REFERENCES

1. Keng H., Flora of Thailand, pp. 251-267, Applied Scientific Research Corporation of Thailand, Bangkok, 1975.

2. Burkill L.H., A Dictionary of the Economic Products of the Malay Peninsula, Vol. II, p. 1464, University Press, Oxford, 1935.

3. Council Scientific & Industrial Research, The Wealth of India Raw Material, Vol. VI, pp. 370-374, Publication & Information Directorate CSIR, New Delhi, 1962.

4. Simitinand T., Thai Plant Names (Botanical Names Vernacular Names). pp. 168 & 226-227, Funny Publishing, Bangkok, 1980.

5. Lily M. Perry with the Assistant Judith Metzger, Medicinal Plants of East and Southeast Asia, pp. 250-251, The MIT Press Cambridge, Massachusetts, 1985.

6. Ogura M., Cordell G.A. and Farnsworth N.R., "Anticancer Sesquiterpene Sesquiterpene lactone of *Michelia compressa* (Magnoliaceae)", Phytochemistry, 17(5), 957-61, 1978.

7. Talapatra S.K., Patra A. and Talapatra B., "Parthenolide and a New Germacranolide 11, 13-Dehydrolanuginolide from *Michelia lanuginosa*", Phytochemistry, 12(7), 1827-8, 1973.

8. Govindachari, T.R. *et al* "Parthenolide from the root of *M. champaca*", Tetrahedron, 21(6) : 1509, 1965.

9. Cordell G.A. and Farnsworth N.R., " Experimental Antitumor Agents from Plants", Lloydia, 40(4), 1-44, 1977.

10. Yang T., "Studies on the Alkaloids of Magnoliaceous Plants. XXXI. Alkaloids of *Michelia alba* DC.," Yakugaku Zasshi, 82, 811, 1962.

11. Harris W.M., Universal Microfilms, Order No. 565-4868, 164 (Through Philippine Plants and Their Contained Natural Products : Biological and Pharmacological Literature Survey, Vol. II, p. 741, 1981).

12. Terence A. Smith, "Phenethylamine and related compounds in plants" Phytochemistry, 16(1), 9, 1977.

13. Wang D., "Studies on the Constituents of the Essential Oil of Aromatic Flowers", K'o Hsueh Fa Chen Yuch K'an, 7(10), 1036-48, 1979.

14. Talapatra S.K., Patra A., Bhar D.S. and Talapatra B., "Alkaloids and Terpenoids of *Michelia* Species", Phytochemistry, 12(9), 2305-6, 1973.

15. Dhingra D.R., Gupta G.N. and Shukla, "Champaca Oil", Essenz, u, Aromen, 3, 99-102, 1953. (Through C.A. 47 (1953) : 8323e).

16. Ito K., "Studies on the Alkaloids of Magnoliaceous Alkaloids of *Michelia champaca* Linn.", Yakugaku Zasshi, 81, 703, 1961.

17. Majumder P.L. and Chatterjee N., "Active Principles of the Trunk Bark of *Michelia champaca* Linn.", Journal of Indian Chemistry Society, 40(11), 929-31, 1963. (Through C.A. 60(1964):8226a).

18. Yang T. and Hsiao C., "Studies on the Alkaloids of Magnoliaceous Plants. XXXVI. Alkaloids of *Michelia champaca* Linn.", Yakugaku Zasshi, 83, 216, 1963.

19. Govindachari T.R., et al., "Structure of Parthenolide", Tetrahedron, 21(6), 1509-19, 1965.

20. Ito K., "Alkaloids of *Michelia compressa*", Yakugaku Zasshi, 80, 325-9, 1959.

21. Yang T., "Alkaloids of *Michelia compressa*", Yakugaku Zasshi, 82, 794-8, 1962.

22. Cassady M.J., Ojima N., Chang C. and McLaughlin L.J., "Dehydrolanuginolide, a Cytotoxic Constituent from the Fruits of *Michelia doltsopa*", Phytochemistry, 18(9), 15 1560-70, 1979. (Through C.A. 92(1980) : 90864m).

23. Arthur H.R., Rosalind P.K., Chan S.N, Loo S.N,, Tam S.W, and Tung S., "New Alkaloids from Hong Kong Plants", Phytochemistry, 5(3), 379-83, 1966.

24. Ito K. and Aoki T., "Alkaloids of *Michelia fuscata*", Yakugaku Zasshi, 79, 325-9, 1959.

25. Ito K. and Uchida I., "Alkaloids of *Michelia fuscata*", Yakugaku Zasshi, 79, 1108-11, 1959.

26. Iida T. and Ito K., "Sesquiterpene Lactones from *Michelia fuscata*", Phytochemistry, 21(3), 701-3, 1982.

27. Wu S., Kao Y., Li T. ans Yang C., "Study on the Chemical Constituents in the Volatile Oil of *Michelia hedyosperma* Law", Chung Ts'ao Yao, 12(2), 8-12, 1981. (Through C.A. 95 (1981) : 103200 f).

28. Talapatra S.K., Patra A. and Talapatra B., "Lanuginolide and Dihydroparthenolide, Two New Sesquiterpene Lactones from *Michelia lanuginosa*", Journal of Chemistry Society, D 22, 1534-5, 1970. (Through C.A. 74 (1971) : 61592 μ)

29. Talapatra S.K., Patra A. and Talapatra B., "Alkaloids of *Michelia lanuginosa*", Tetrahedron, 31(8), 1105-7, 1975.

30. Heywood V.H., Harborne J.B. and Turner B.L., The Biology and Chemistry of the Compositae, Vol. I, pp. 281-321, 412-428 and 1097-1104, Academic Press, London, 1977.

31. Hooker J.D., The Flora of British India, Vol, III, p. 417, William Clowes and Sons, London, 1880.

32. Saldanha C.J. and Nicolson D.H., Flora of Hassan District Karnataka India, p. 616, Amerind Publishing, New York, 1978.

33. Craib W.G., Florae Siamensis Enumeratio, Vol. II, p. 251, The Siam Society, Bangkok, 1939.

34. Grierson A.J.C., "Compositae", A Revised Handbook to the Flora of Geylon, (Dasson, M.D. and Fosberg F.R.), Vol I, p. 147, Oxonium Press, India, 1980.

35. ชยามฤต ก่องกานดา, สมุนไพรไทย, ตอนที่ ๔, หน้า ๔๒๒ และ ๔๒๔, ชุติมาการพิมพ์, ๒๕๒๘.

36. Dymock W., Warden C.J.H. and Hooper D., Pharmacographia India, Vol. II, p. 248, Education Society's Press, Bombey, 1981.

37. สมาคมโรงเรียนแพทย์แผนโบราณ, ประมวลสรรพคุณยาไทย, ภาค ๑-๓, สำนักวัดพระเชตุพนฯ, กรุงเทพฯ, ๒๕๐๗-๒๕๑๖.

38. Pandey U.C., et al., "Stereochemistry of Strictic Acid and Related Furanoditerpenes from *Conyza japonica* and *Grangea maderaspatana*", Phytochemistry, 23(2), 391-7, 1984.

39. Iyer C.S. and Iyer P.R., "Steroids from *Grangea maderaspatana*", Phytochemistry, 17(11), 2036-7, 1978.

40. Iyer C.S., Iyer P.R. and Viswanathan N., "Isolation of Strictic Acid from *Grangea maderaspatana* Poir. : Identity of Methyl Strictate with Methyl Secondioresedate", Journal of Indian Chemistry, 18 B(6), 529-31, 1979.

41. Robert J.S., "The Sesquiterpenes", Chemistry of Terpenes and Terpenoids (Newman, A.A.), Academic Press, London, 1972.

42. Porter J.W. and Spurgeon S.E., Biosynthesis of Isoprenoid Compounds, Vol. I, pp. 1, 3, 13 and 285-362, John Wiley and Sons, New York, 1981.

43. Fischer N.H., Oliver E.J. and Fischer H.D., "The Biogenesis and Chemistry of Sesquiterpene Lactones", Progress in the Chemistry to Organic Natural Products, (Herz, W., H. Grisebach and G.W. Kirby), Vol. 38, pp. 48-264, Springer-Verlag Wien, New York, 1979.

44. Eloy R., Towers G.H.N. and Mitchell J.C., "Reveiw Biological Activities of Sesquiterpene Lactones,"Phytochemistry, 15, 1573-1580, 1976.

45. Kupchan S.M., Eakin M.A. and Thomas A.M., "Tumor Inhibitors, 69. Structure-Cytotoxicity Relationships among the Sesquiterpene Lactones", Journal of Medicinal Chemistry, 14(12), 1147-1152, 1971.

46. Herz W. and Sharma R.P., "Sesquiterpene Lactones of *Eupatorium hyssopifolium*. A Germacranolide with an Unusual Lipid Ester Side Chain", Journal of Organic Chemistry, 41, 1015,1976.

47. Yoshioka H., Renold W. and Mabry T.J., "The Structure of Salonitenolide and the Preferential C-8 Relactonization of Germacranolides Containing C-6 and C-8 Lactonizable α-Oxygen Groups", Chem. Commun., 148, 1970.

48. Rao A.S., G.R. Kelkar and S.C. Bhattacharyya, "The Structure of Costunolide, A New Sesquiterpene Lactone from Costus Root Oil", Tetrahedron, 9, 275, 1960.

49. Kupchan S.M. and M. Mayurama, "Reductive Elimination of Epoxides to Olefins with Zinc-Copper Couple", Journal of Organic Chemistry, 1187, 1971.

50. Sutherland J.K., "Regio-and Stereo-Specificity in the Cyclization of Medium Ring 1.5-Dienes", Tetrahedron, 30, 1651, 1974.

51. Jain T.C. and McCloskey J.E., "Carbocyclization in Natural Products. Amberlite IR-120 Cation Exchange Resin-Catalyzed Cyclization of Costunolide, Structure of β-Cyclocostunolide", Tetrahedron, 31, 2211, 1975,

52. Kulkarni G.H., Kelkar G.R. and Bhattacharyya S.C., "Costunolides", Tetrahedron, 20, 2639, 1964.

53. Doskotch R.W., Keely S.L., Hufford C.D. and El-Feraly F.S., "New Sesquiterpene Lactones from *Liriodendron tulipifera*", Phytochemistry, 14, 769, 1975.

54. Doskotch R.W., *et al.*, "Sesquiterpene Lactones from Pyrethrum Flowers", Canada Journal of Chemistry, 49, 2163, 1971.

55. Sokoloff S. and Scgal R., "Eudesmanolides Derived from Herbolide B", Tetrahedron, 33, 2837, 1977.

56. Saitoh T., Geissman T.A., Waddell T.G., Herz W. and Bhat S.V., "Sesquiterpene Lactones of *Eriophyllum confertiflorum* (DC.) Gray.", Rev. Latinoamer. Quim., 2, 69, 1971. (Through C.A., 75 (1971) : 129952 q).

57. Govindachari T.R., Joshi B.S. and Kamat V.N., "Structure of Parthenolide", Tetrahedron, 21, 1509, 1965.

58. Talapatra S.K., Patra A. and Talapatra B., "Lanuginolide and Dihydroparthenolide, Two New Sesquiterpenoid Lactones from *Michelia lanuginosa* The Structure, Absolute Configuration, and a Novel Rearrangement of Lanuginolide, "Chem. Commun., 1534, 1970.

59. Doskotch R.W., El-Feraly F.S., Fairchild E.H. and Huang C., "Peroxyferolide; a Cytotoxic Germacranolide Hydroperoxide from *Liriodenron tulipifera*", Chem. Commun., 402, 1976.

60. Asakawa Y., Muller J.C., Ourisson G., Foussereau J. and Ducombs G., "New Sesquiterpene Lactones of *Frullania* (Hepaticae). Isolation, Structures, Allergenic Properties", Bull, Soc. Chim., 1465, 1976. (Through C.A., 86 (1977) : 190227a).

61.Ohta Y., Anderson N.H. and Liu C.B., "Sesquiterpene Constituents of Two Liverworts of Genus *Diplophyllum*. Novel Eudesmanolides and Cytotoxicity Studies for Enantiomeric Methylene Lactones", Tetrahedron, 33, 617, 1977.

62. Tsuda K., Tanabe K., Iwai I. and Funakoshi K., "The Structure of Alantolactones", J. Amer. Chem. Soc., 79, 5721, 1957.

63. Grieco P.A., "Methods for Synthesis of α-Methylene Lactones", Synthesis, 67, 1975.

64. Banker N.S. and Kulkarni G.H., "Monoepoxidation of Saussurea Lactone", Journal of Indian Chemistry., 13, 744, 1975.

65. Pinder A.R., "The Chemistry of the Eremophilane and Related Sesquiterpenes", Progress in the Chemistry of Natural Products, (Herz, W., H. Grisebach and G.W. Kirby), Vol. 34, Wien : Springer, 1977.

66. Luckner M., Secondary Metabolism in Plants and Animals, pp. 122-131, Academic Press, New York, 1972.

67. Geissman T.A., "The Biosynthesis of Sesquiterpene Lactones of the Compositae", Recent Advances in Phytochemistry, (Runeckles, V.C. and T.J. Mabry), Vol. 6, p. 65, Academic Press, New York and London, 1973.

68. Geissman T.A. and Crout D.H.G., Organic Chemistry of Secondary Plant Metabolism, Freeman, Cooper and Co., San Francisco, 1969.

69. Herz W., "Biogenetic Aspects of Sesquiterpene Lactone Chemistry", Israel J. Chmem., 16, 32, 1977.

70. Rodrigues A.A.S., Garcia M. and Rabi J.A., "Facile Biomimetic Synthesis of Costunolide-1, 10-epoxide. Santamarin and Reynosin", Phytochemistry, 17, 953, 1978.

71. Fischer N.H., Mabry T.J. and Kagon H.B., "The Structure of Tamaulipin A. A New Germacranolide from *Ambrosia confertiflora* DC. (Compositae)", Tetrahedron, 24, 4091, 1968.

72. Kitagawa I., Shibuya H., Yamazoe Y., Takeno H. and Yosioka I., "Conversion of Dihydroalantolactone to Tetrahydroliguarenolide. A Biogenetic-type Transformation of Eudesmanolide to Eremophilanolide", Tetrahedron Letters, 111, 1974.

73. Novotny L., Samek Z. and Sorm.F., "Isolation and Structure of Dimethoxydihydrofuroeremophilane", Chem. Commun., 31, 371, 1966.

74. Hooker and Jackson B.D., Index Kewensis, Vol. II, p. 223, Clarendon Press, Oxford, 1880.

75. Theophilus D. and B.D. Jackson, Index Kewensis Supplementum I (1886-1895), Oxford University Press, 1906.

76. Theophilus D. and B.D. Jackson, Index Kewensis Supplementum II-XVI (1896-1975), Clarendron Press.

77. Ruangrungsi N., Rivepiboon A., Gordon L.L., Lee M. and Carl P. "Constituents of Paramichelia baillonii : A New Antitumor Germacranolide Alkaloid" Journal of Natural Products, Vol. 50, No 5, pp. 891-896, 1987.

78. Budesinky M., Saman D., Nowak G., Drozdz B. and Holub M., Coll. Czech. Chem. Commun., 49, 637 (1984).

79. El-Feraly, Chan Y.M., and Capiton G.A., Journal of Organic Chemistry, Vol, 44, p. 3952, 1979.

80. Perold G.W., Muller J.C. and Ourisson G., "Structure D'Une Lactone Allergisante : Le Frullanolide-I" Tetrahedron, Vol. 28, pp. 5797-5803, 1972.

81. Connolly J.D. and Thomson I.M.S., "Sesquiterpene Lactones from the Liverwort *Frullania tamarisci*" Phytochemistry, Vol. 12, pp. 631-632, 1973.

82. Quick A. and Rogers, D., "Structures of Cathedulin-2 and Cathedulin-8, New Sesquiterpene Alkaloids from *Catha edulis*", Journal of Chemistry Society, Perkin II, 465, 1976.

83. Bawdekar A.S., Kelkar G.R. and Battacharya S.C., "Terpenoids LXXXIX Absolute Configuration of Parthenolide", Tetrahedron Letters, 1225, 1966.

84. Yanagita M., Inayama S., Kawamata T. and Okura T., "Pulchellidine, A Novel Sesquiterpene Alkaloid Isolated from *Gaillardia pulchelia* Foug.", Tetrahedron Letters, 2073, 1969.

85. Bick I.R.C., Gillard J.W. and Leow M.-M., "Isolation of Tri-(α-Methylene-γ-Butyrolactone) amine from *Bellendena montana*", Phytochemistry, 25, 972, 1986.

86. Lima P.D.D.B., Garcia M. and Rabi J.A., "Selective Extraction of α-methylene-γ-lactones. Reinvestigation of *Vanillosmopsis erythropappa*", Journal of Natural Products, 48, 986, 1985.

87. Rivepiboon A., M.Sc. Thesis, Dept. of Pharmacognosy, Faculty of Pharmaceutical Science, Chulalongkorn University. Thailand, 1988.

88. Doskotch R.W. and El-Feraly F.S., "The Structure of Tulipinolide and Epitulipinolide. Cytotoxic Sesquiterpenes from *Liriodendron tulipifera* L.", Journal of Organic Chemistry, 35, 1928, 1970.

89. Jakupovic J., Jia Y, Zdero C., Warning U., Bohlmann F. and Jones S.B., "Germacranolides from *Elephantopus* Species", Phytochemistry, 26, 1467, 1987.

90. Lange G.L. and Galatsis P., "Structure of Germacranolides Isoaristolactone and Pyroaristolactone", Journal of Organic Chemistry 49, 178, 1984.

91. Bick I.R.C. and Douglas C.K., "Yellow Alkaloids of *Atherosperma moschatum* Labill." Tetrahedron Letters, 1629, 1964.

92. Kupchan S.M., Suffness M.I. and Gordon E.M., "The Isolation and Structure Elucidation of Oxoxylopine, A New Oxoaporphine Alkaloid from *Stephania abyssinica*", Journal of Organic Chemistry, 1682, 1970.

93. Guinaudeau H., Leboeuf M. and Cave A., "Aporphinoid Alkaloids, III", Journal of Natural Products, 46, 761, 1983.

APPENDIX

a) silica gel GF_{245}/benzene : acetone (1:1)

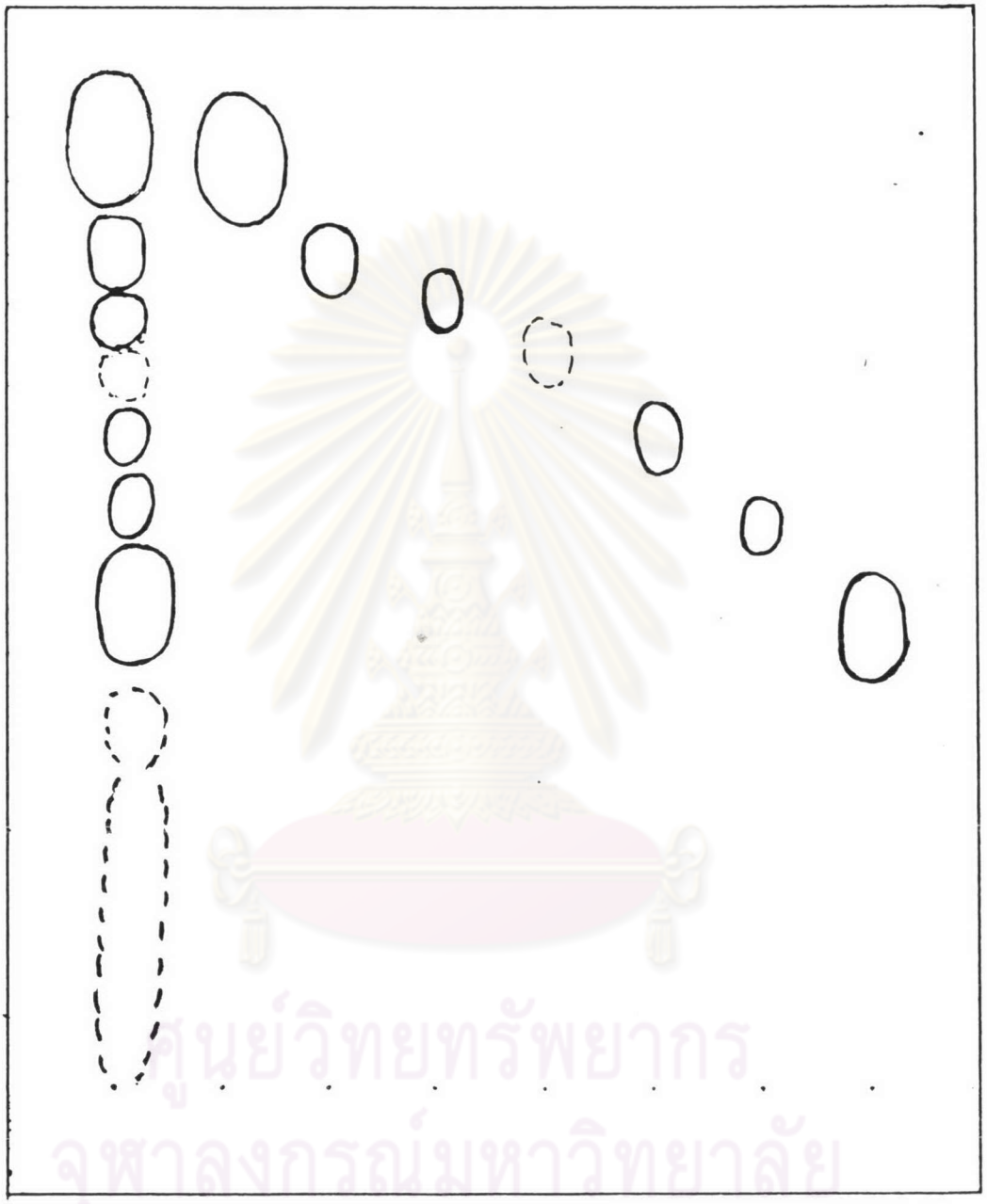


Figure 3 Thin-layer chromatogram of isolated compounds from *Michelia rajaniana* Craib. stem bark.

