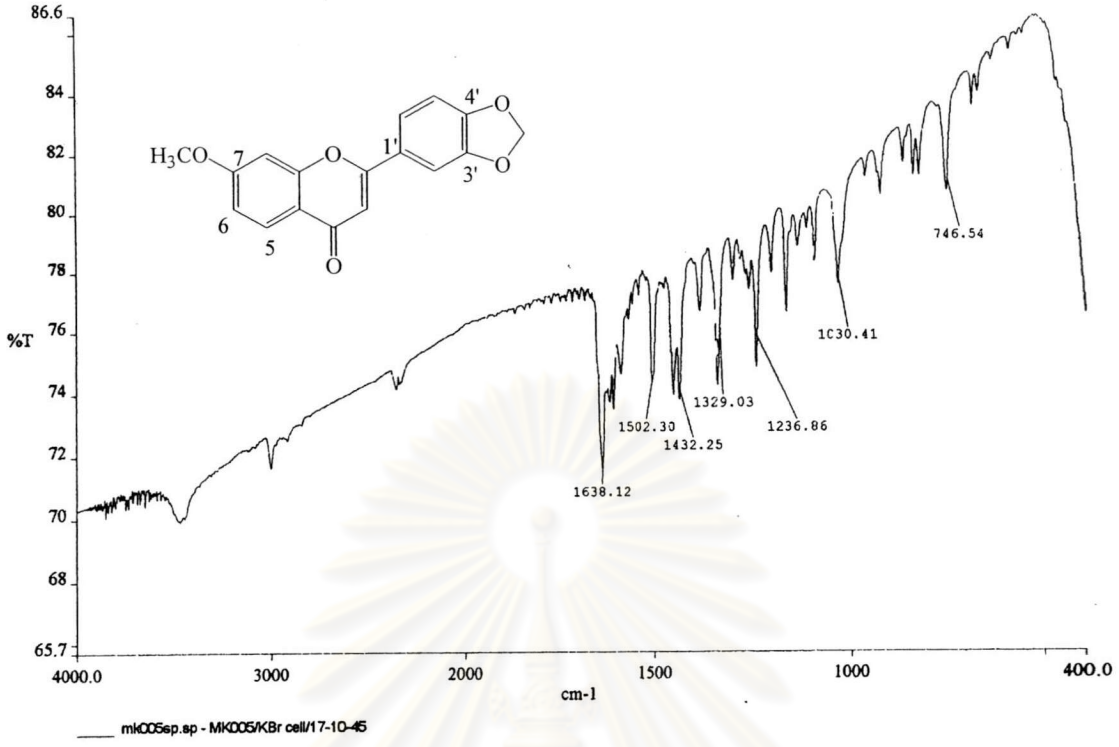

Figure 119 IR spectrum of Compound **68** (Film)

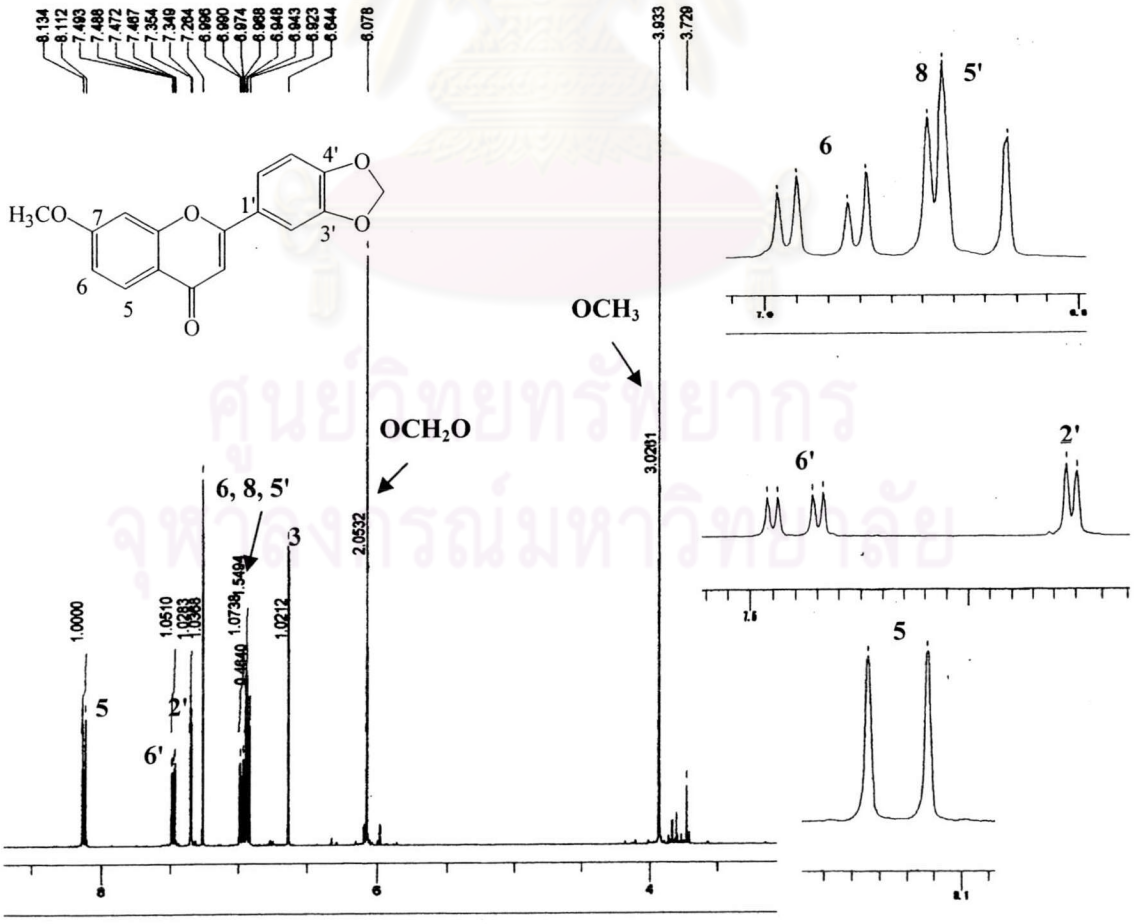

Figure 120 ^{1}H-NMR (400 MHz) spectrum of Compound **68** ($CDCl_3$)