Note: After warmed, MR-1 - MR-6 gave yellow color , MR-7 gave pale pink colour. These colours are indicated a germacranolide group of sesquiterpene lactone.

(the mixture of 2% resorcinol in methanol and 2% sulphuric acid as spraying reagent)

b) silica gel GF_{254}/benzene : acetone (4:1)

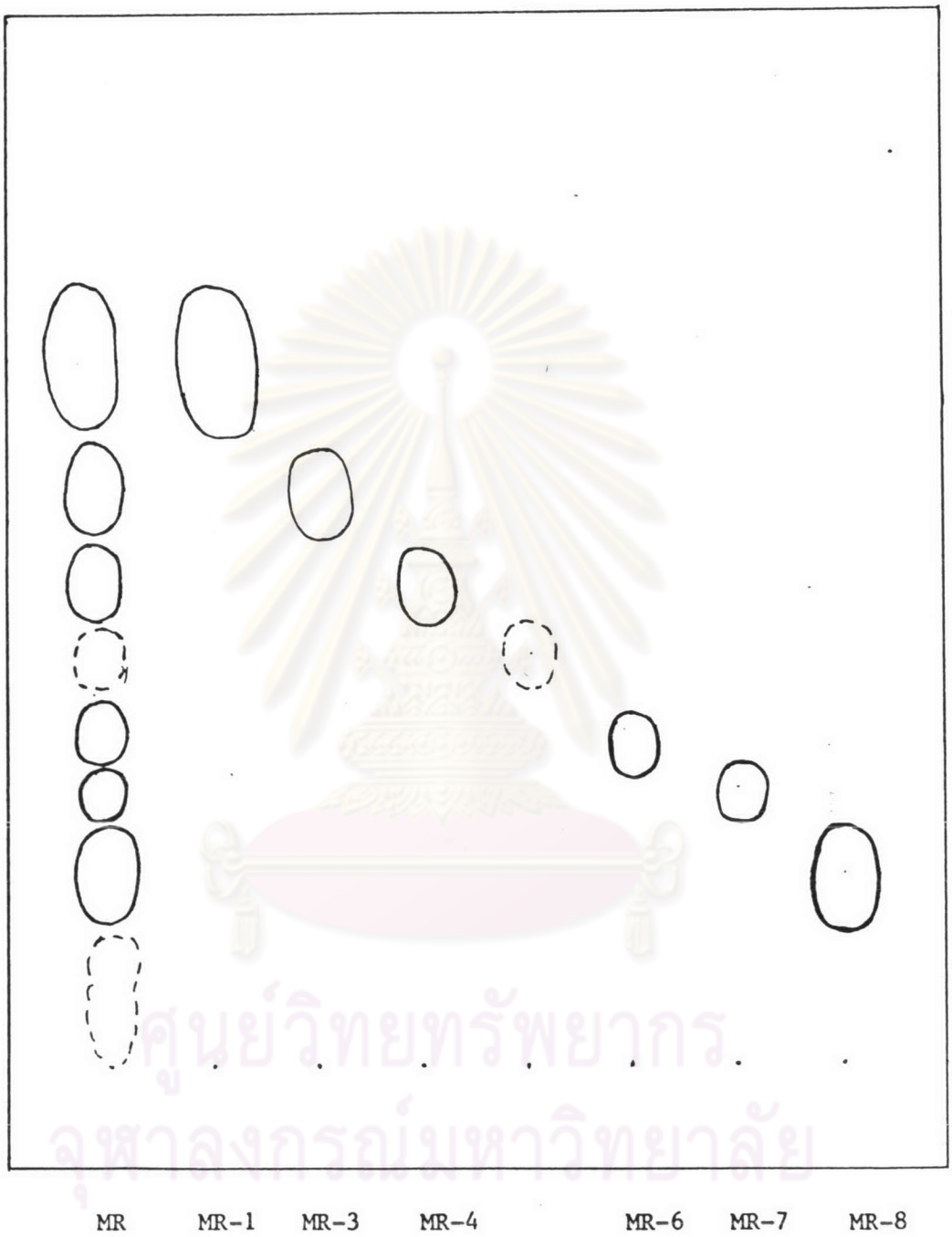


Figure 4 Thin-layer chromatogram of isolated compounds from *Michelia rajaniana* Craib. stem bark.

c) silica gel GF_{254}/ benzene : ethylacetate (4:1)

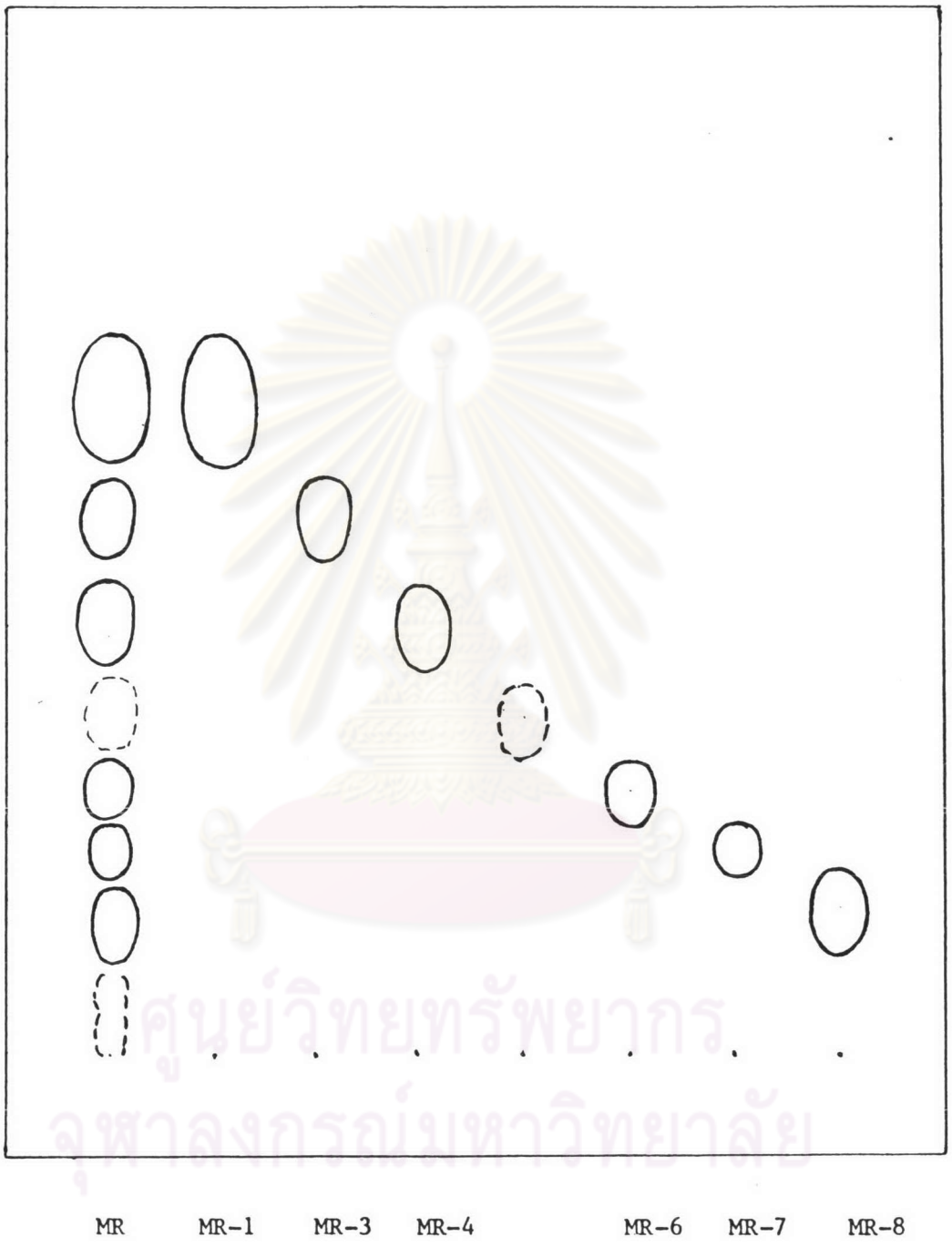


Figure 5 Thin-layer chromatogram of isolated compounds from *Michelia rajaniana* Craib.stem bark.

d) silica gel GF_{254}/benzene : ethylacetate (1:2)

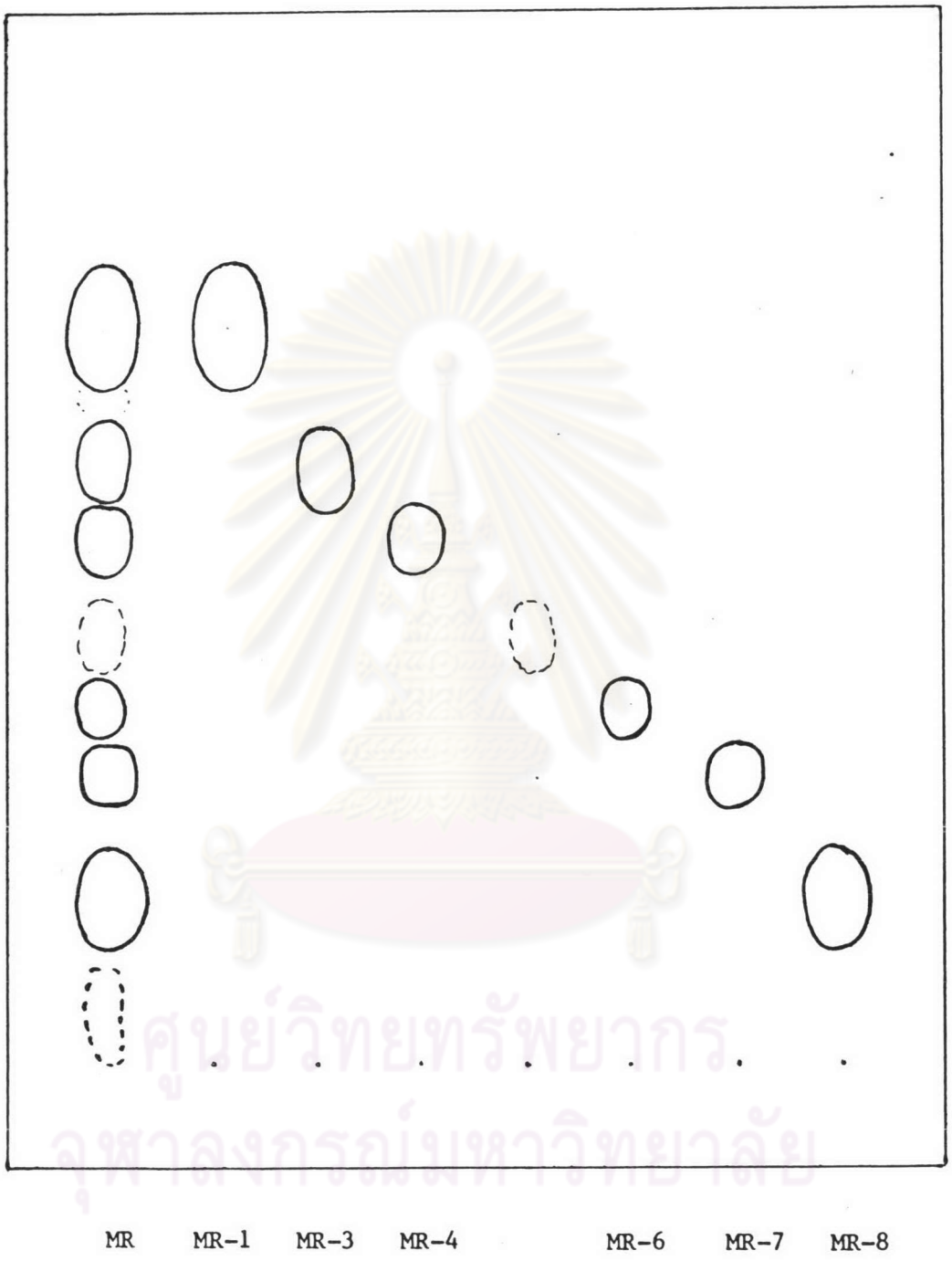


Figure 6 Thin-layer chromatogram of isolated compounds from *Michelia rajaniana* Craib.stem bark.

e) silica gel GF_{254}/chloroform : acetone (5:1)

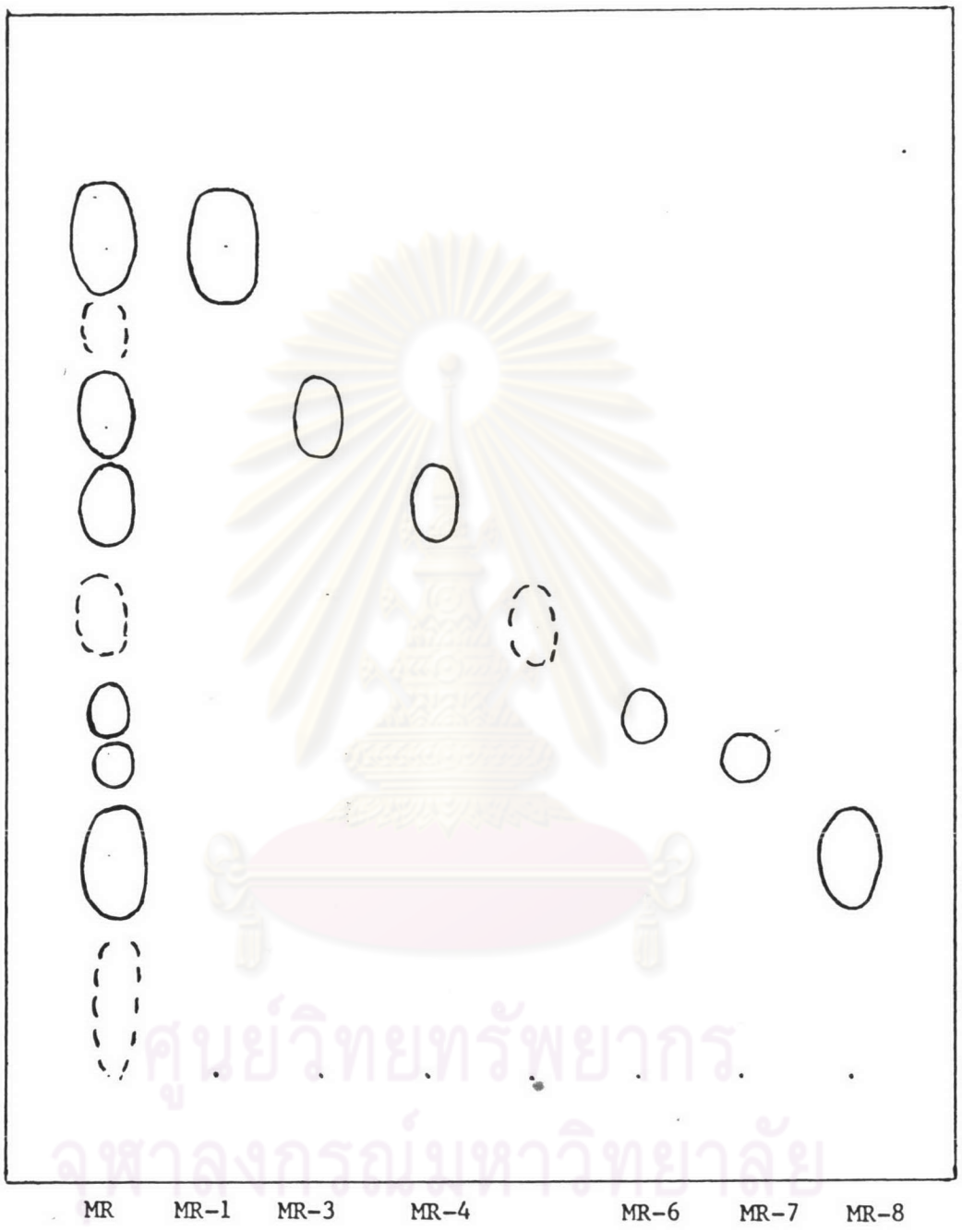


Figure 7 Thin-layer chromatogram of isolated compounds from *Michelia rajaniana* Craib.stem bark.

f) silica gel GF_{254}/ethylacetate : acetone (1:1)

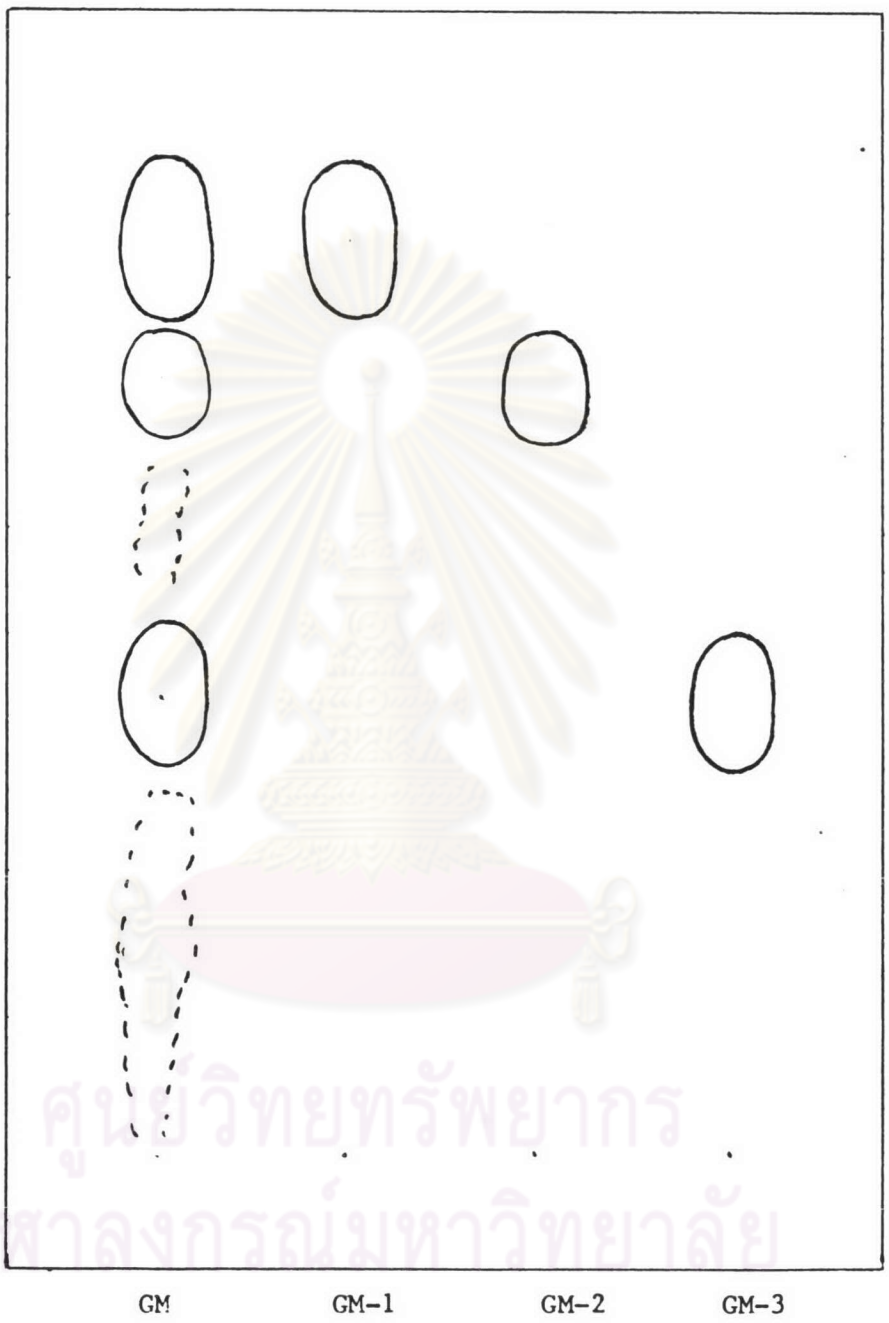


Figure 8 Thin-layer chromatogram of isolated compounds from *Grangea maderaspatana* Poir.

Note: After warmed, GM-1 gave purple colour, GM-2 and GM-3 gave violet colour. These colour are indicated a eudesmanolide group of sesquiterpene lactone. (the mixture of 2% resorcinol in methanol and 2% sulphuric acid as spraying reagent)

g) silica gel GF_{254}/benzene : acetone (1:1)

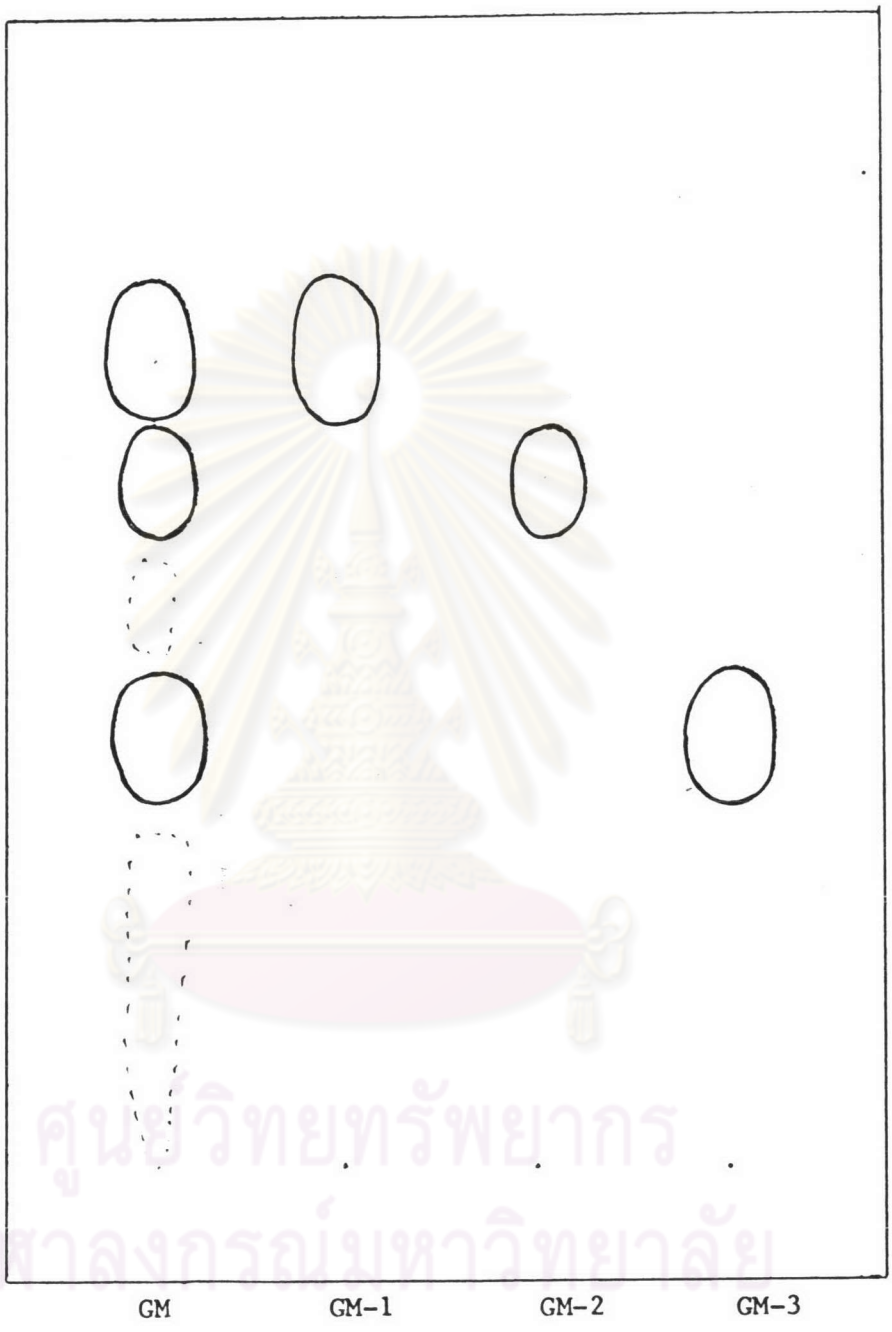


Figure 9 Thin-layer chromatogram of isolated compounds from *Grangea maderaspatana* Poir.

h) silica gel GF_{254}/benzene : acetone (4:1)

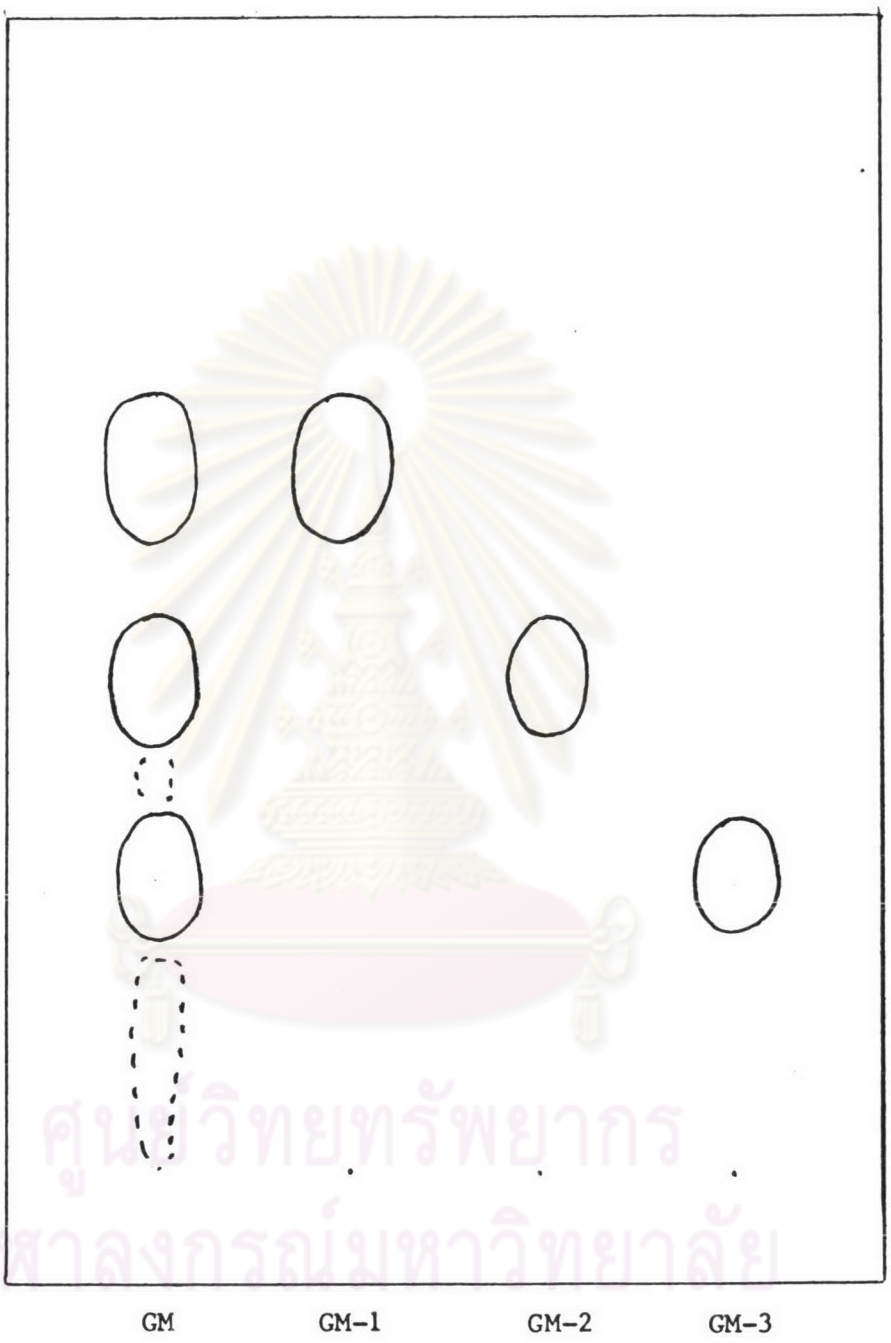


Figure 10 Thin-layer chromatogram of isolated compounds from *Grangea maderaspatana* Poir.

i) silica gel GF_{254}/benzene : ethylacetate (4:1)

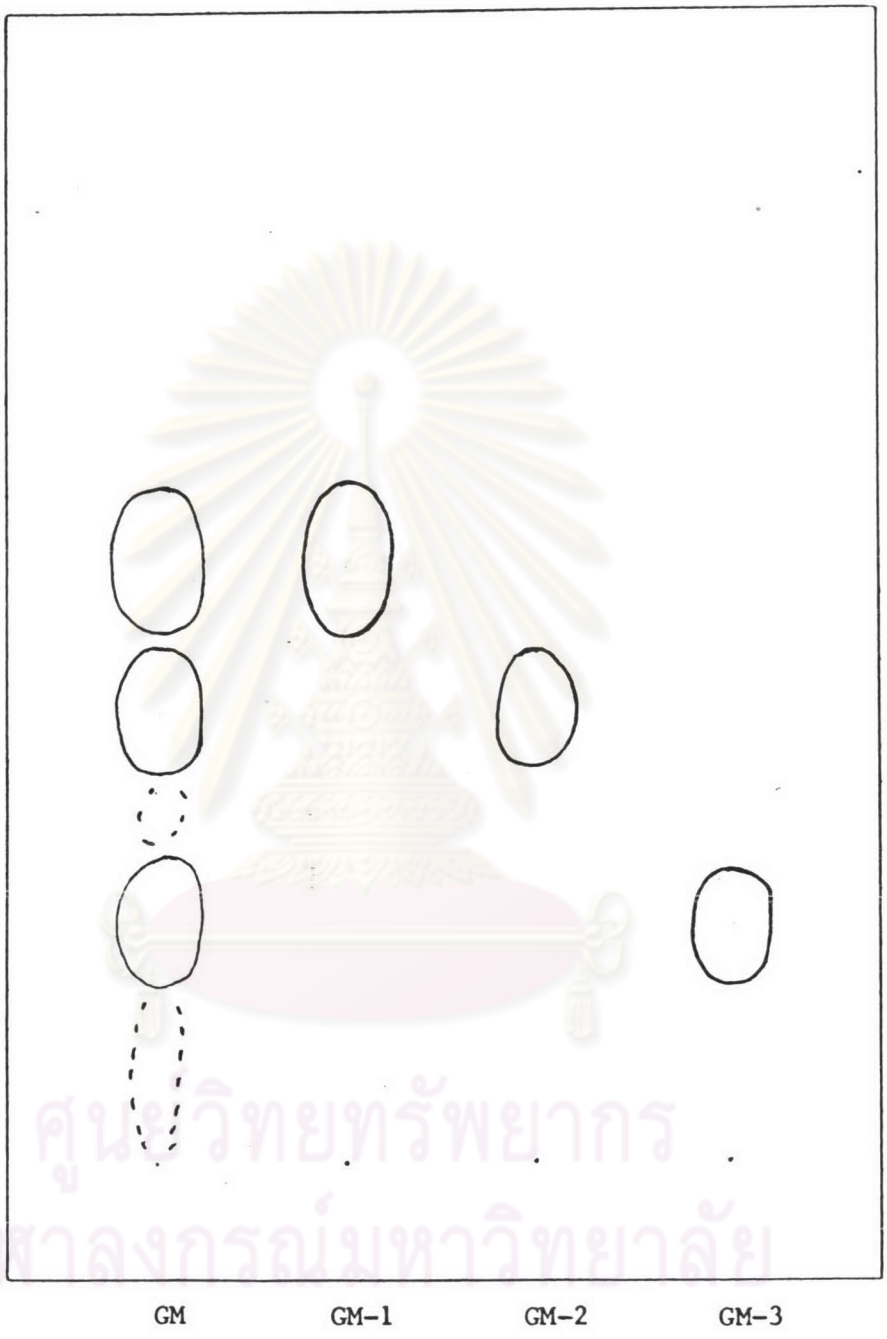


Figure 11 Thin-layer chromatogram of isolated compounds from *Grangea maderaspatana* Poir.

j) silica gel GF_{254}/benzene : ethylacetate (1:2)

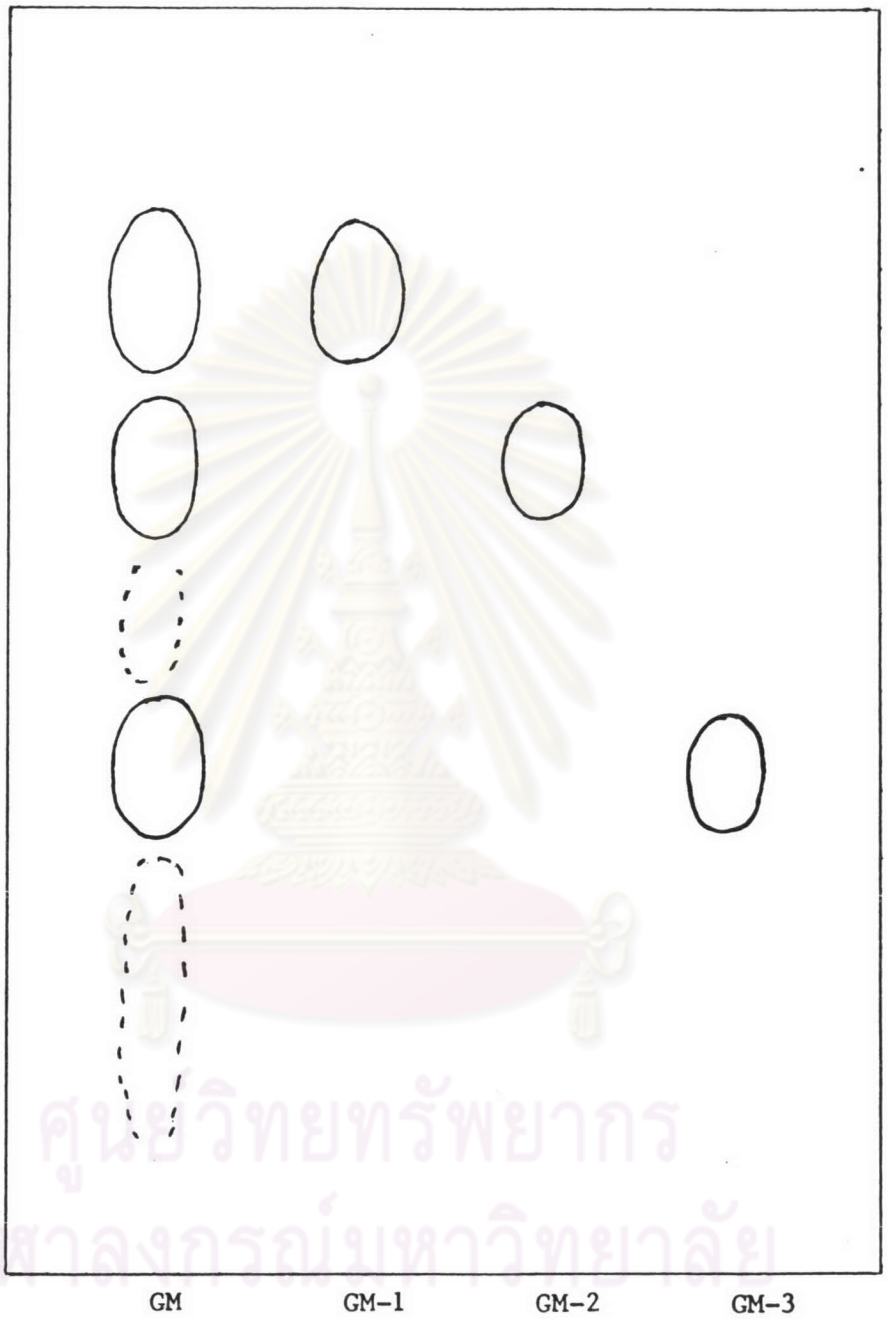


Figure 12 Thin-layer chromatogram of isolated compounds from *Grangea maderaspatana* Poir.

k) silica gel GF_{254}/chloroform : acetone (5:1)

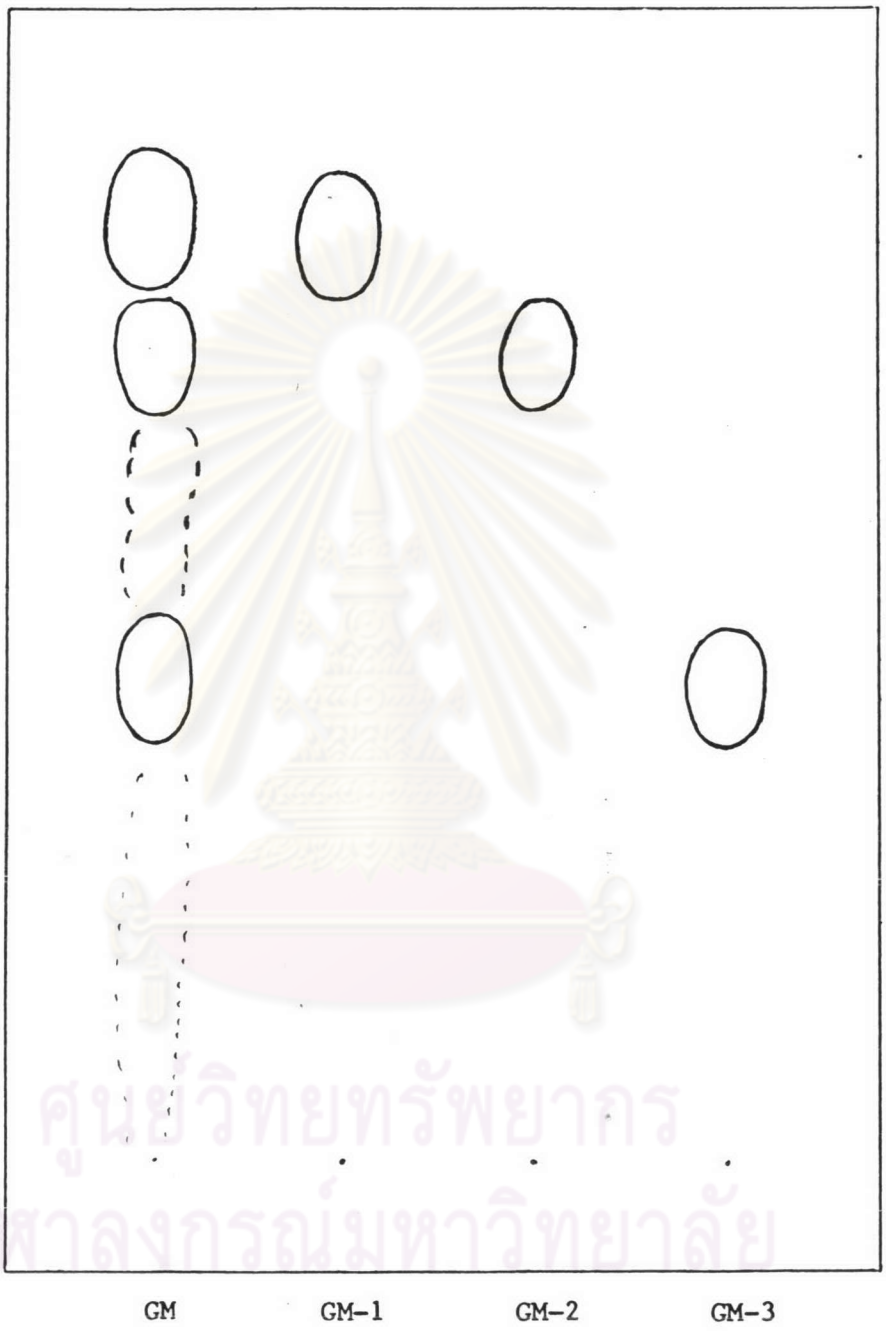


Figure 13 Thin-layer chromatogram of isolated compounds from *Grangea maderaspatana* Poir.

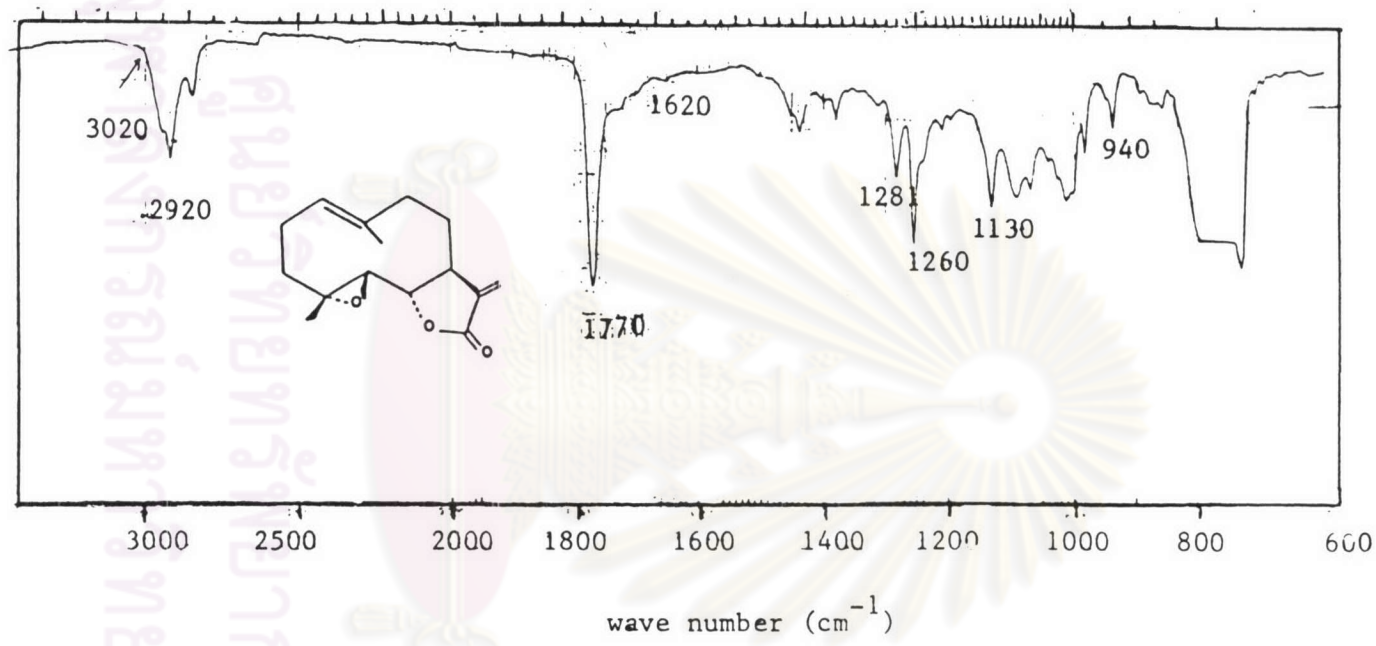


Figure 14 Infrared absorption spectrum of MR-1 from *Michelia rajaniana* Craib.stem bark in CCl_4.