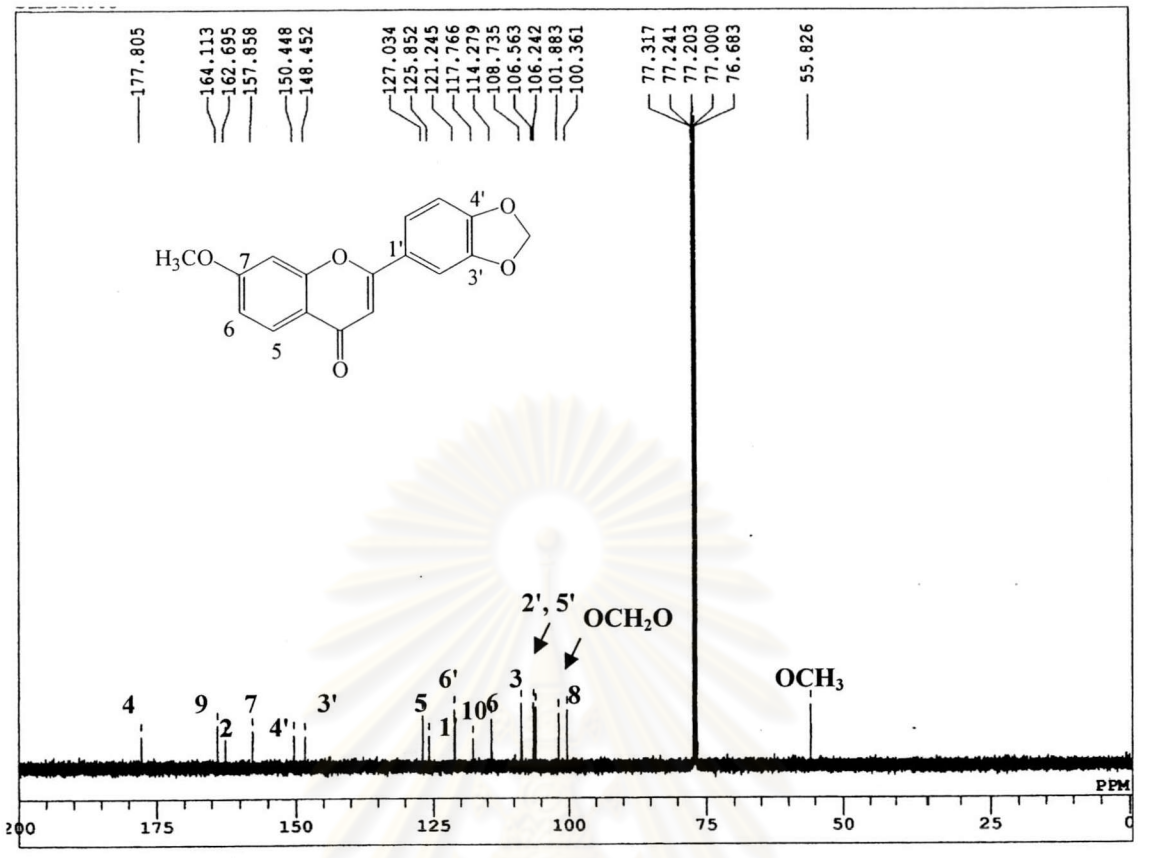

Figure 121 ^{13}C-NMR (100 MHz) spectrum of Compound **68** ($CDCl_3$)

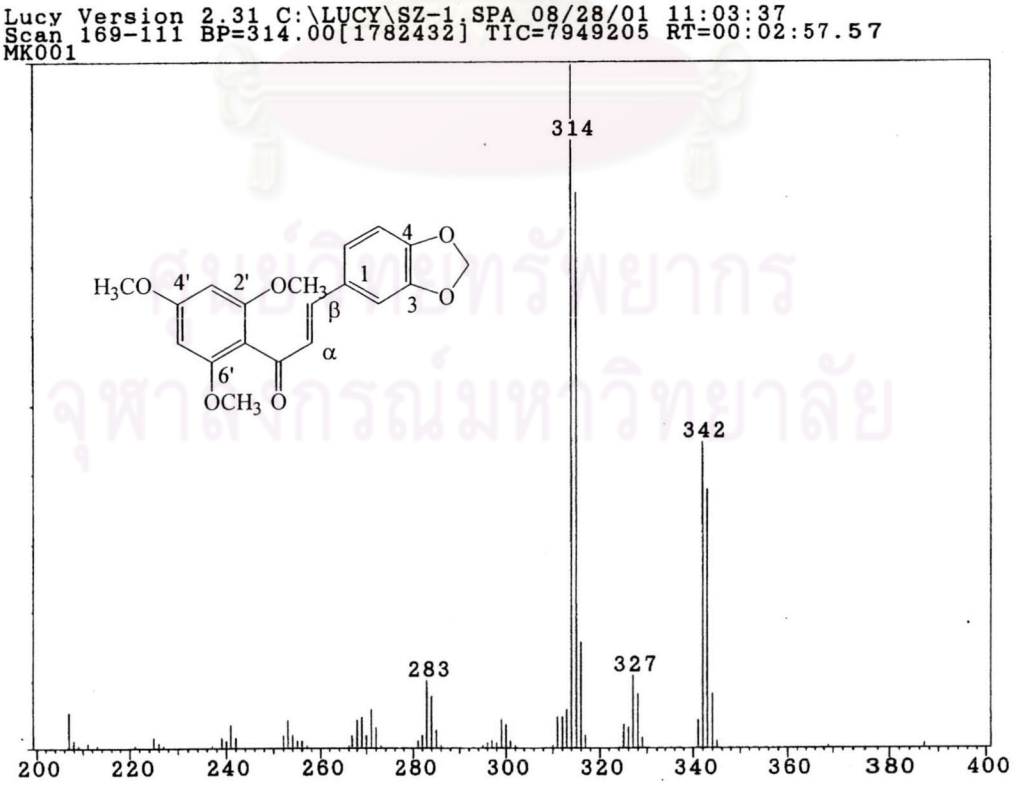

Figure 122 EI Mass spectrum of Compound **285**

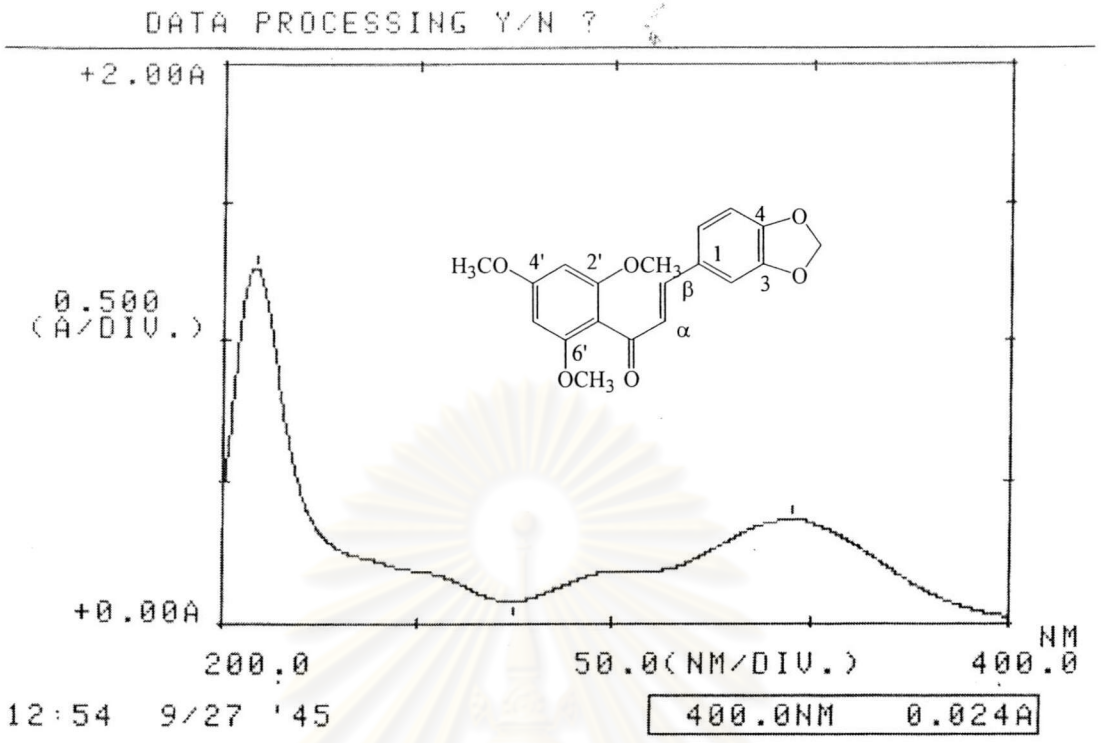

Figure 123 UV spectrum of Compound **285** (MeOH)