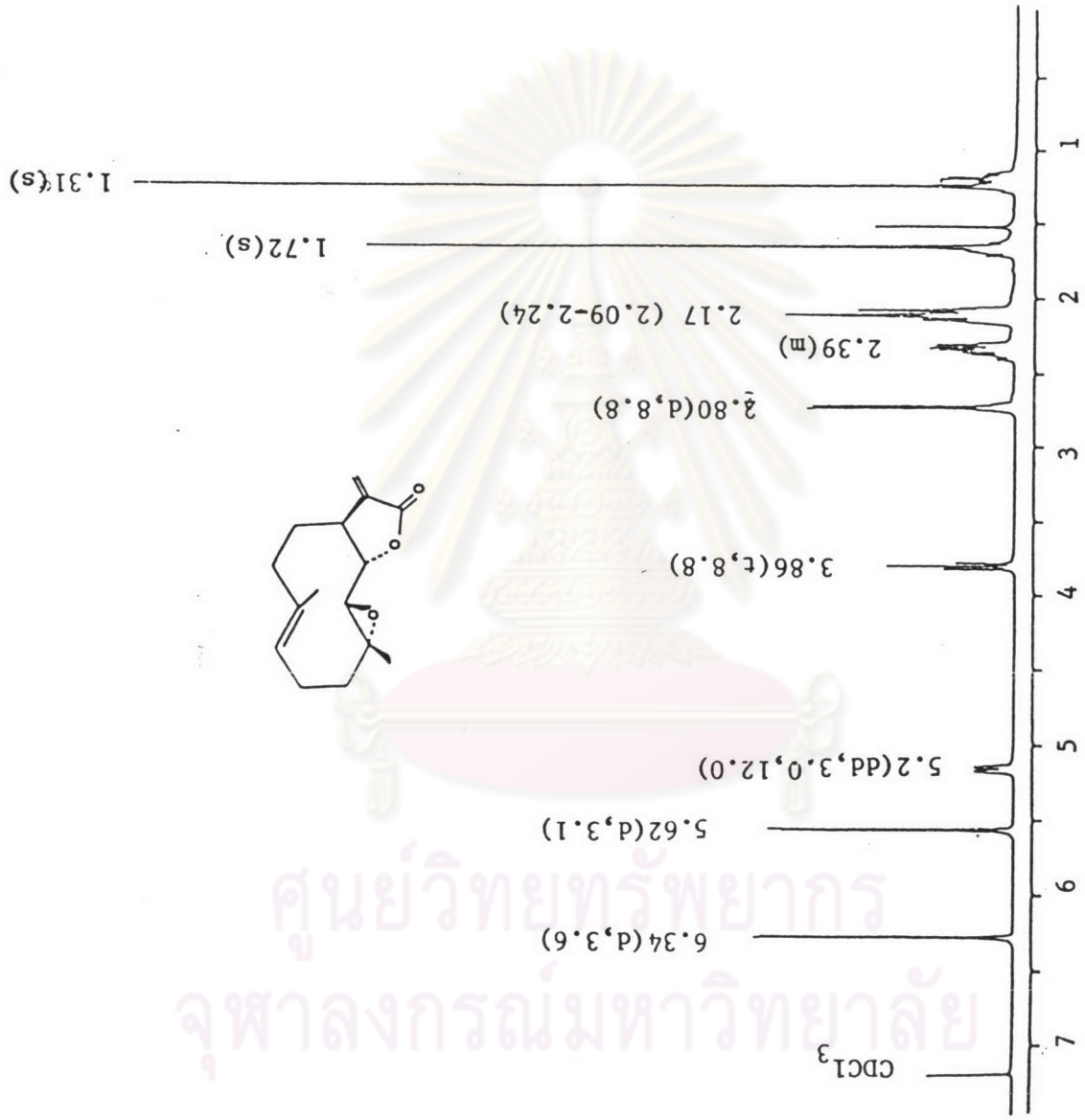


Figure 15 Proton NMR spectrum of MR-1 from *Michelia rajaniana* Craib, stem bark in $CDCl_3$

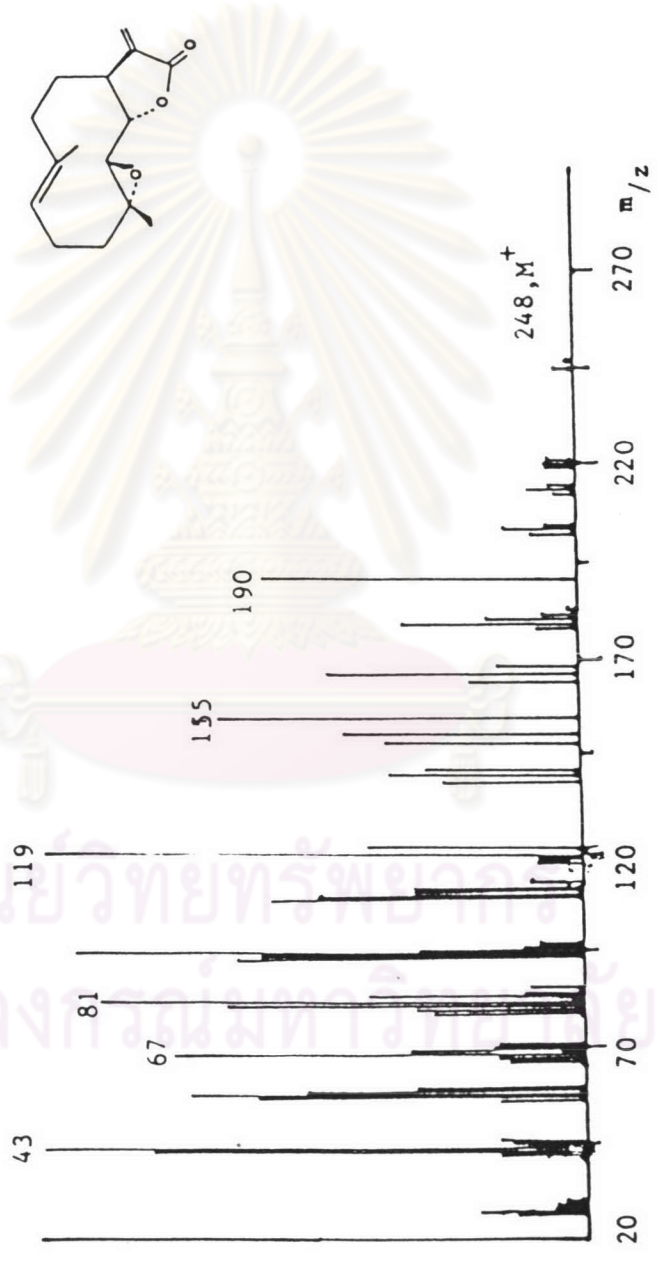


Figure 16 Mass spectrum of MR-1 from *Michelia rajaniana* Craib.stem bark.

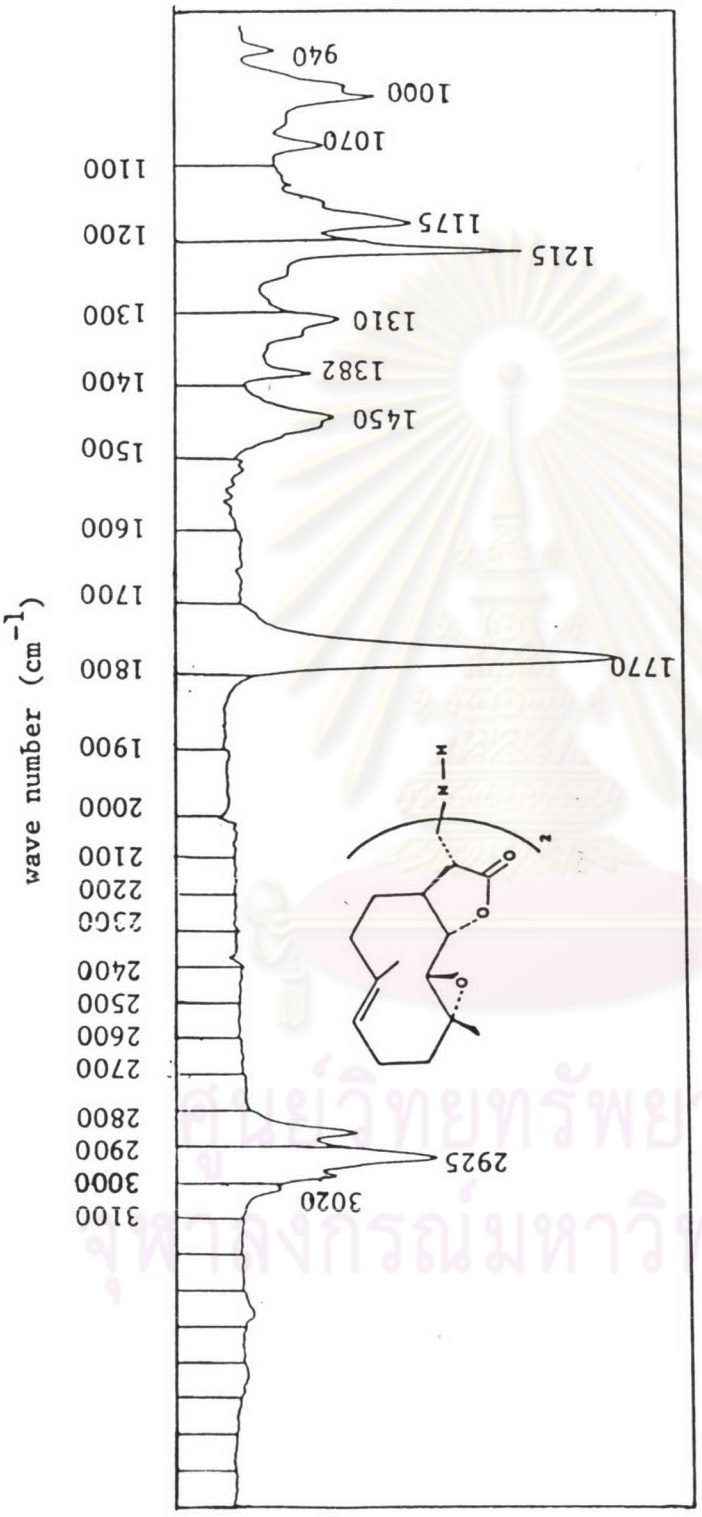


Figure 17 Infrared absorption spectrum of MR-3 from *Michlia rajaniana* Craib.stem bark in CCl_4.

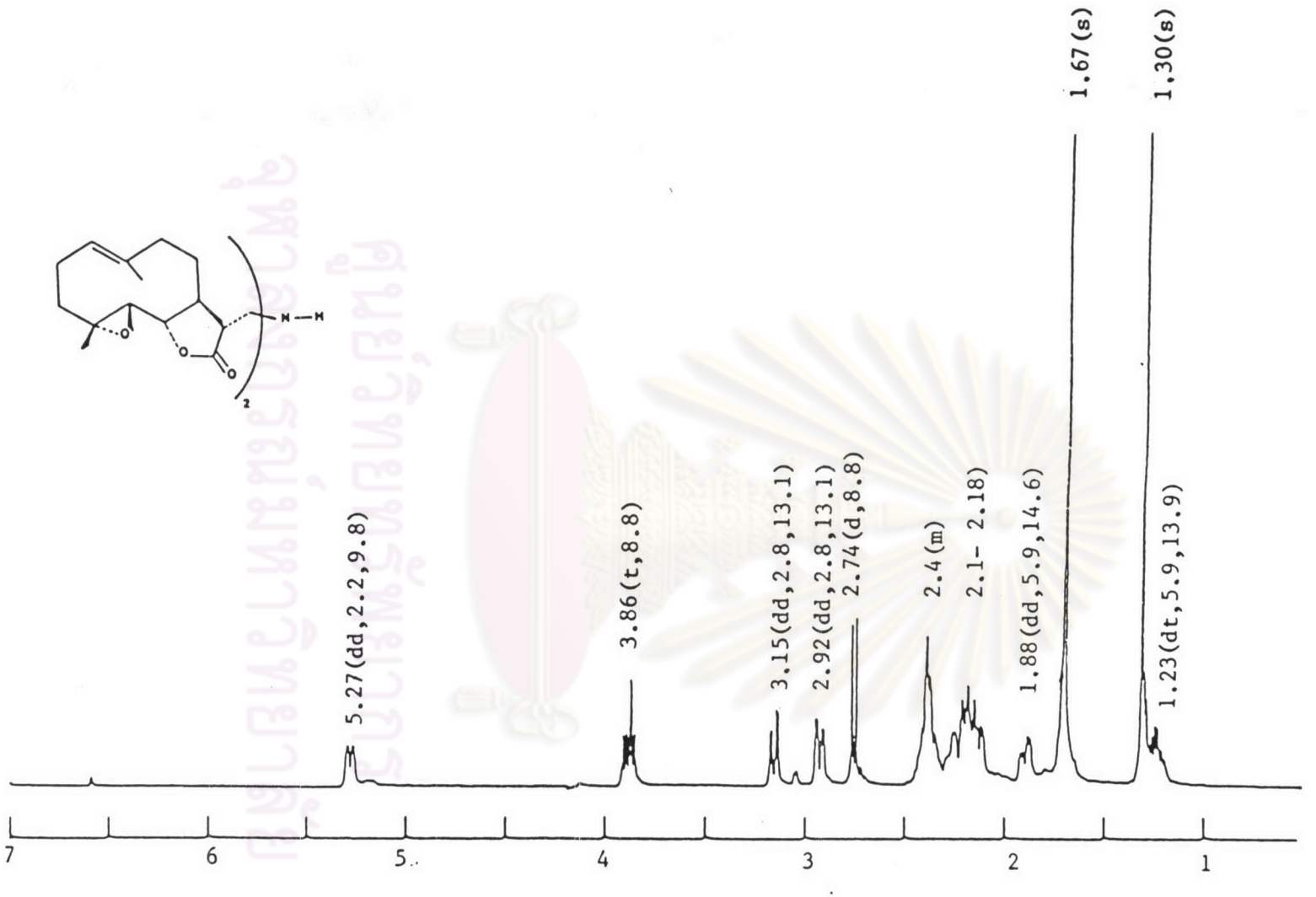


Figure 18 Proton NMR spectrum of MR-3 from *Michelia rajaniana* Craib.stem bark in $CDCl_3$.

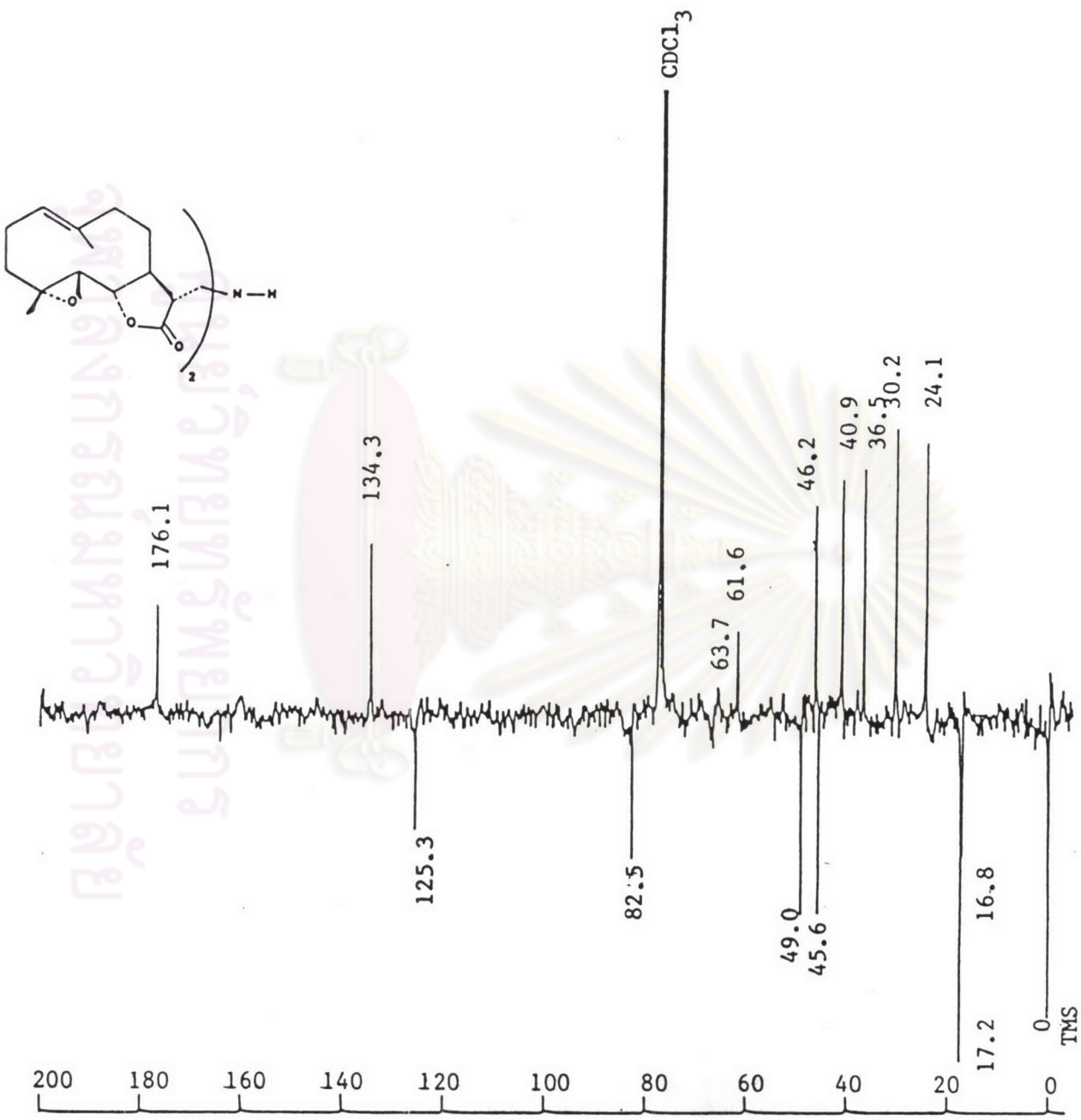


Figure 19 Carbon-13 spectrum of MR-3 from *Michelia rajaniana* Craib.stem bark in $CDCl_3$.

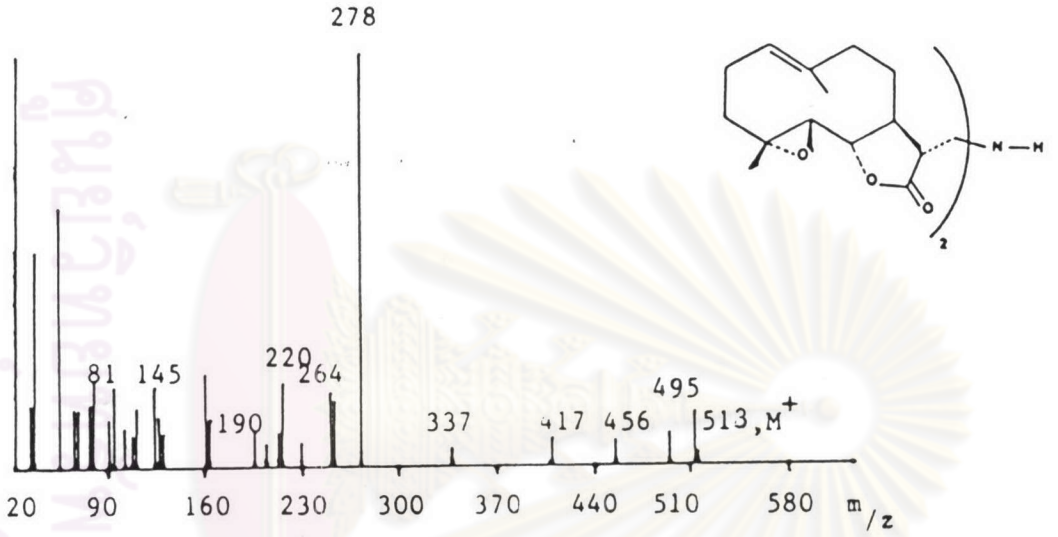


Figure 20 Mass spectrum of MR-3 from *Miliusa rajaniana* Craib.stem bark.

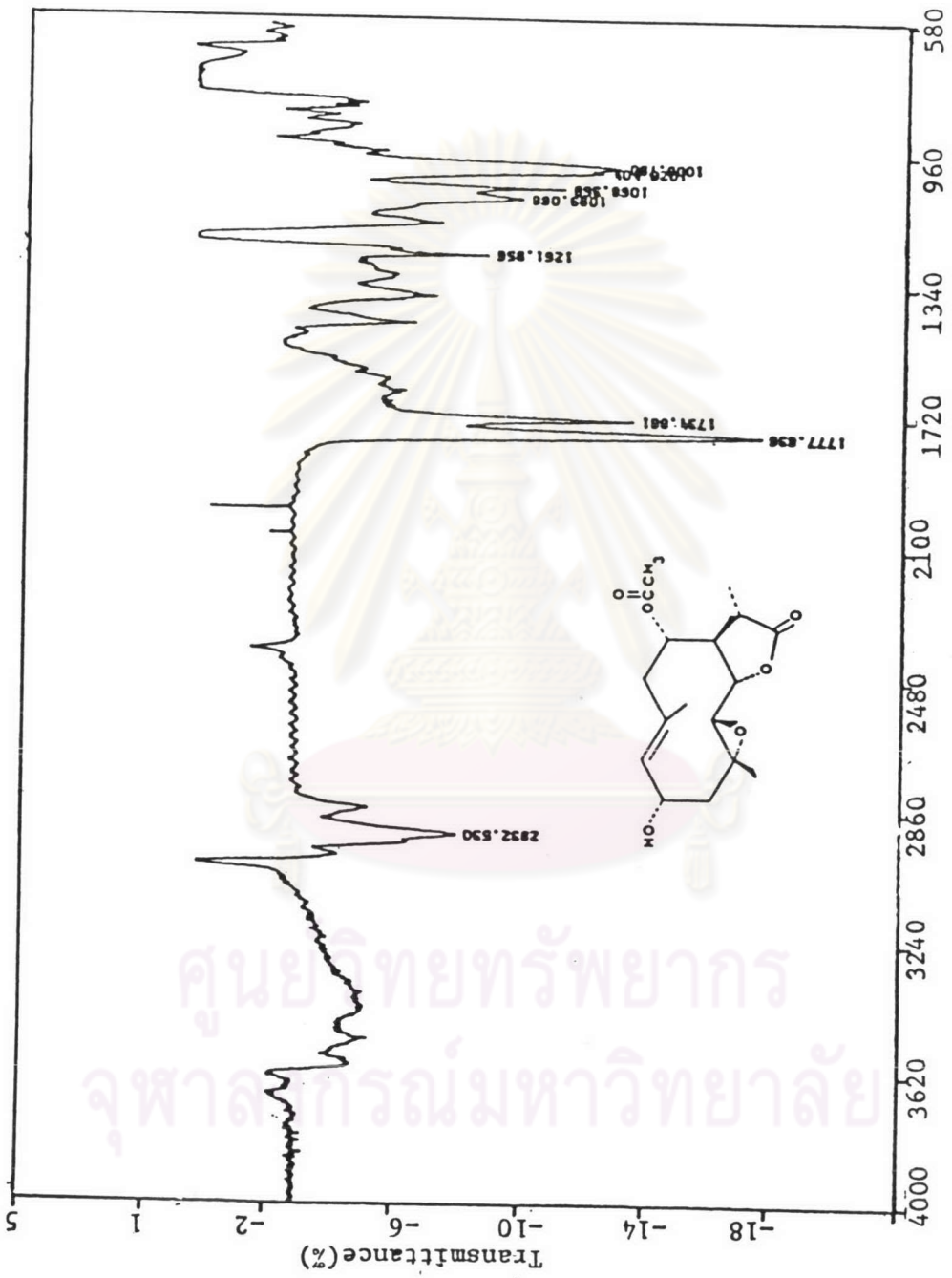


Figure 21 Infrared spectrum of MR-4 from *Michelia rajaniana* Craib.stem bark in $CHCl_3$.

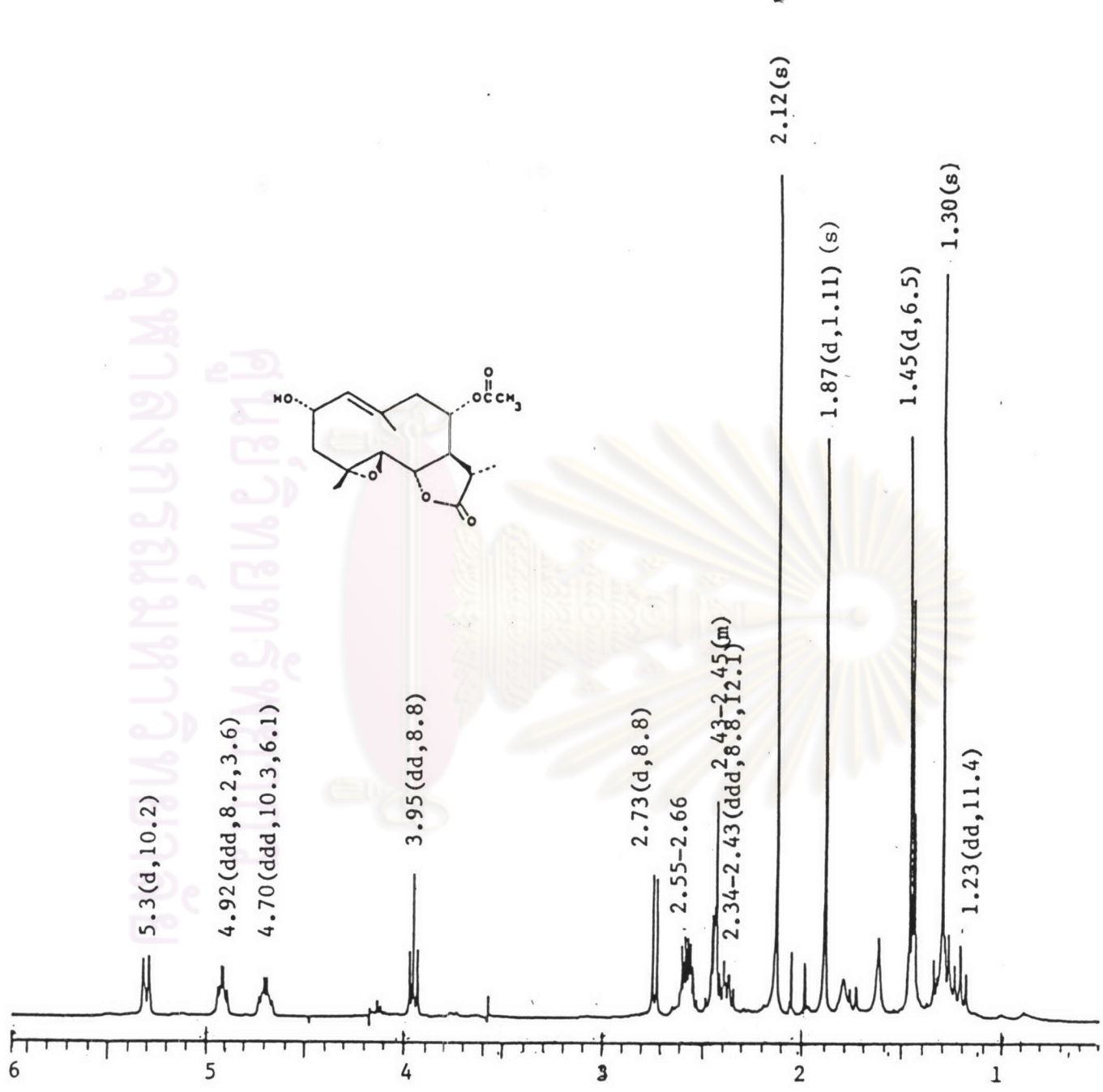


Figure 22 Proton NMR spectrum of MR-4 from *Michelia rajaniana* Craib.stem bark in $CDCl_3$.

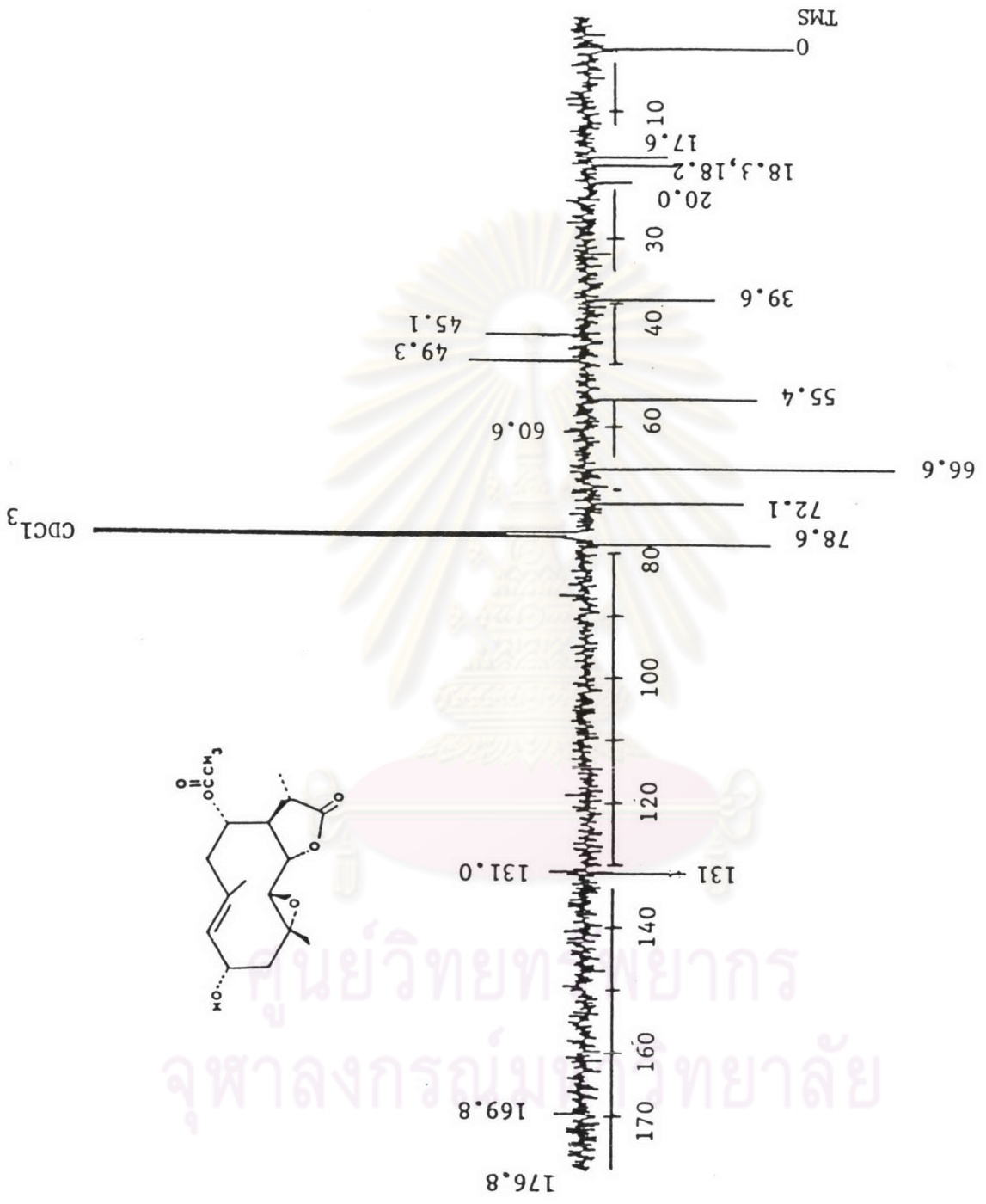


Figure 23 Carbon-13 NMR spectrum of MR-4 from *Michelia rajaniana* Craib.stem bark in $CDCl_3$.

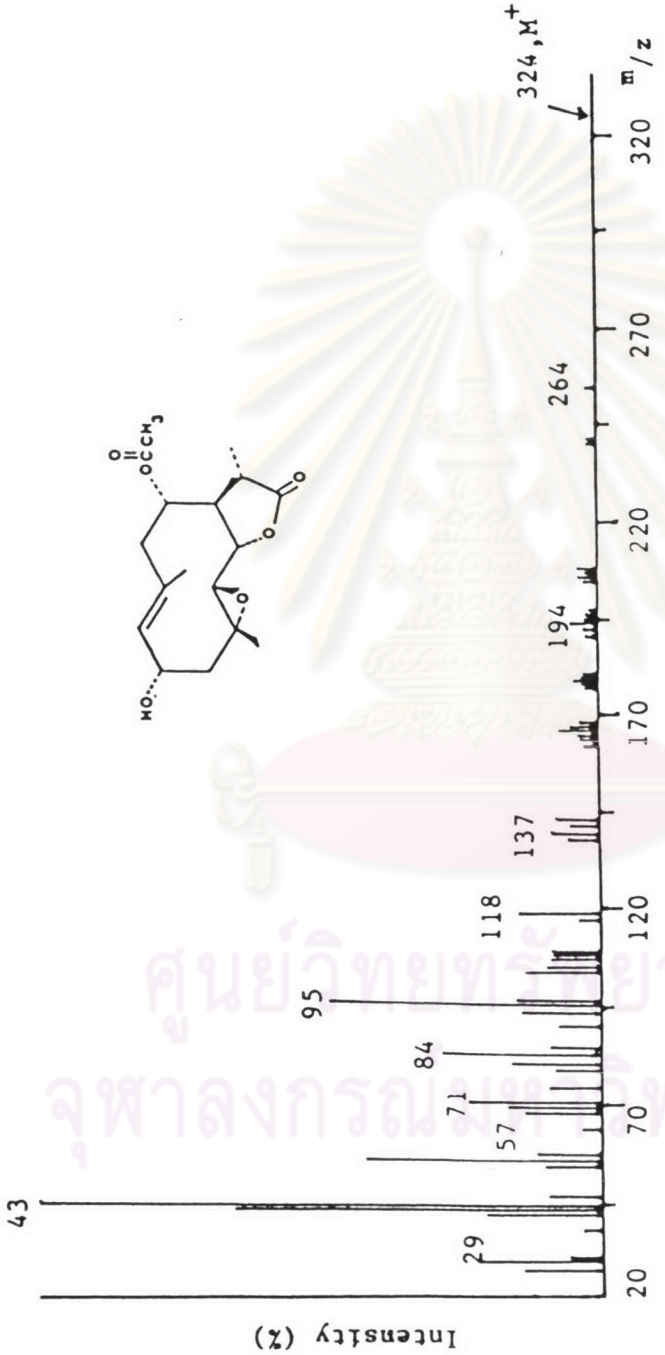


Figure 24 Mass spectrum of MR-4 from *Michelia rajaniana* Craib.stem bark.

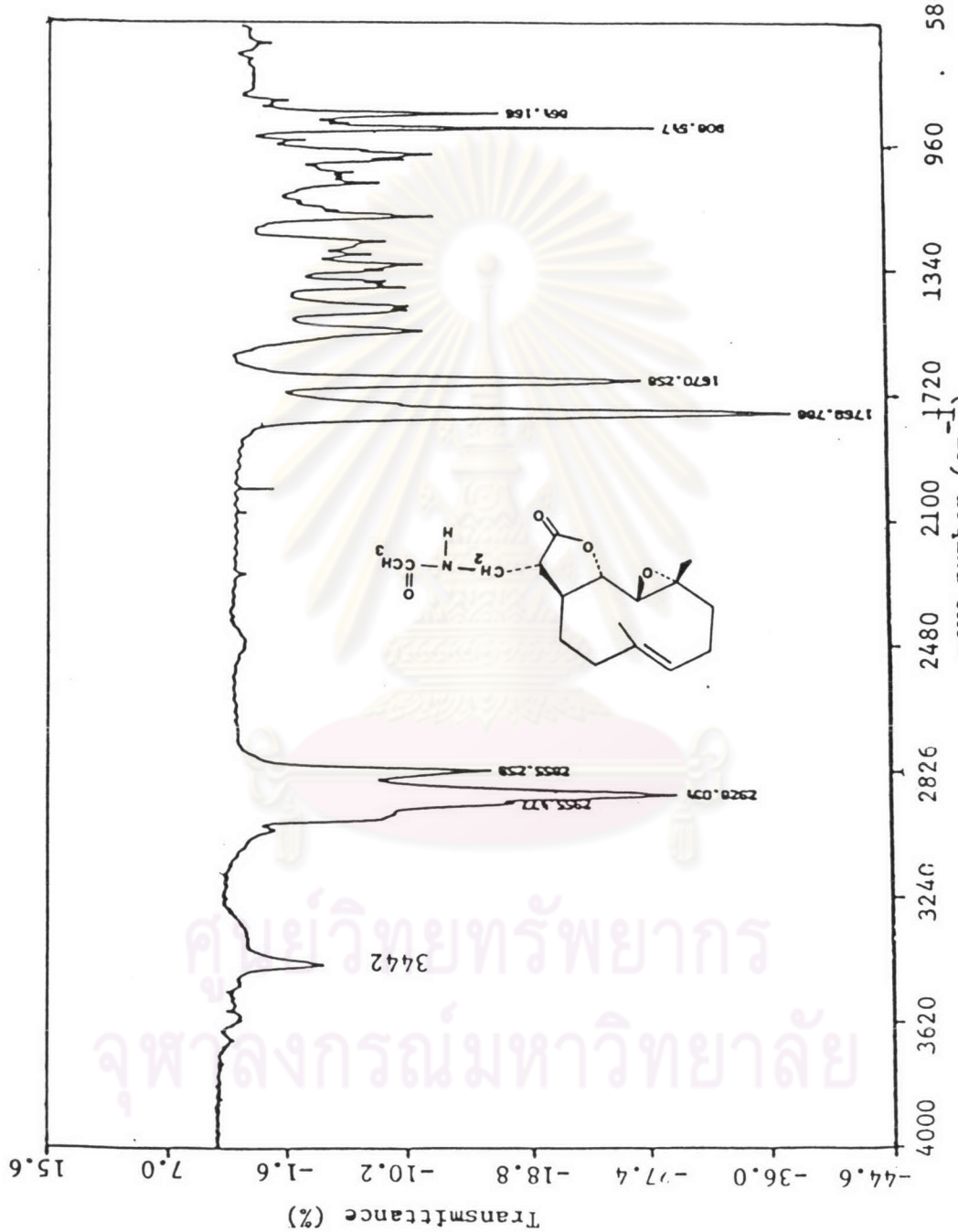


Figure 25 Infrared spectrum of MR-6 from *Michelia rajaniana* Craib.stem bark in $CHCl_3$.

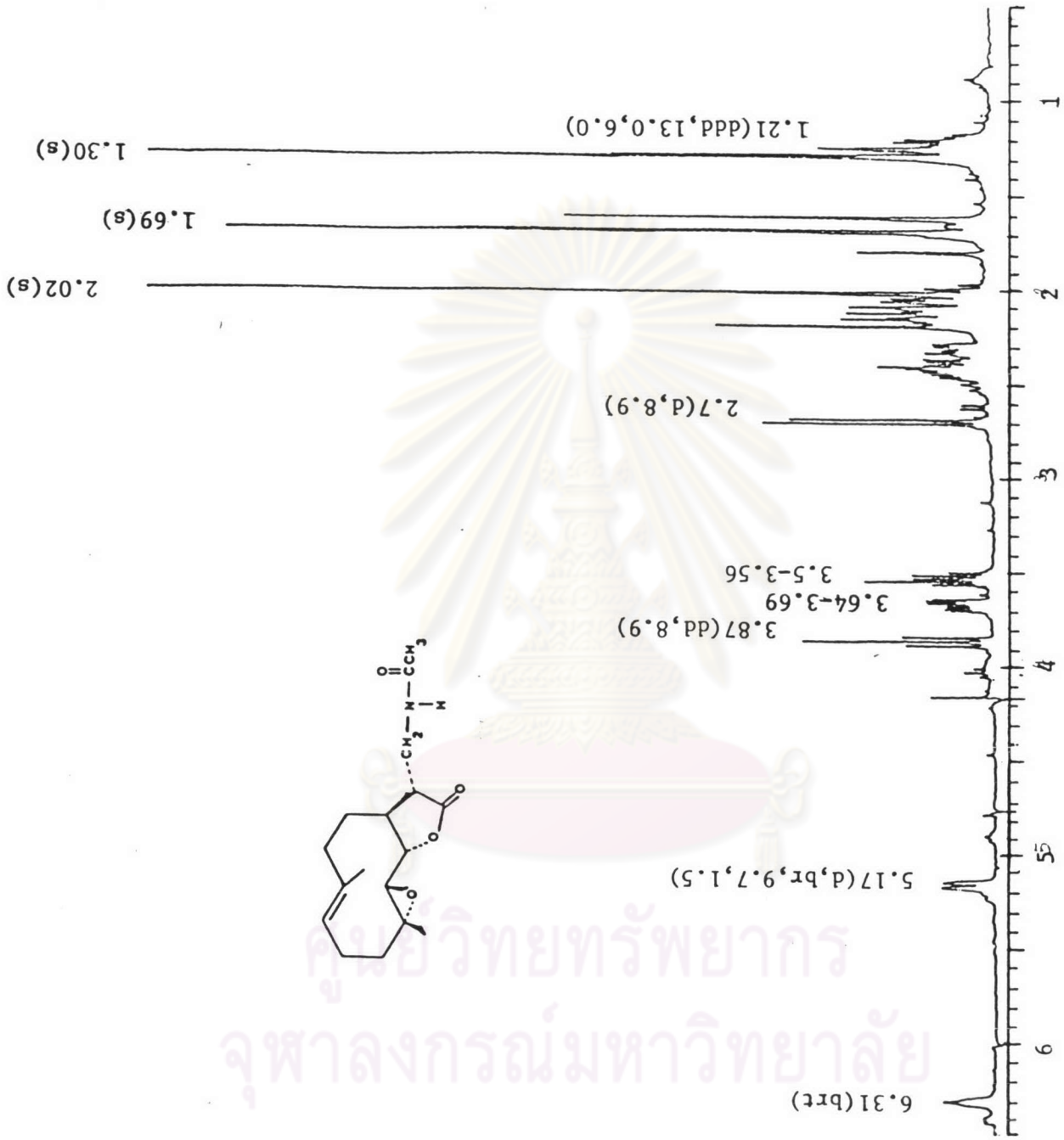


Figure 26 Proton NMR spectrum of MR-6 from *Michelia rajaniana* Craib.stem bark in $CDCl_3$.

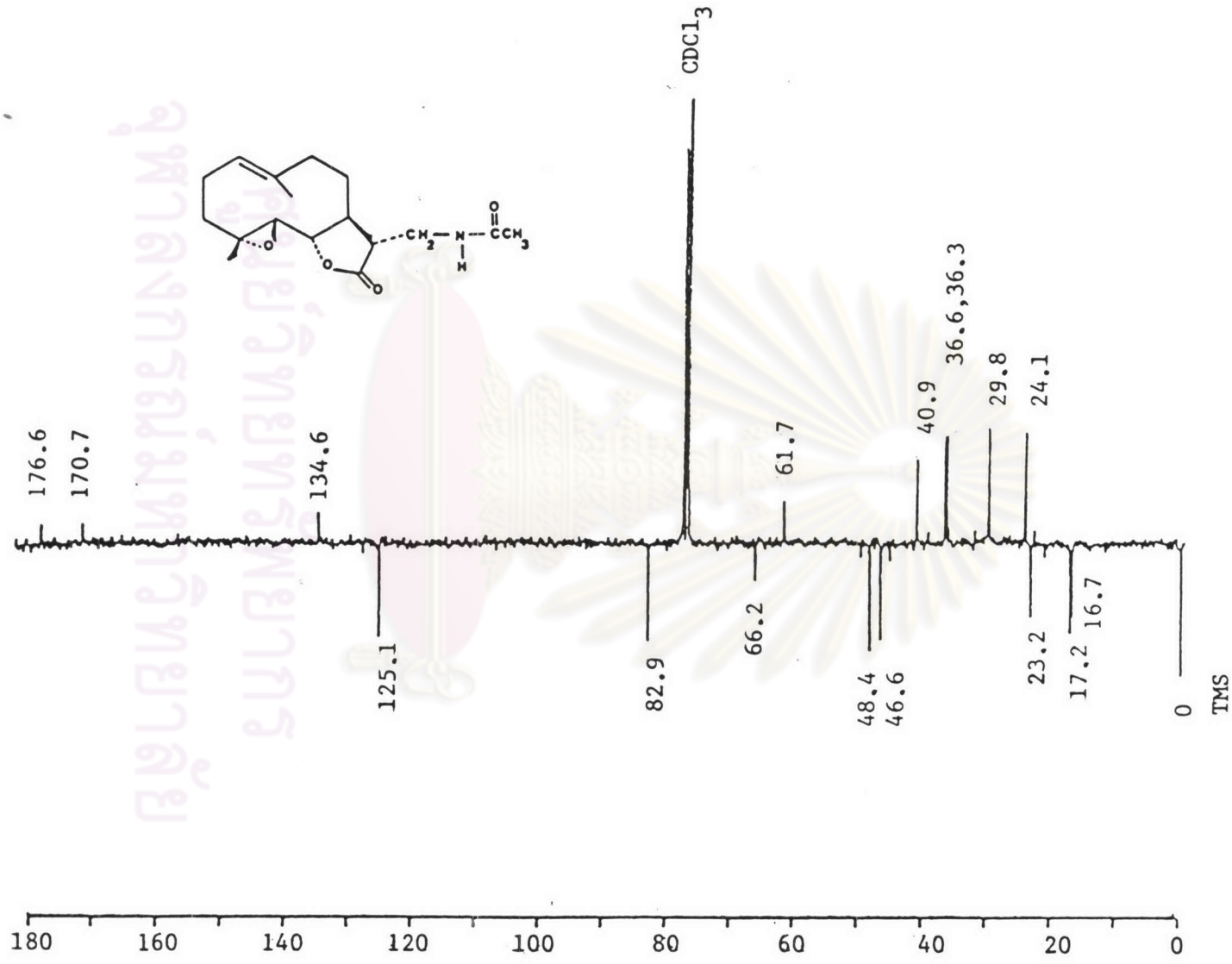


Figure 27 Carbon-13 NMR spectrum of MR-6 from *Michelia rajaniana* Craib.stem bark in $CDCl_3$.