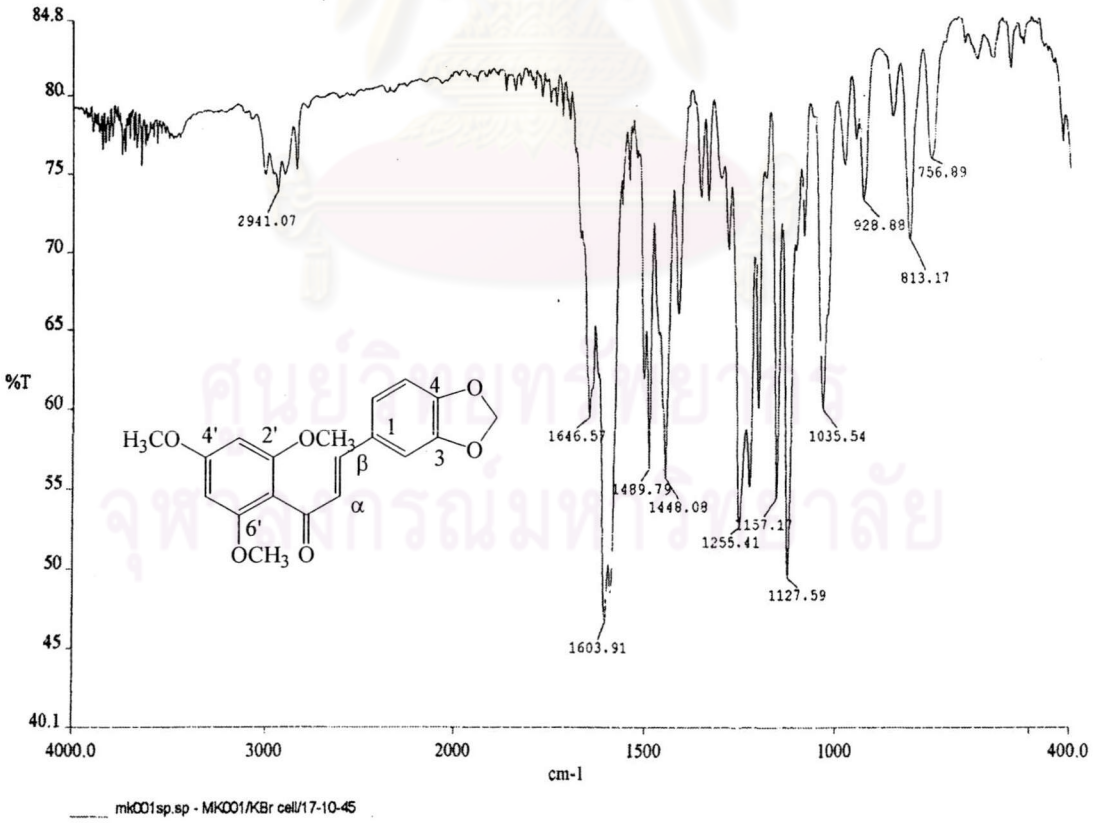

Figure 124 IR spectrum of Compound **285** (Film)

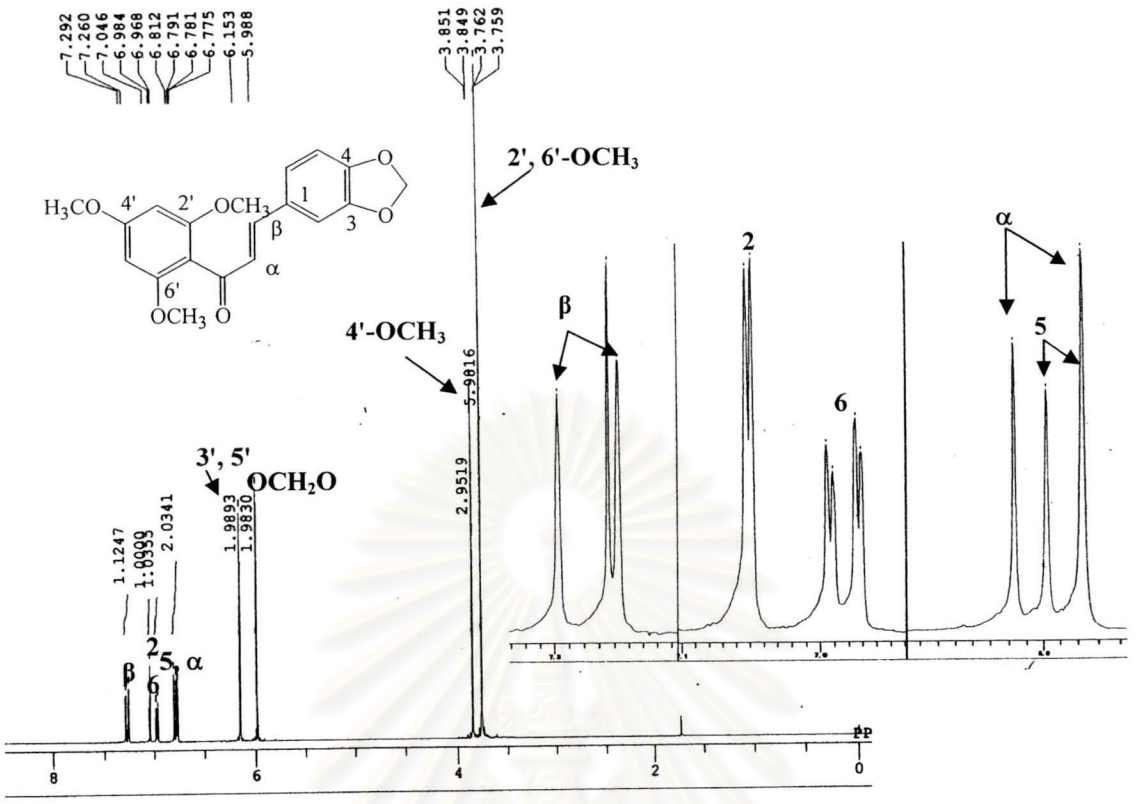

Figure 125 ^{1}H-NMR (400 MHz) spectrum of Compound **285** ($CDCl_3$)

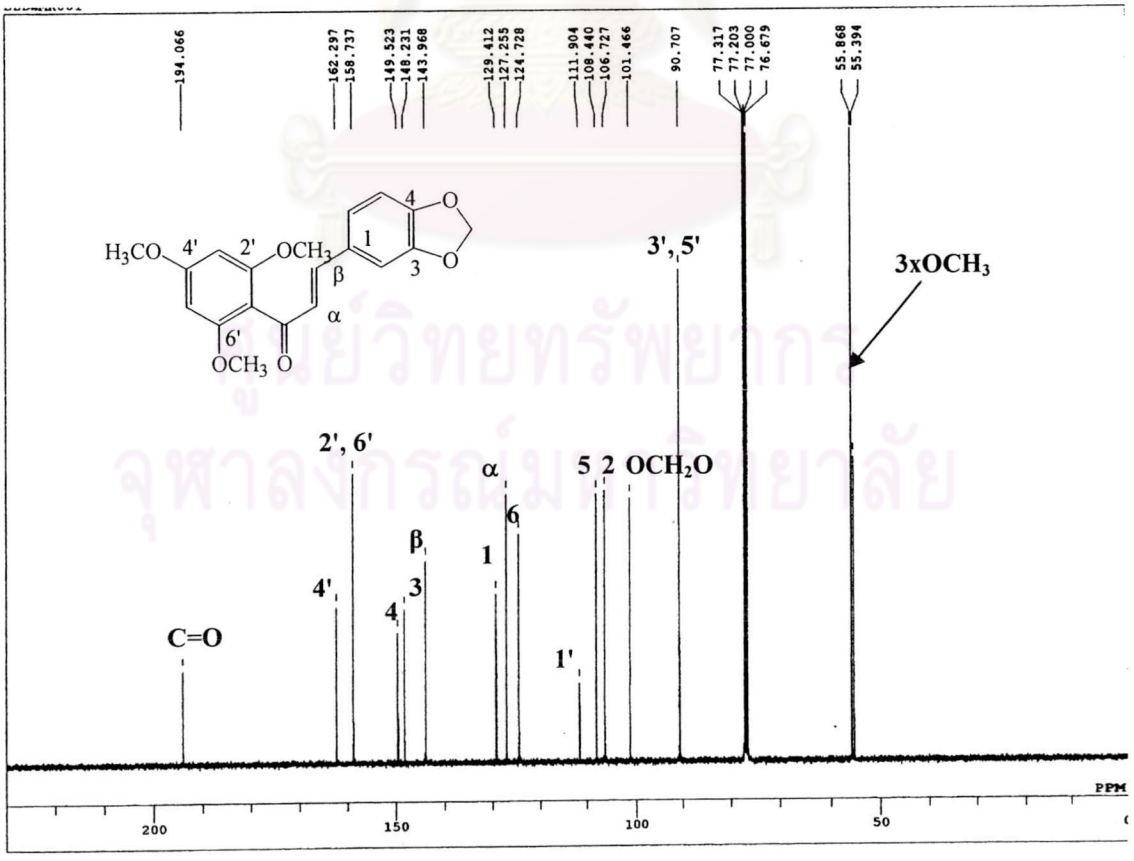

Figure 126 ^{13}C-NMR (100 MHz) spectrum of Compound **285** ($CDCl_3$)