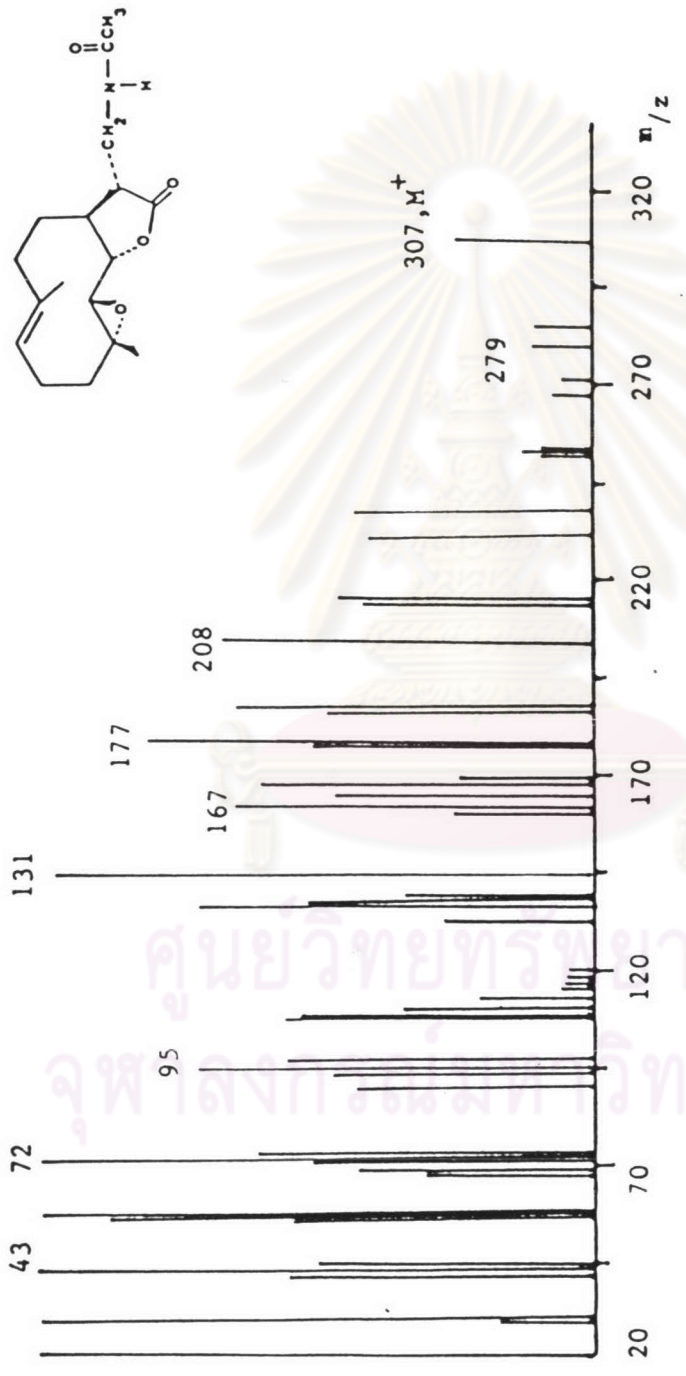


Figure 28 Mass spectrum of MR-6 from *Michelia rajaniana* Craib.stem bark.

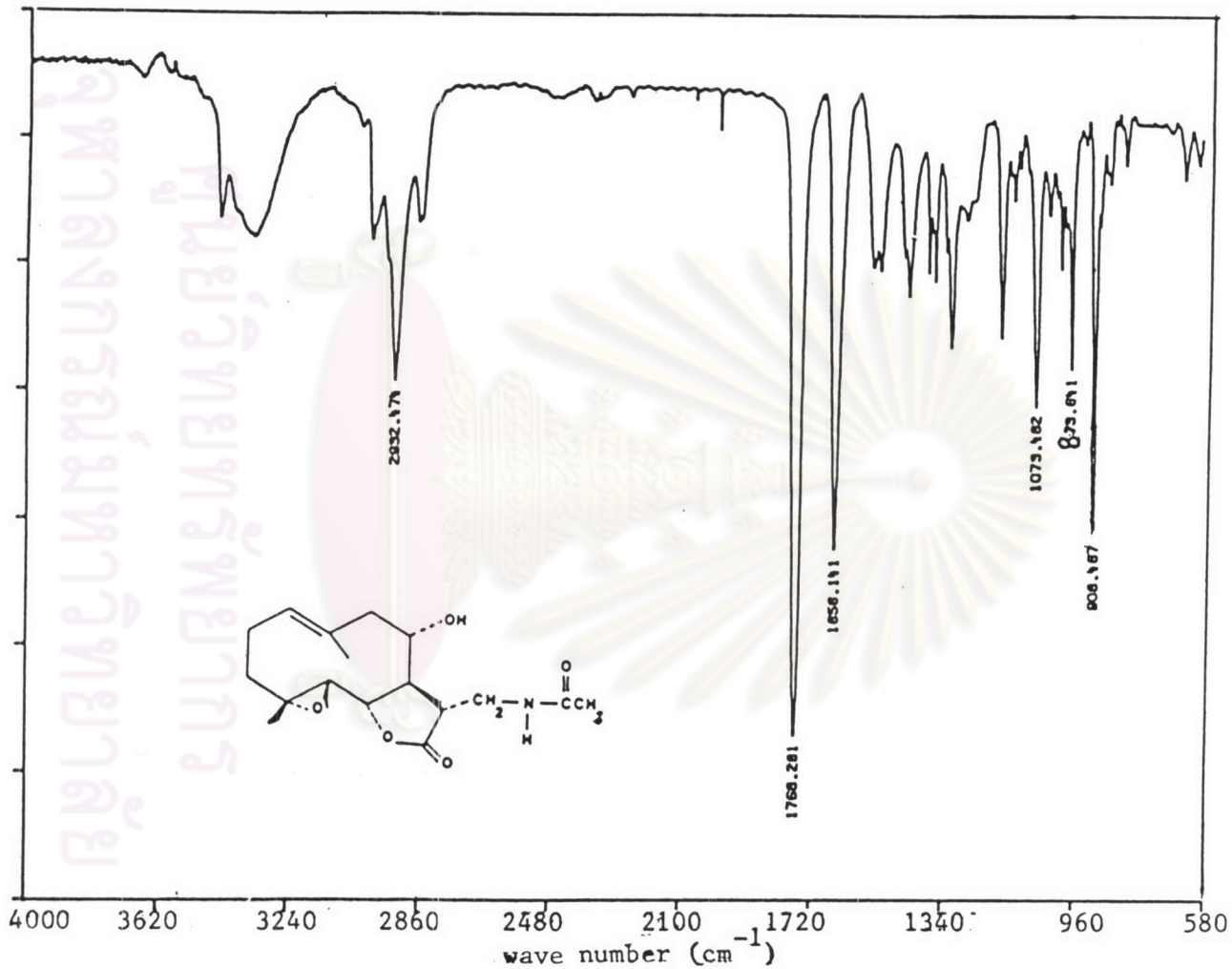


Figure 29 Infrared spectrum of MR-7 from *Michelia rajaniana* Craib.stem bark in $CHCl_3$.

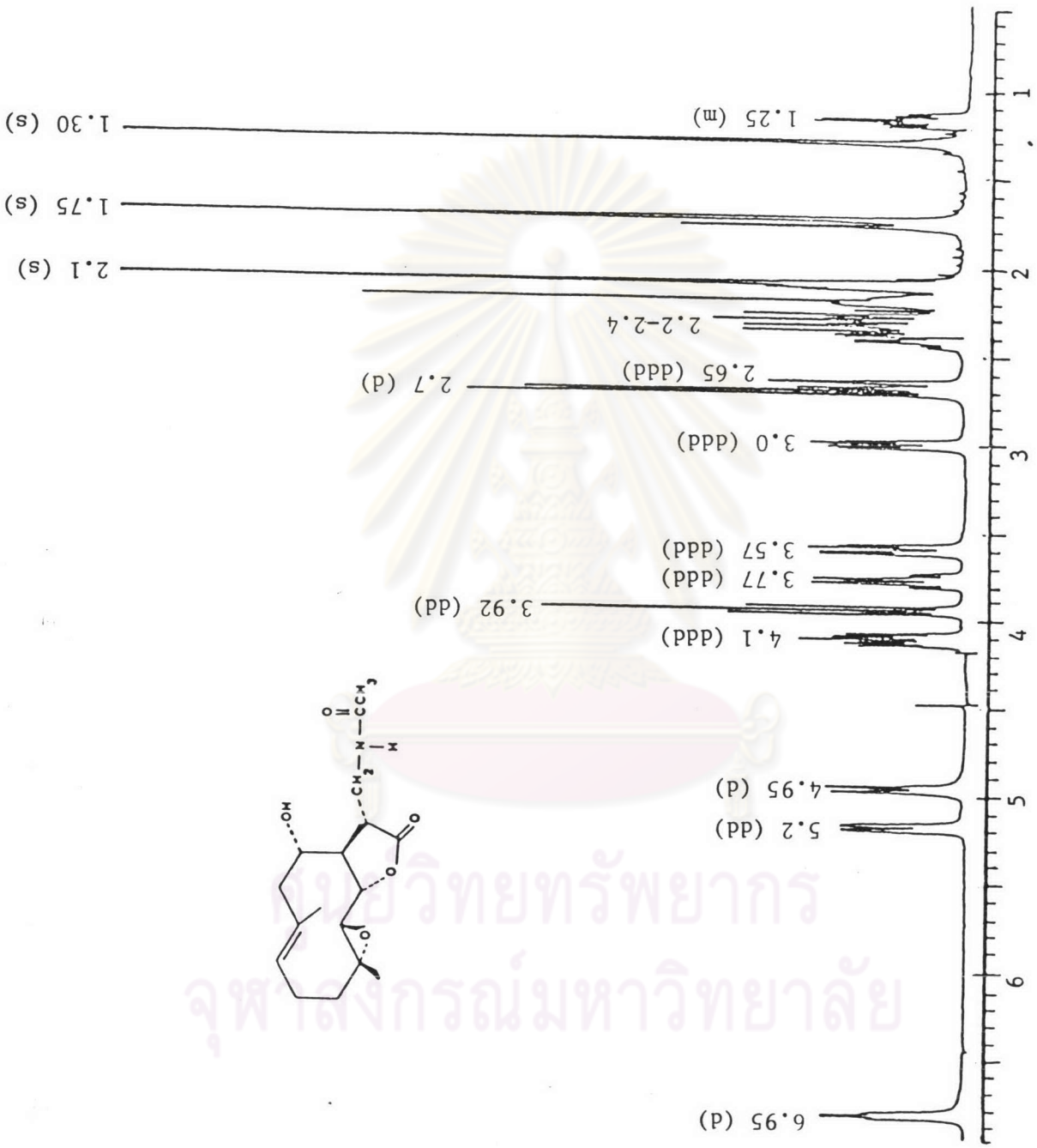


Figure 30 Proton NMR spectrum of MR-7 from *Michelia rajaniana* Craib.stem bark in $CDCl_3$.

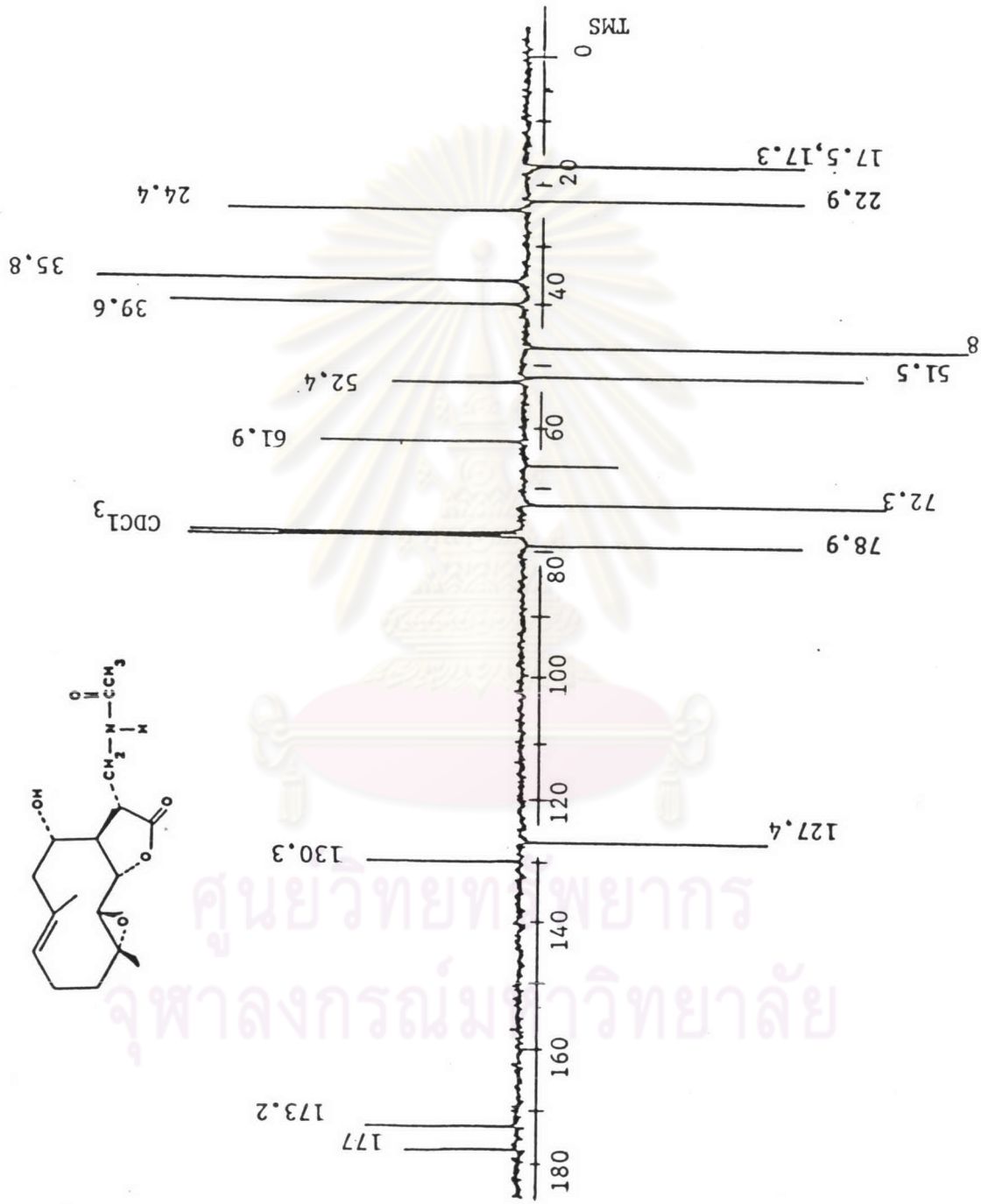


Figure 31 Carbon-13 spectrum of MR-7 from *Michelia rajaniana* C.taib.stem bark in $CDCl_3$.

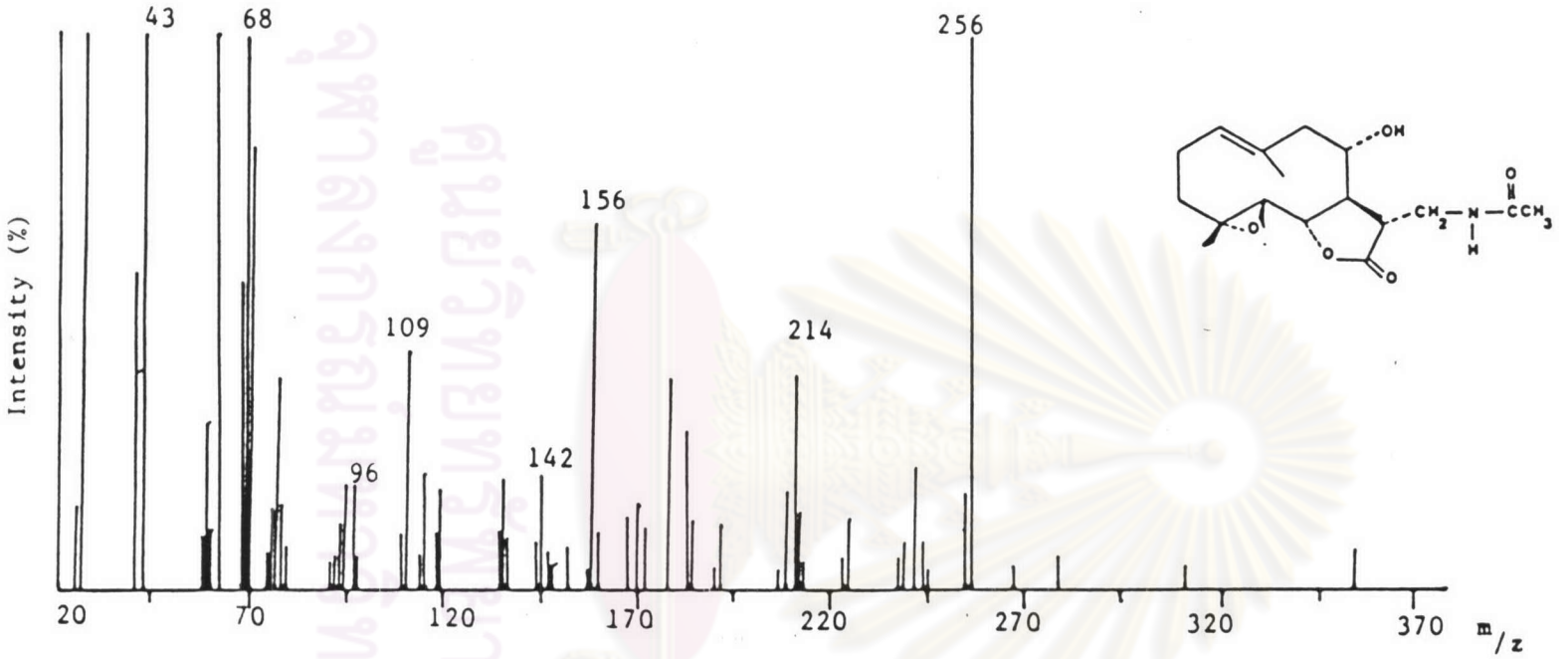


Figure 32 Mass spectrum of MR-7 from *Michelia rajaniana* Craib, stem bark.

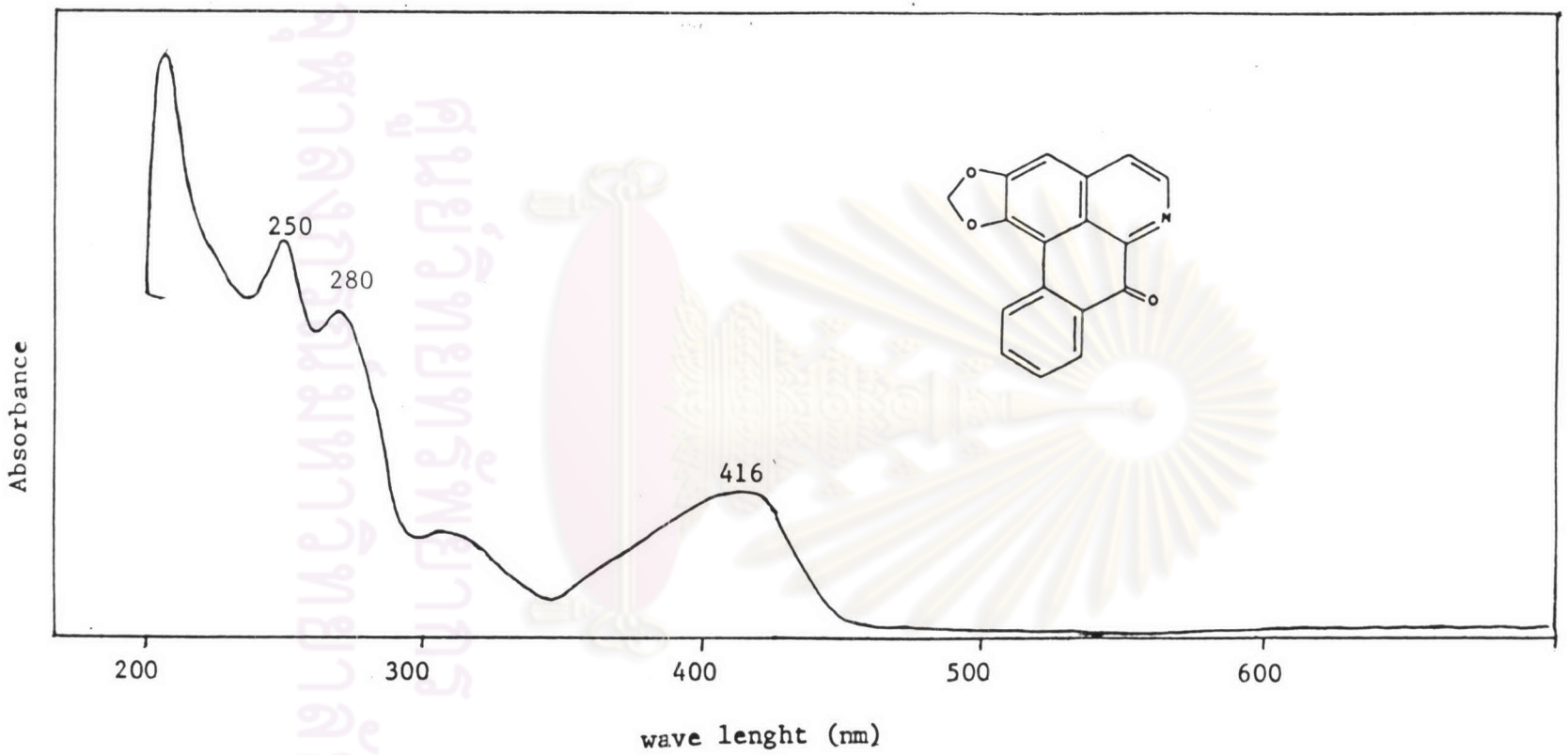


Figure 33 Ultraviolet-visible spectrum of MR-8 from *Michelia rajaniana* Craib.stem bark in 95% ethanol.