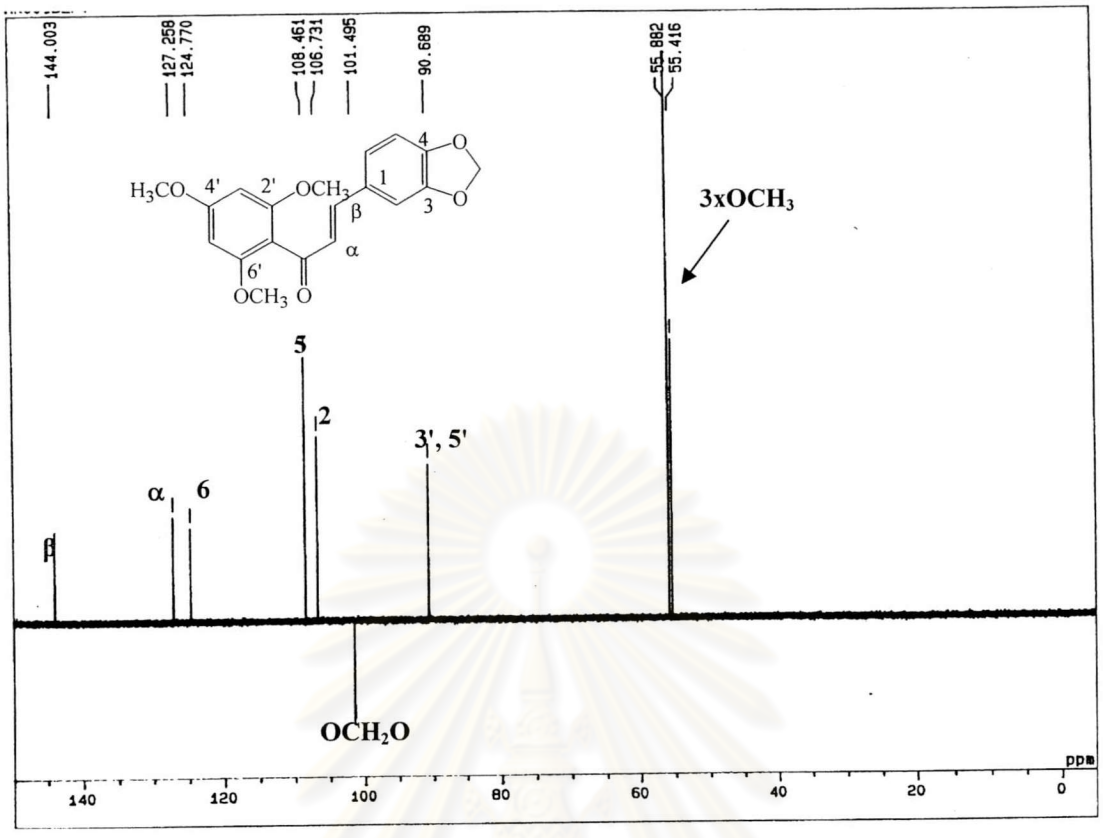

Figure 127 DEPT-135 spectrum of Compound **285**

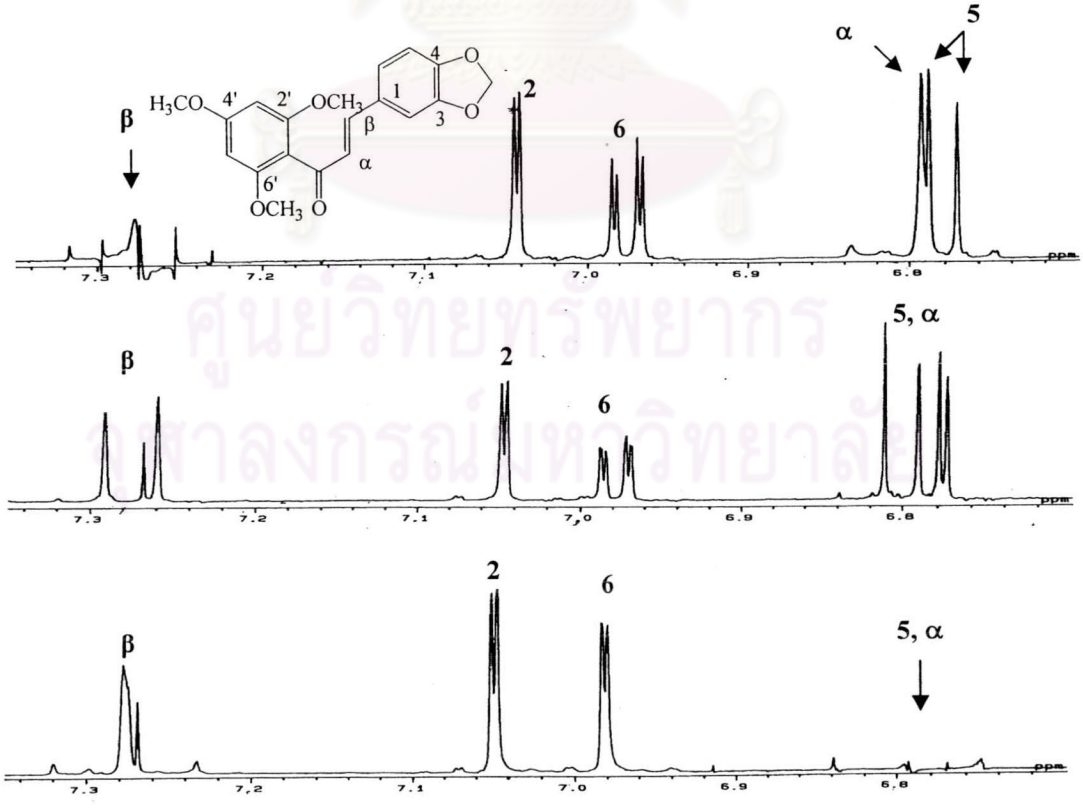

Figure 128 The ^{1}H-^{1}H Decoupling spectrum of Compound **285**

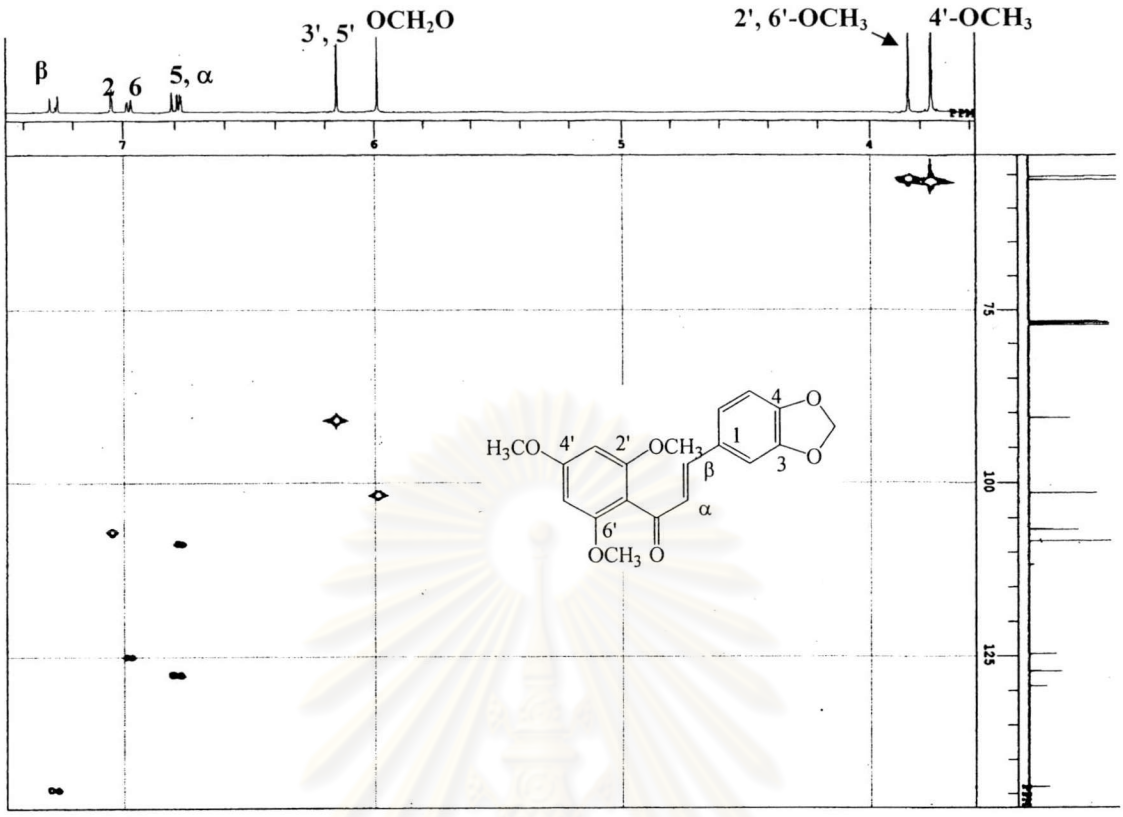

Figure 129 HMQC spectrum of Compound **285**

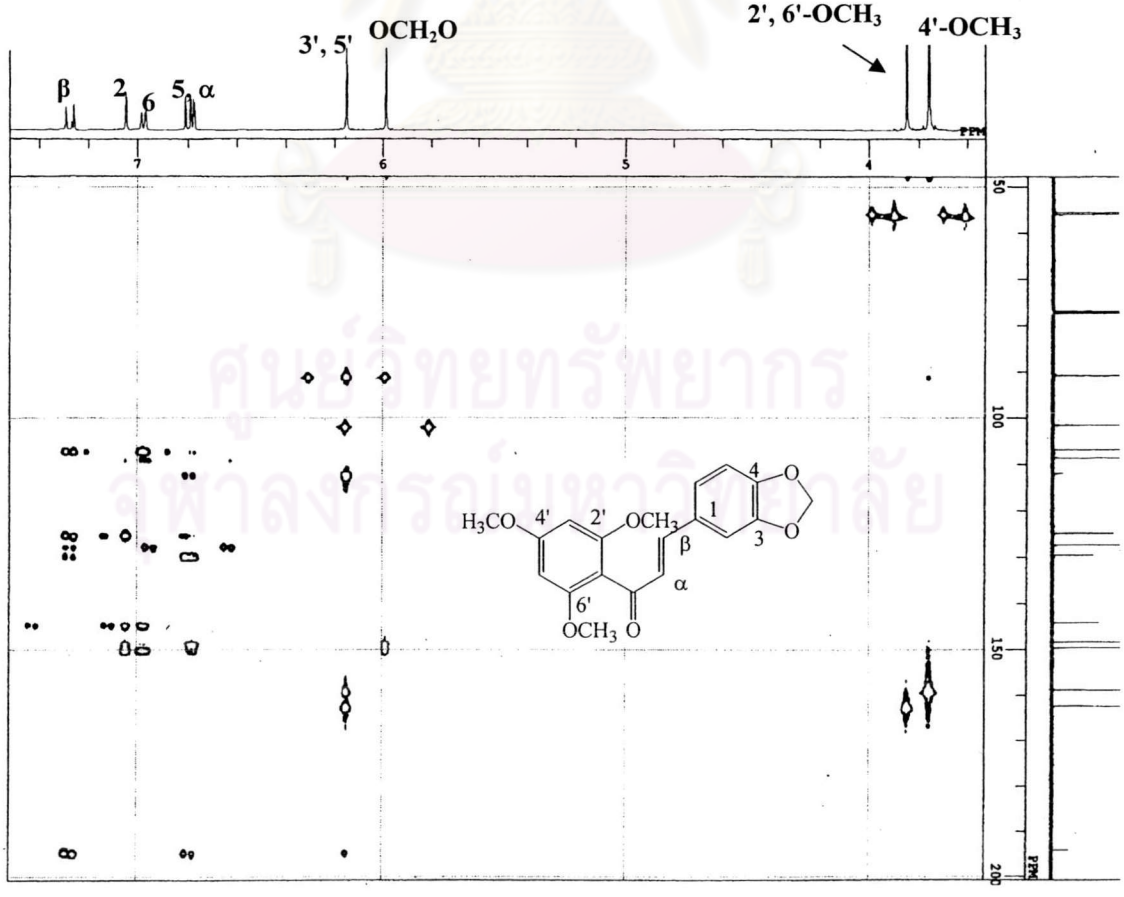

Figure 130 HMBC spectrum of Compound **285**

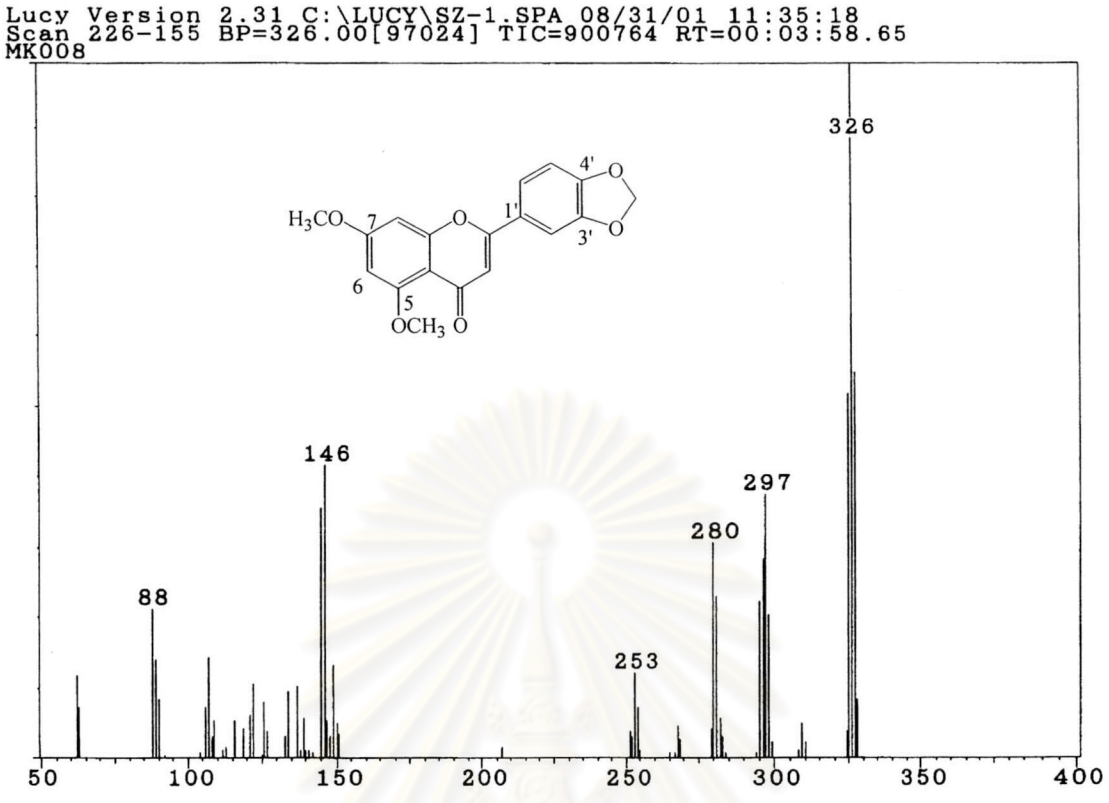

Figure 131 EI Mass spectrum of Compound **287**

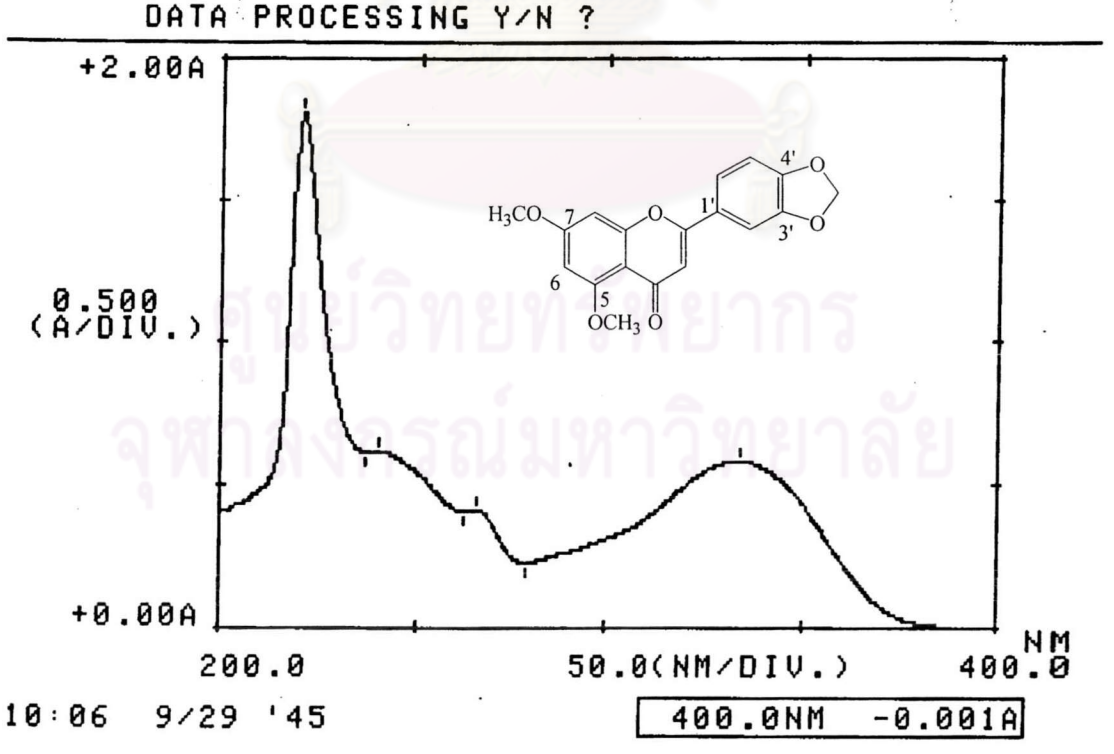

Figure 132 UV spectrum of Compound **287** (MeOH)