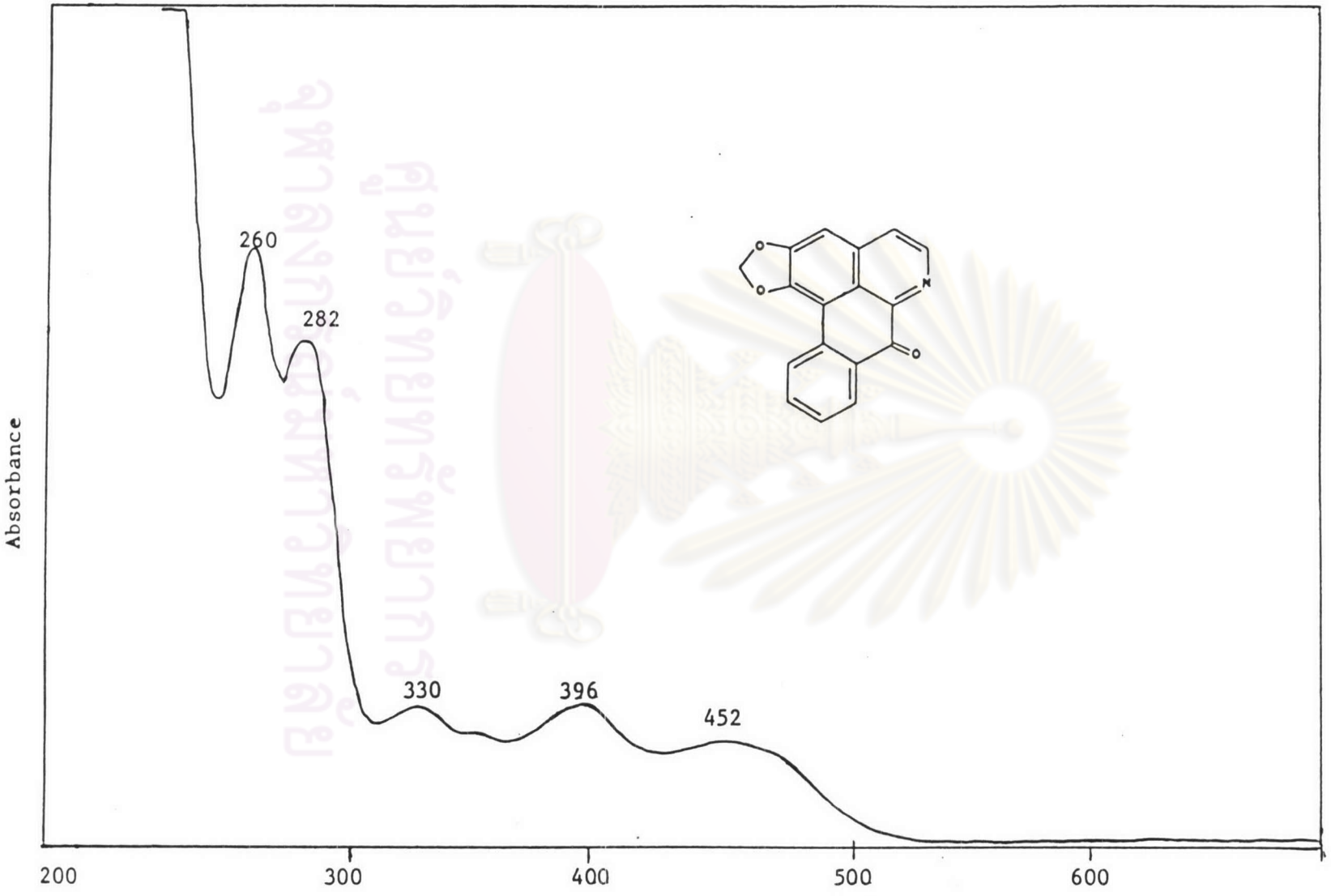


Figure 34 ultraviolet-visible spectrum of MR-8 from *Michlia rajaniana* Craib.stem bark in 0.1N HCl in ethanol

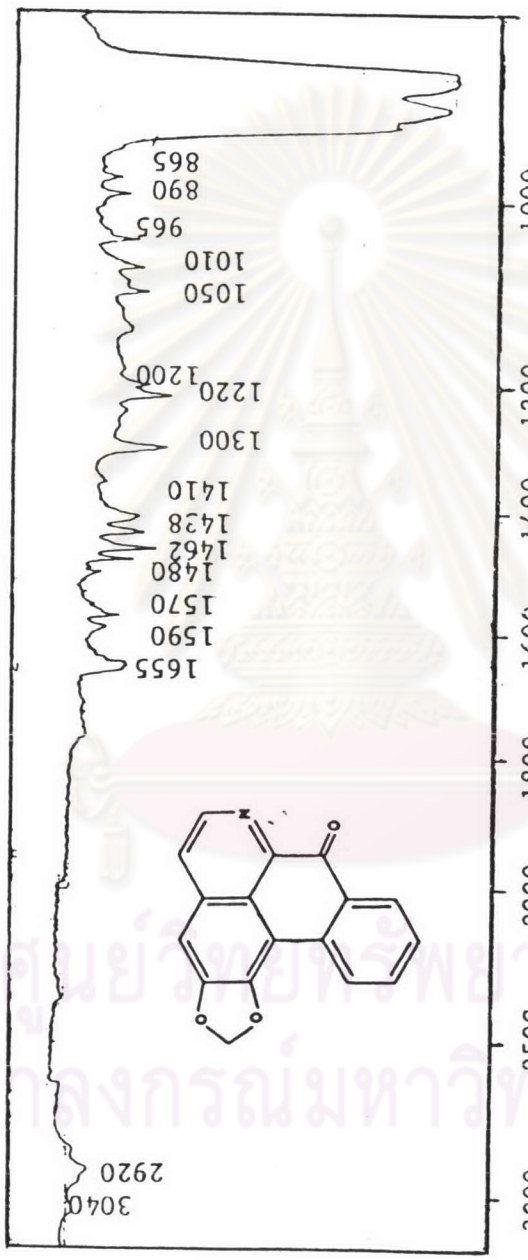


Figure 35 Infrared spectrum of MR-8 from *Michelia rajaniana* Craib.stem bark in dichloromethane

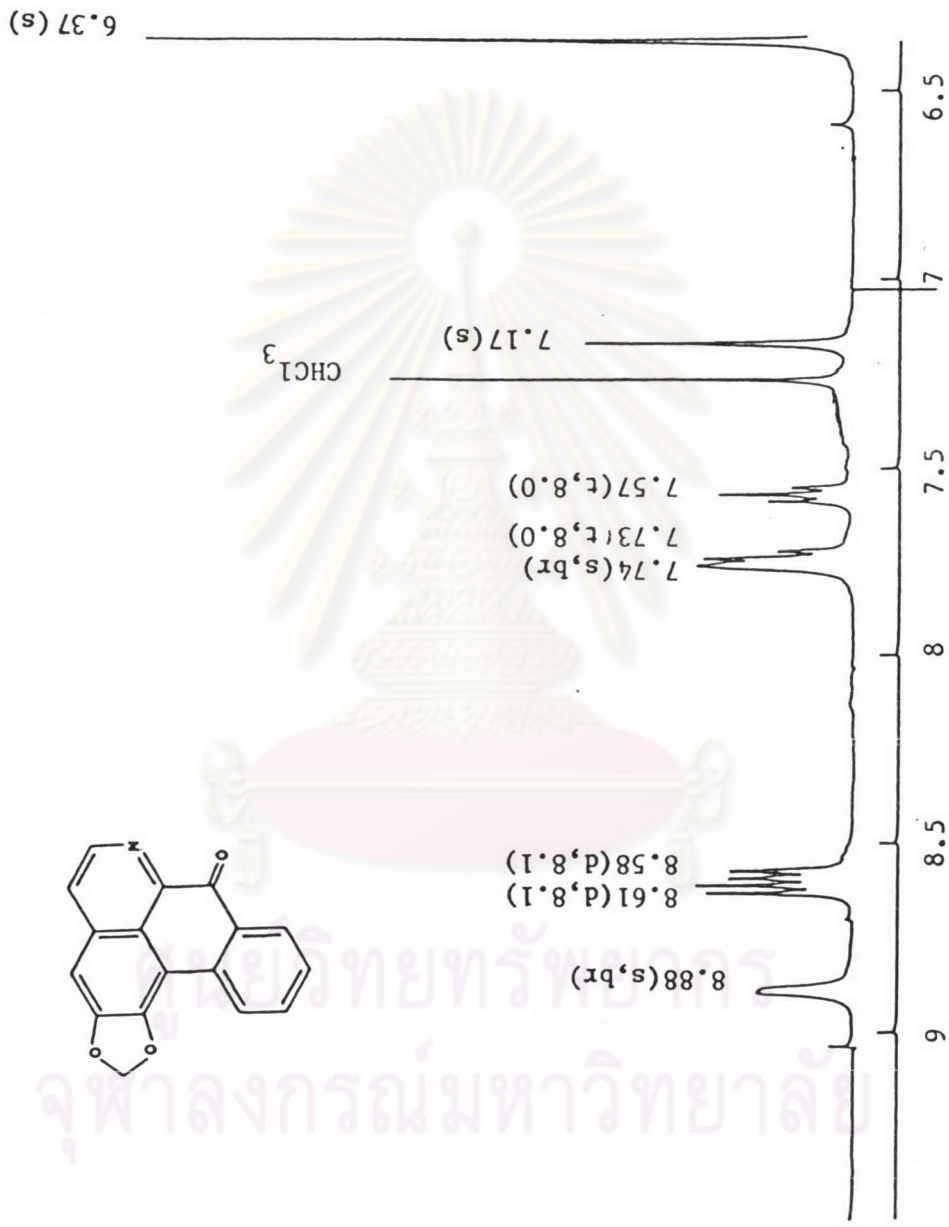


Figure 36 Proton NMR spectrum of MR-8 from *Michelia rajaniana* Craib.stem bark in $CDCl_3$.

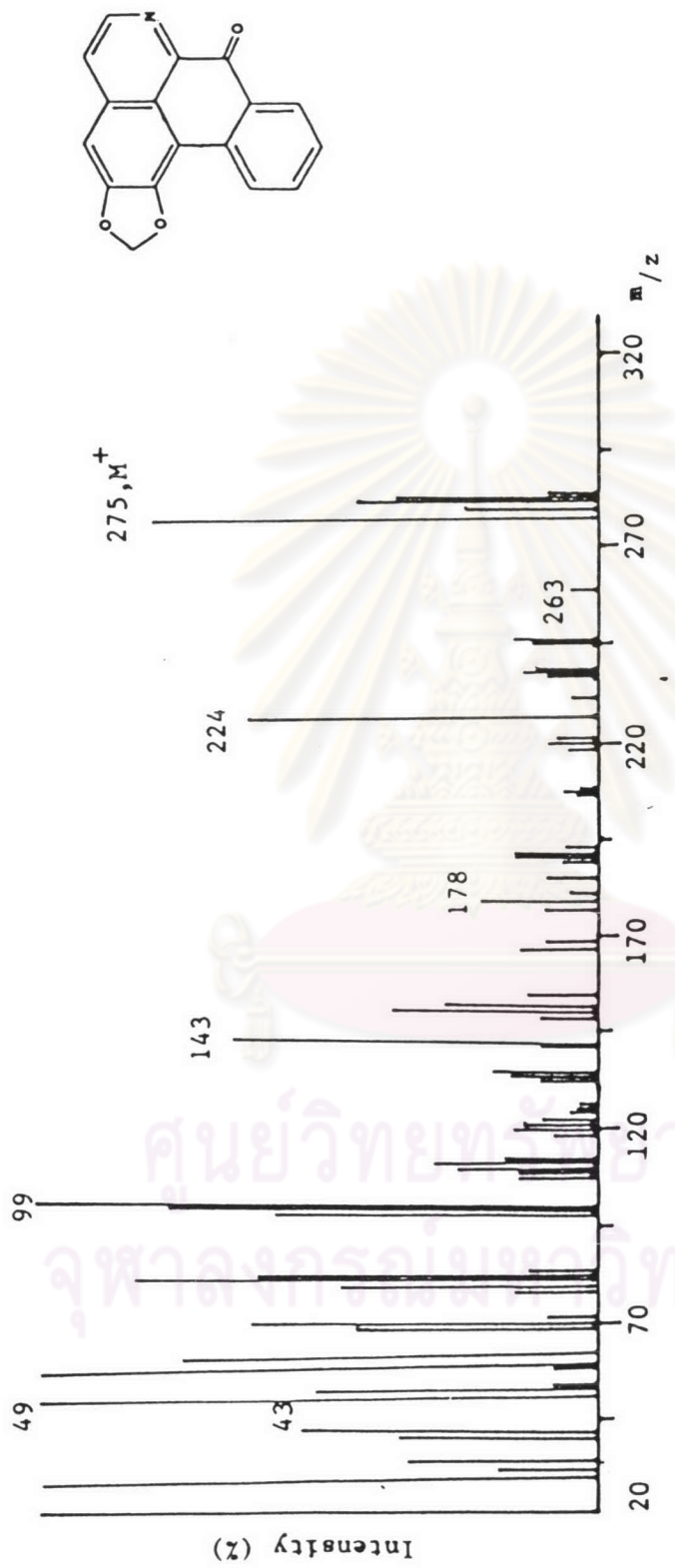


Figure 37 Mass spectrum of MR-8 from *Michelia rajaniana* Craib.stem bark.

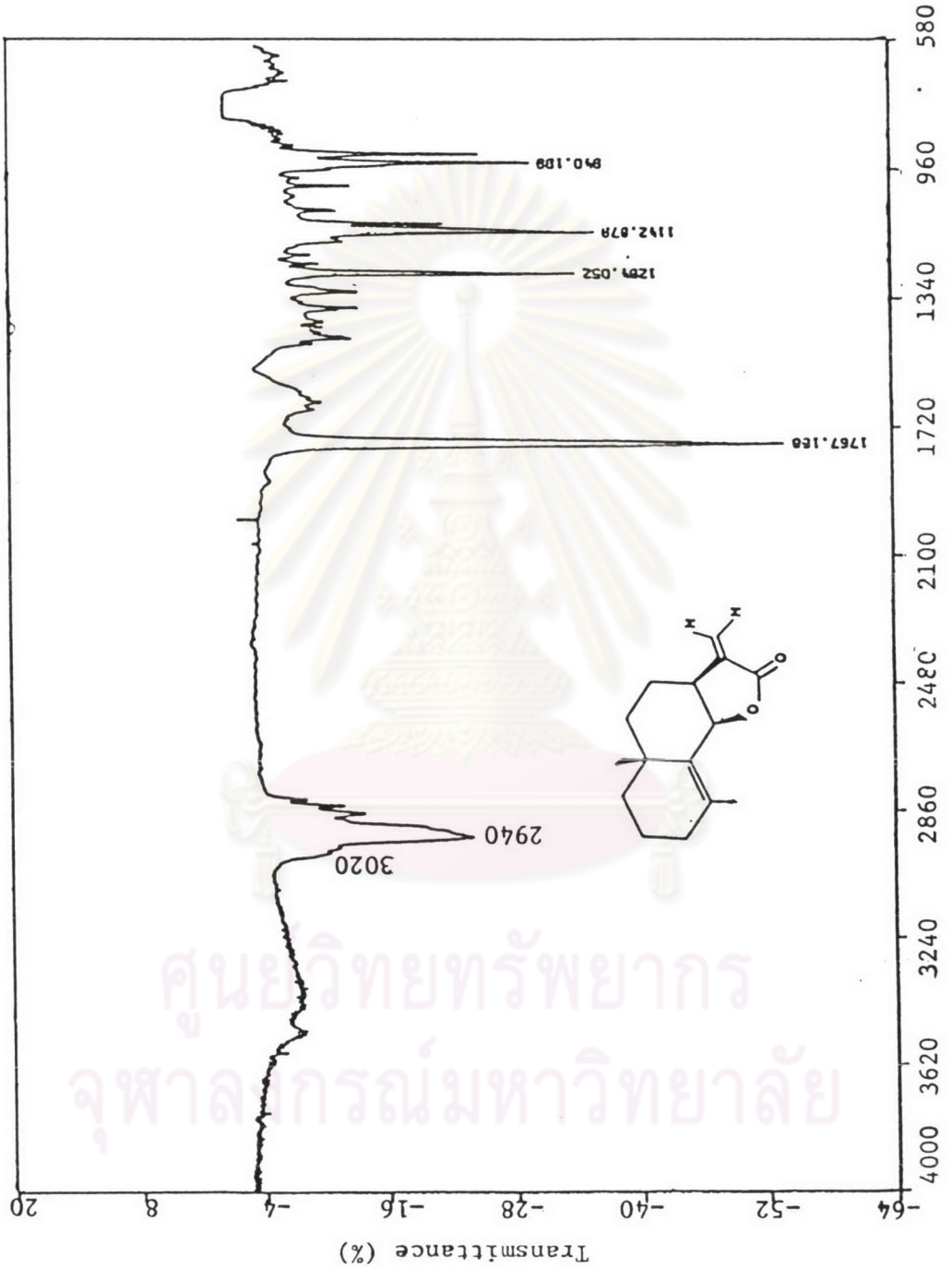


Figure 38 Infrared spectrum of GM-1 from *Grangea maderaspatana* . Poir. in CCl_4.

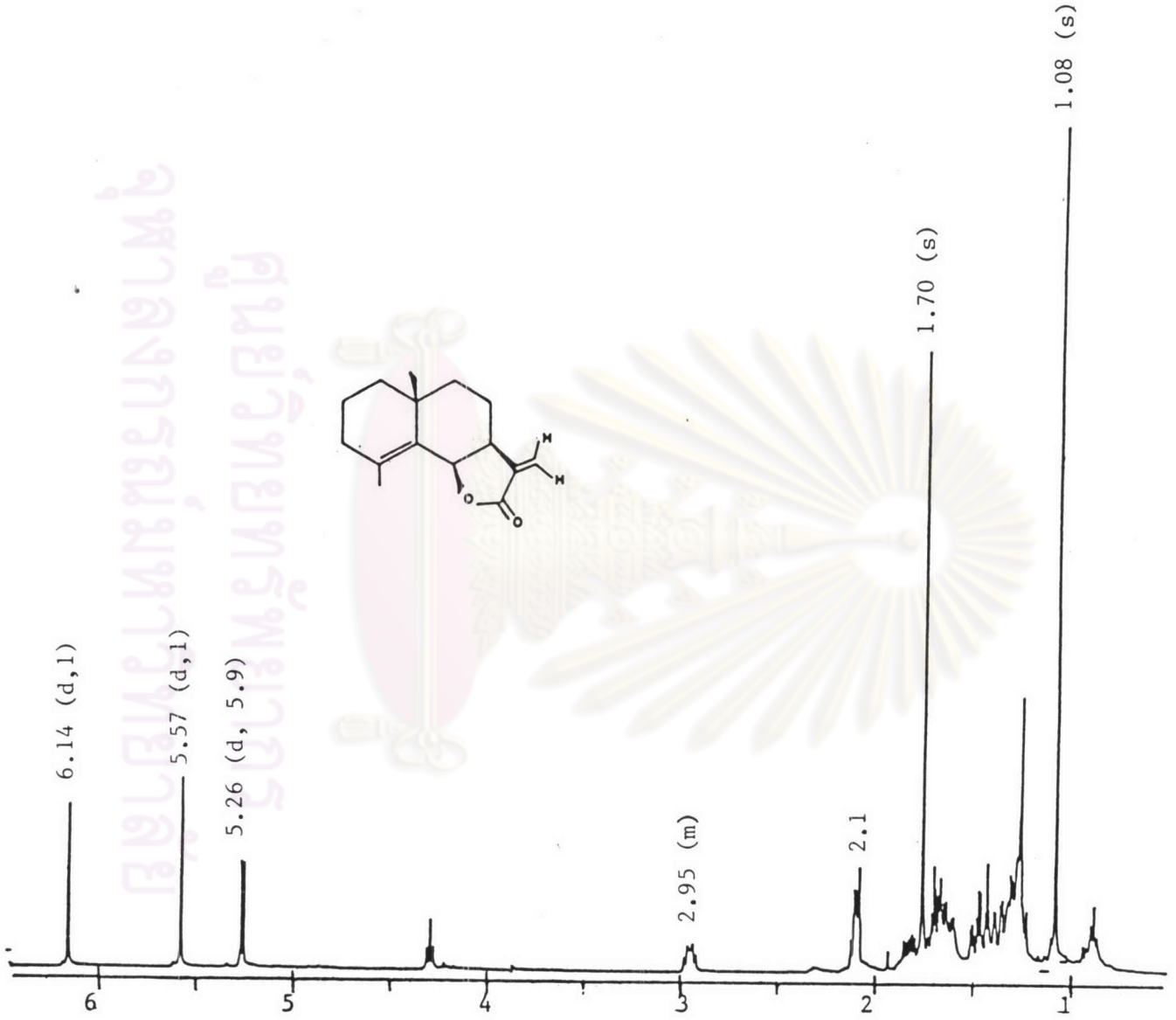


Figure 39 Proton NMR spectrum of GM-1 from *Grangea maderaspatana* Poir.in$CDCl_3$.