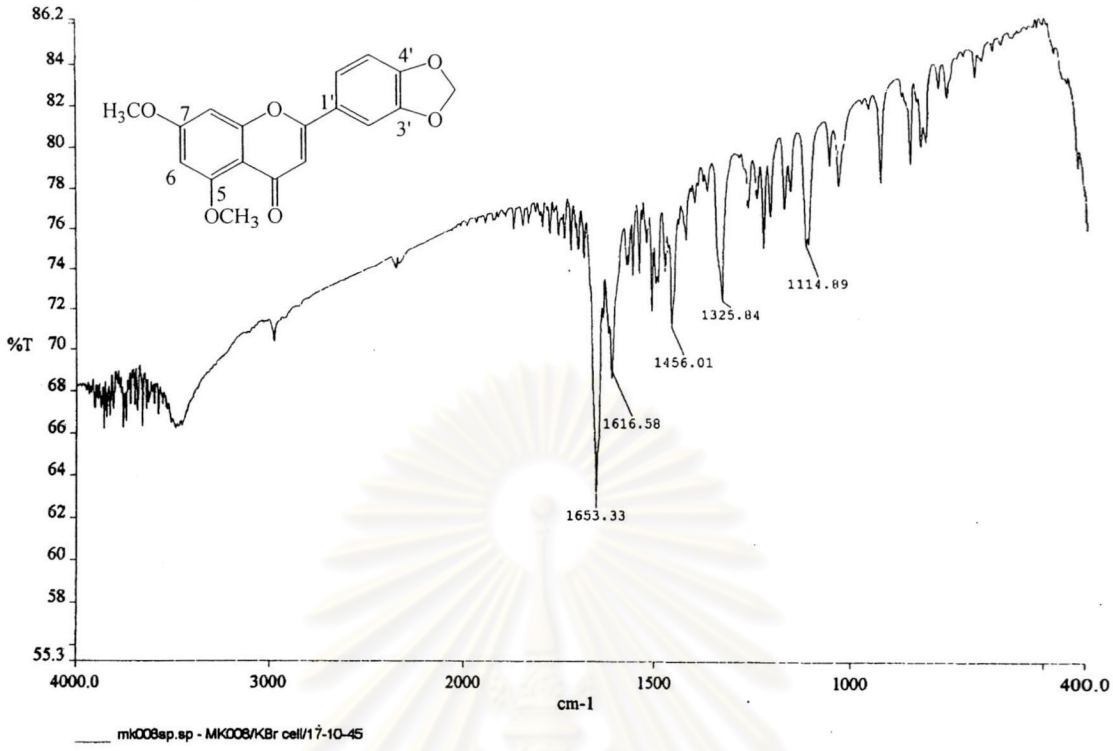

Figure 133 IR spectrum of Compound **287** (Film)

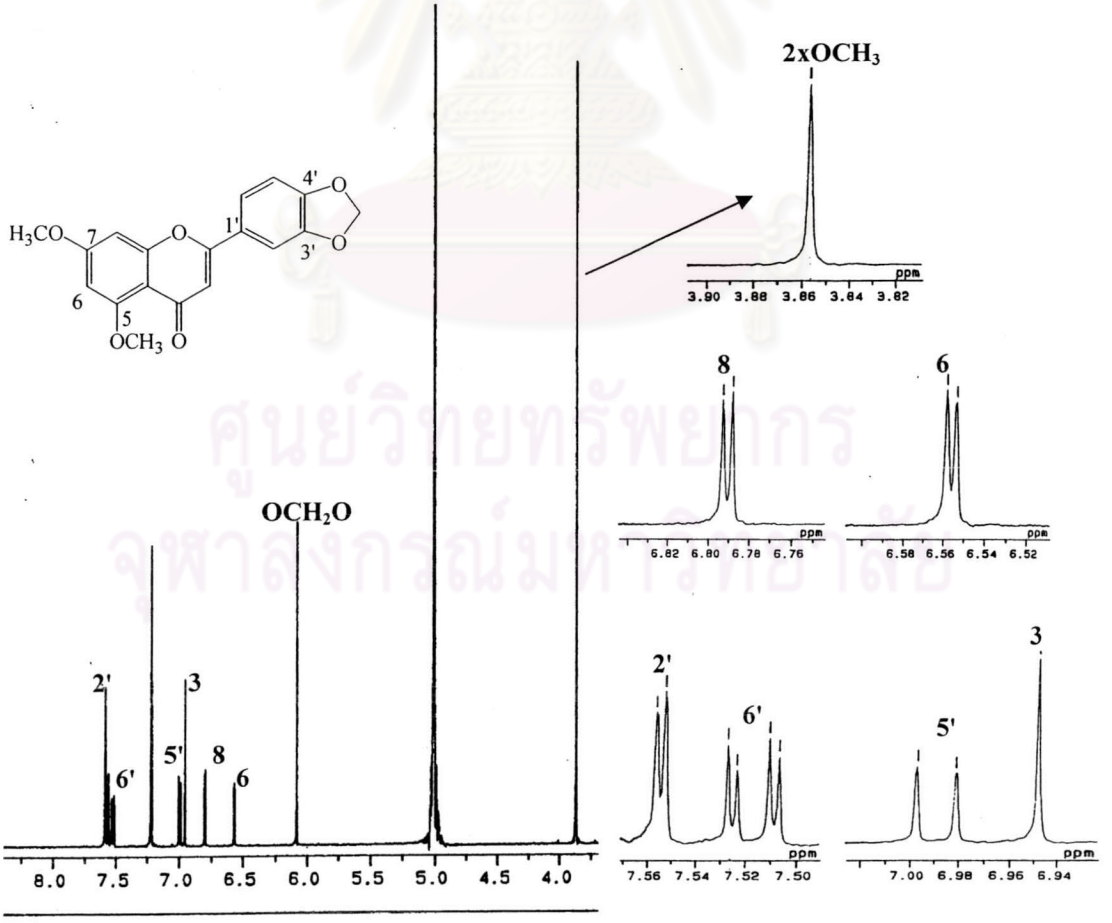

Figure 134 ^{1}H-NMR (500 MHz) spectrum of Compound **287** (C_5D_5N)

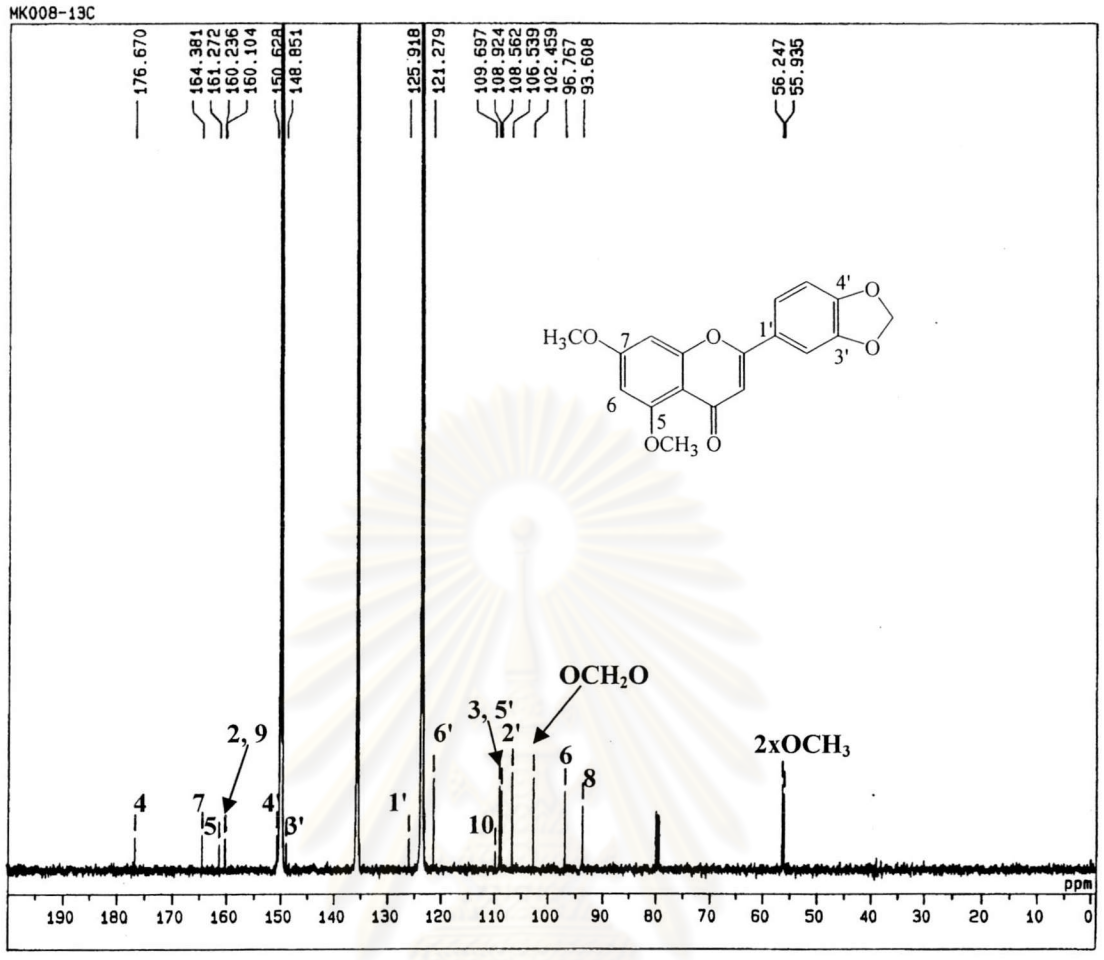

Figure 135 ^{13}C-NMR (125 MHz) spectrum of Compound **287** (C_5D_5N)

VITA

Miss Ampai Phrutivorapongkul was born on May 28, 1974 in Nakornsawan, Thailand. She received her Bachelor's degree of Science in Pharmacy (1st class honor) from the Faculty of Pharmacy, Chiang Mai University in 1998. She was granted a 1998 Royal Golden Jubilee Ph.D. Scholarship from Thailand Research Fund (TRF).

Publications

1. Phrutivorapongkul, A., Lipipun, V., Ruangrungsi, N., Watanabe, T., and Ishikawa,T. 2002. "Studies on the constituents of seeds of *Pachyrrhizus erosus* and their anti-Herpes Simplex Virus (HSV) activities". **Chem. Pharm. Bull. 50** (4): 534-537.
2. Phrutivorapongkul, A., Lipipun, V., Ruangrungsi, N., Kirtikara, K., Nishikawa, K., Maruyama, S., Watanabe, T., and Ishikawa, T. 2003. "Studies on the chemical constituents of stem bark of *Millettia leucantha*: isolation of new chalcones with cytotoxic, anti-Herpes Simplex Virus and anti-inflammatory activities". **Chem. Pharm. Bull. 51** (2): 187-190.

Poster Presentations

1. Ruangrungsi, N, Phadungcharoen, T., Phrutivorapongkul, A., Guinaudeau, H., Bohlke, M., Lin, L-Z., Angerhofer, C. K., and Cordell, G. A. "Phytochemical and pharmacognostic studies of *Pachygone dasycarpa*". p. 14. NRCT-JSPS CORE UNIVERSITY SYSTEM: The fourth NRCT-JSPS Joint Seminar in Pharmaceutical Sciences; Drug Development Through Biopharmaceutical Sciences. November 24-26, 1998, Hat Yai, Thailand.
2. Phrutivorapongkul, A., Likhitwitayawuid, K., and Ruangrungsi, N. "A morphinan alkaloid from *Pachygone dasycarpa* leaves". pp. 498-499. 25th Congress on Science and Technology of Thailand, October 20-22, 1999, Amarin Lagoon Hotel, Pitsanuloke.
3. Phrutivorapongkul, A., Ruangrungsi, N., Watanabe, T., and Ishikawa,T. "Isoflavonoids from *Pachyrrhizus erosus*". p. 133. RGJ-Ph.D. Congress II, April 20-22, 2001, Garden Beach Resort Hotel, Chonburi.
4. Phrutivorapongkul, A., Lipipun, V., Ruangrungsi, N., Watanabe, T., and Ishikawa,T. "Anti-HSV agents from *Pachyrrhizus erosus*". p. 183. 27th Congress on Science and Technology of Thailand, October 16-18, 2001, Lee Gardens Plaza Hotel, Hat Yai, Songkla.
5. Phrutivorapongkul, A., Ruangrungsi, N., Watanabe, T., and Ishikawa,T. "Novel chalcones from Thai medicinal plant, *Millettia leucantha* stem bark". p. 126. 122th Annual Meeting of the Pharmaceutical Society of Japan, March 26-28, 2002, Chiba, Japan.
6. Phrutivorapongkul, A., Lipipun, V., Ruangrungsi, N., Watanabe, T., and Ishikawa,T. "Isoflavonoids from Thai medicinal plant, *Pachyrrhizus erosus* seeds". p. 126. 122th Annual Meeting of the Pharmaceutical Society of Japan, March 26-28, 2002, Chiba, Japan.
7. Phrutivorapongkul, A., Lipipun, V., Ruangrungsi, N., Kirtikara, K., Nishikawa, K., Maruyama, S., Watanabe, T., and Ishikawa, T. "Bioactive compounds from *Millettia leucantha* stem bark". p. 7. Thai J. Pharm. Sci. 26, 2002. (suppl)

Oral Presentation

1. Phrutivorapongkul, A., Lipipun, V., Ruangrungsi, N., Kirtikara, K., Nishikawa, K., Maruyama, S., Watanabe, T., and Ishikawa, T. "Bioactive flavonoids from *Pachyrrhizus erosus* and *Millettia leucantha*". 22nd RGJ Seminar Series: Research Progress in Pharmacognosy and Phytochemistry, February 11, 2003, Faculty of Pharmaceutical Sciences, Chulalongkorn University, Bangkok.