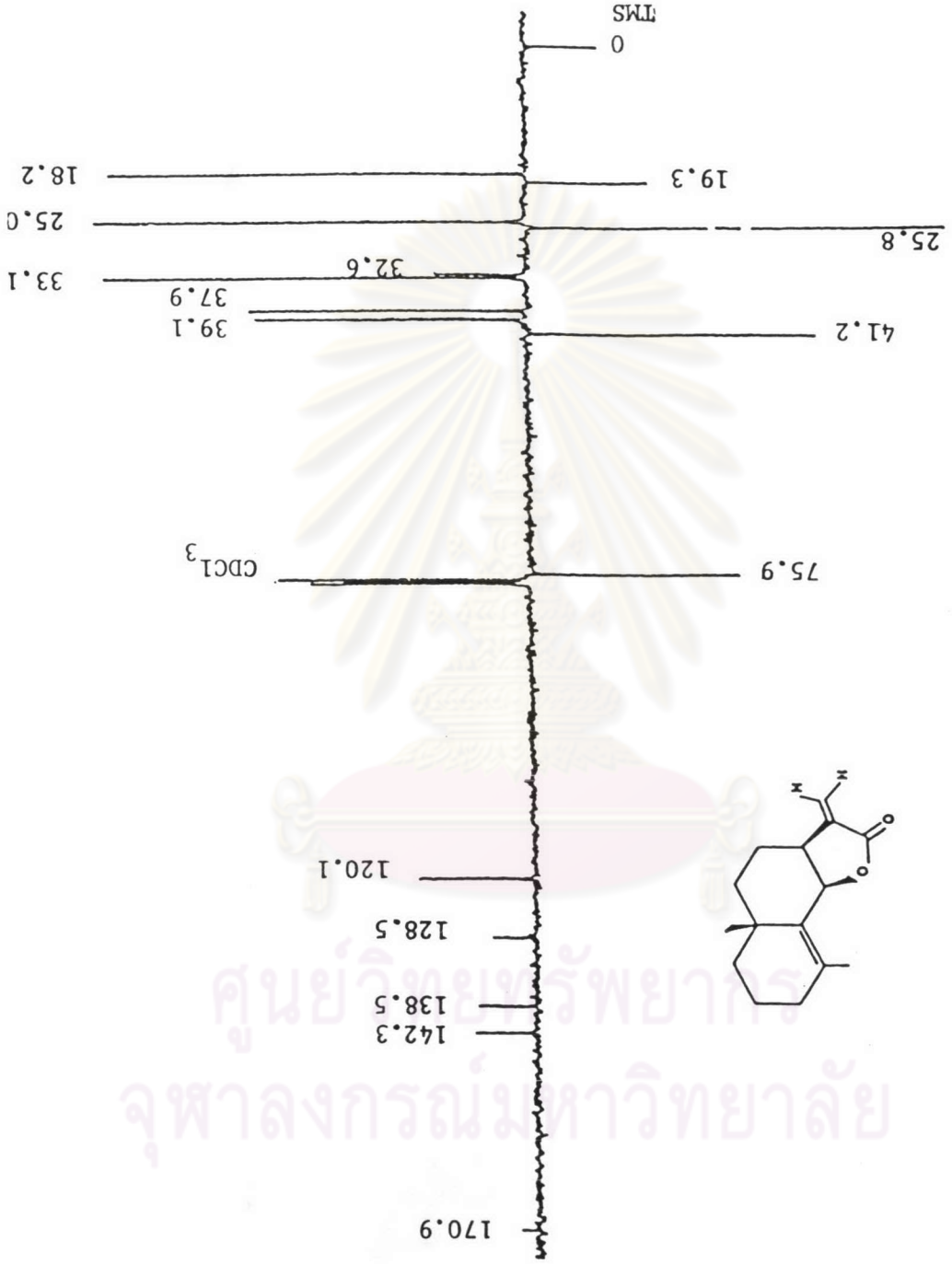


Figure 40 Carbon-13 NMR spectrum of GM-1 from *Grangea maderaspatana* Poir.in$CDCl_3$.

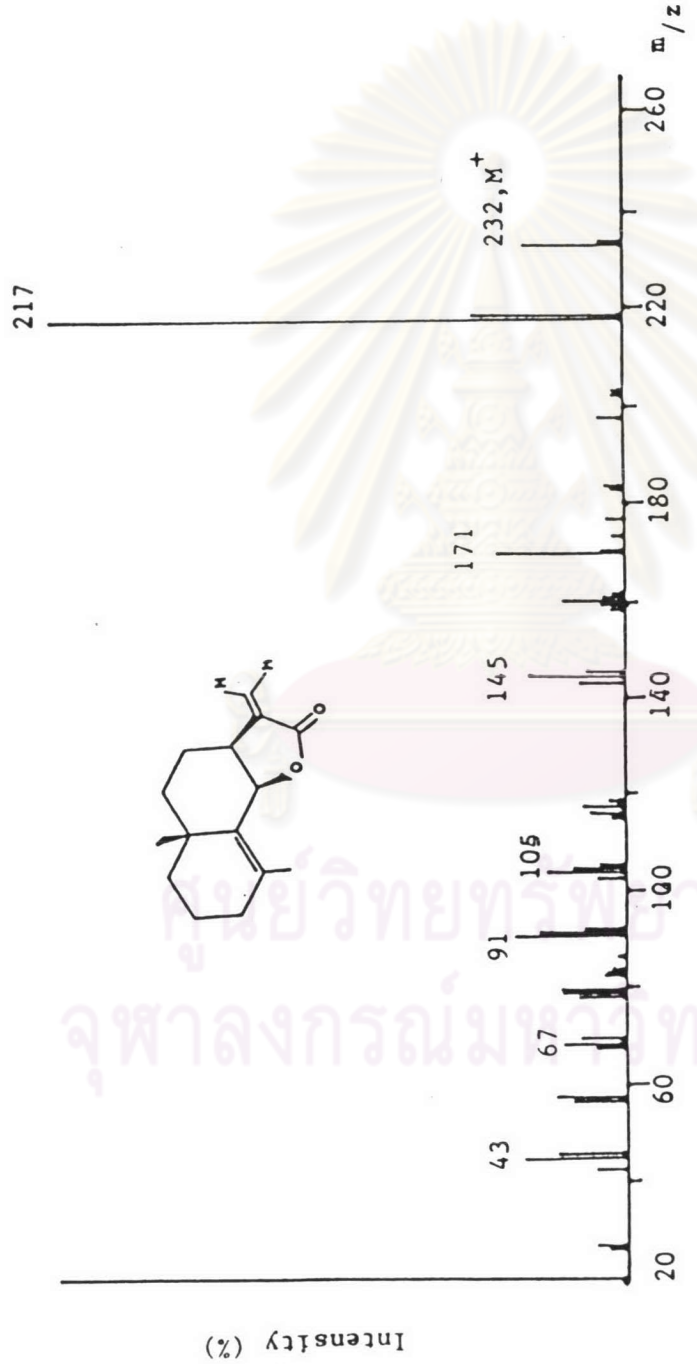
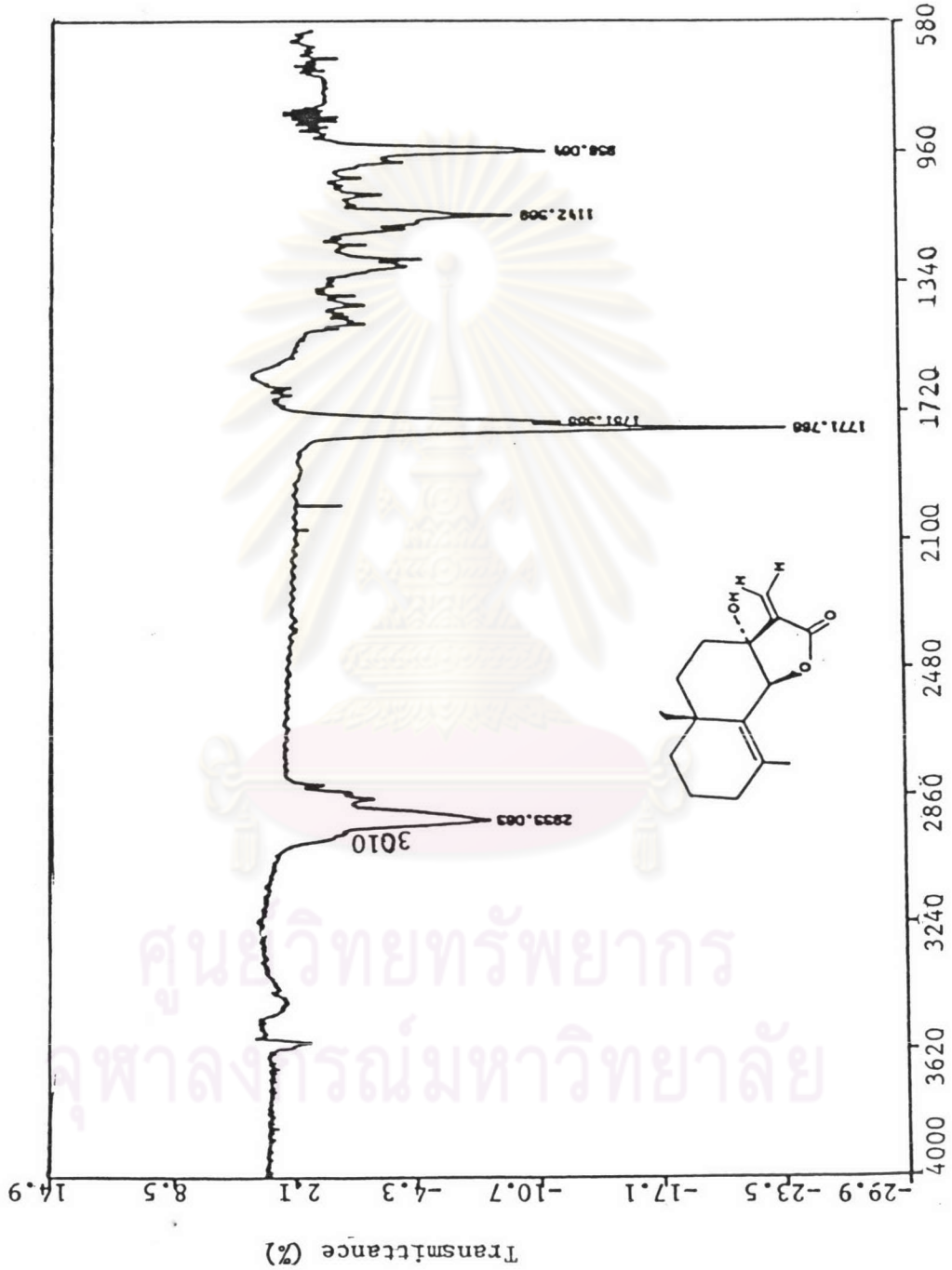


Figure 41 Mass spectrum of GM-1 from *Grangea maderaspatana* Poir.



Figer 42 Infrared spectrum of GM-2 from *Grangea maderaspatana* Poir. in CCl_4.

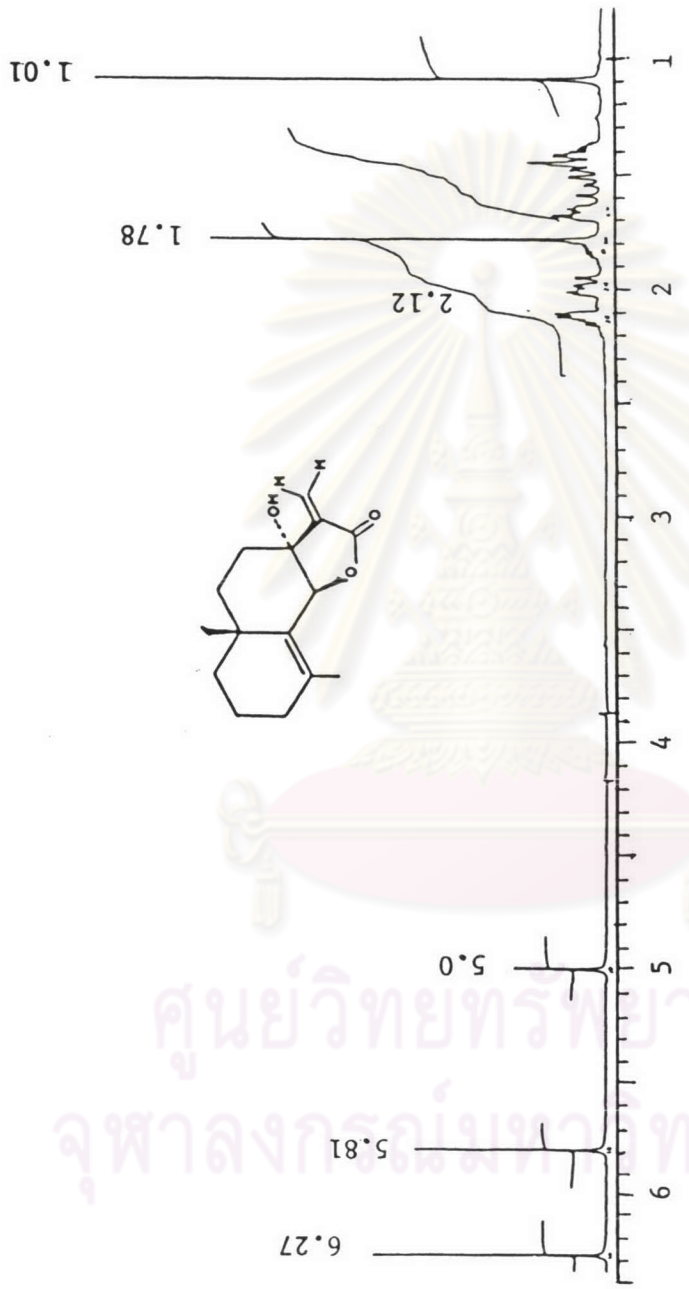


Figure 43 Proton NMR spectrum of GM-2 from *Grangea maderaspatana* Poir.in $CDCl_3$.

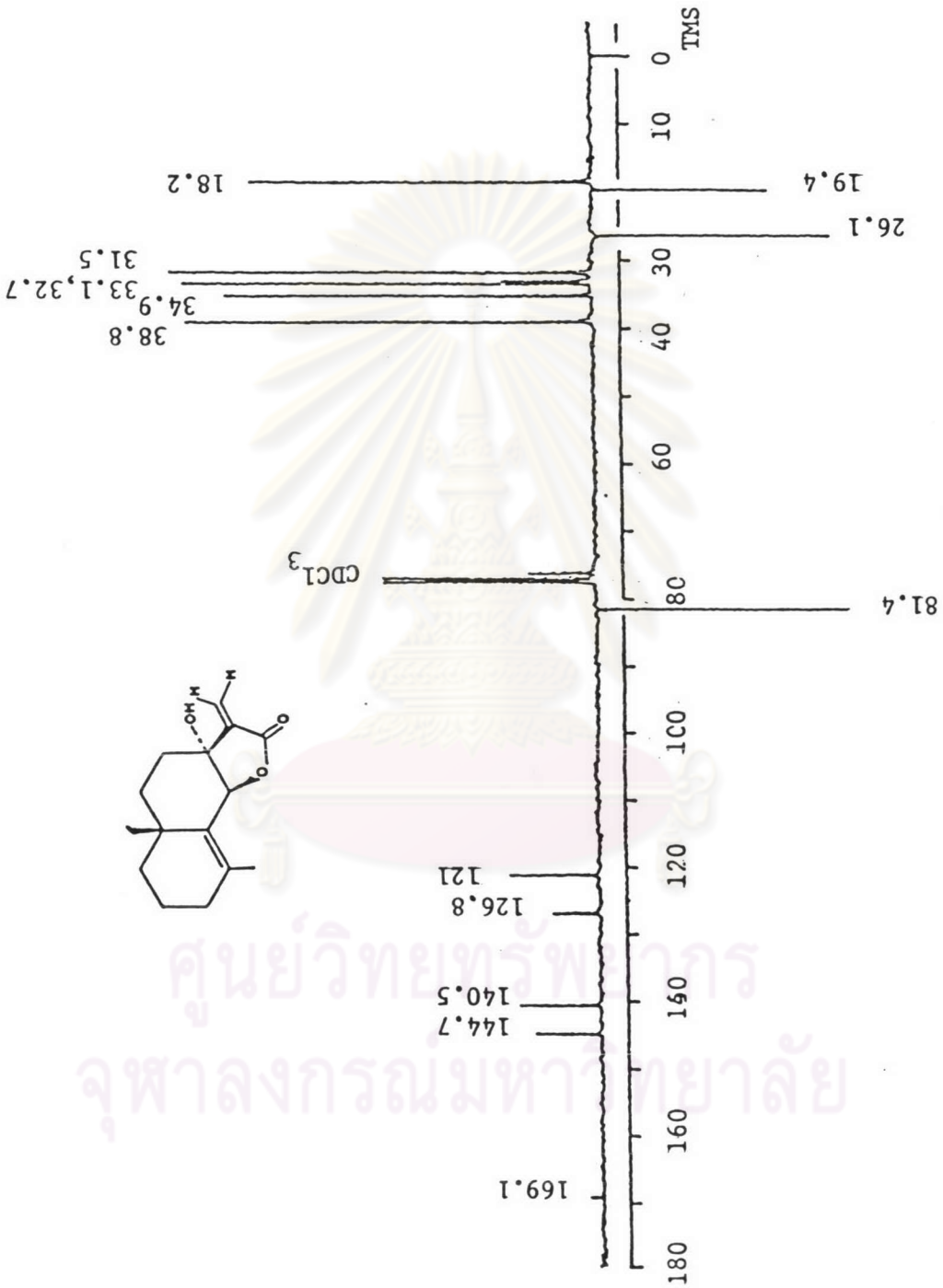


Figure 44 Carbon-13 NMR spectrum of GM-2 from *Grangea maderaspatana* Poir.in $CDCl_3$.

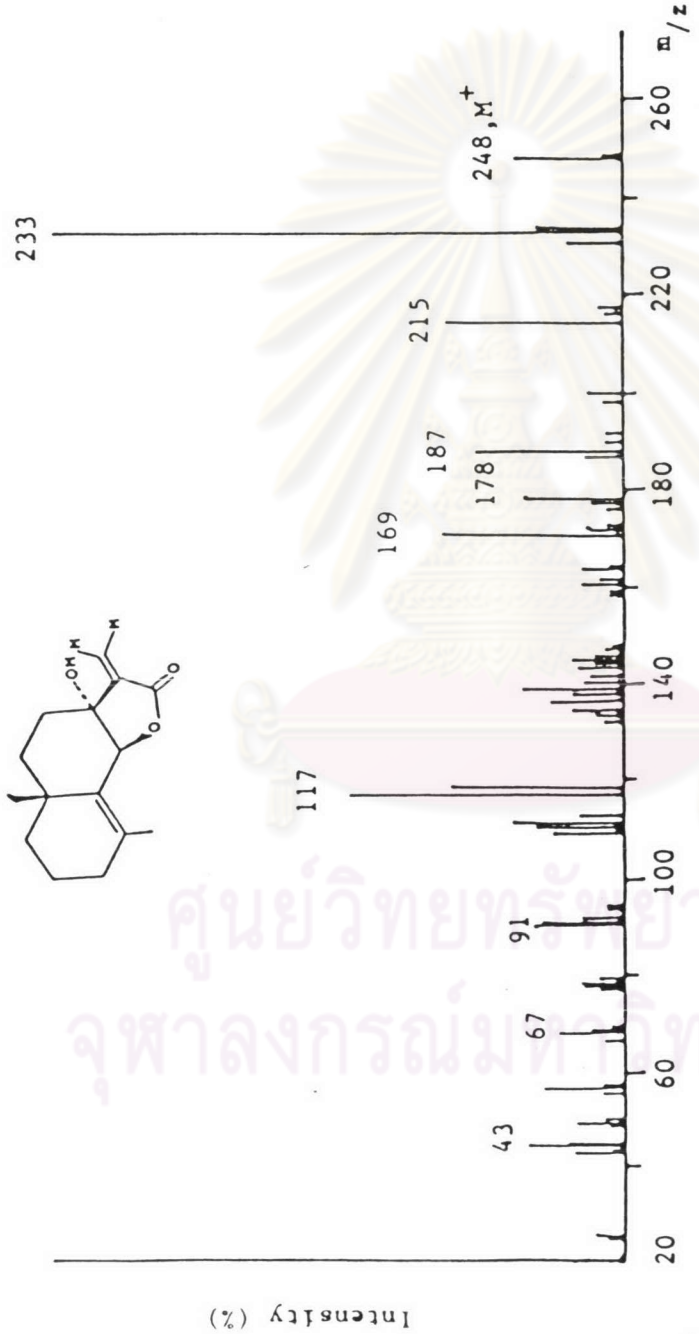


Figure 45 Mass spectrum of GM-2 from *Grangea maderaspatana* Poir.

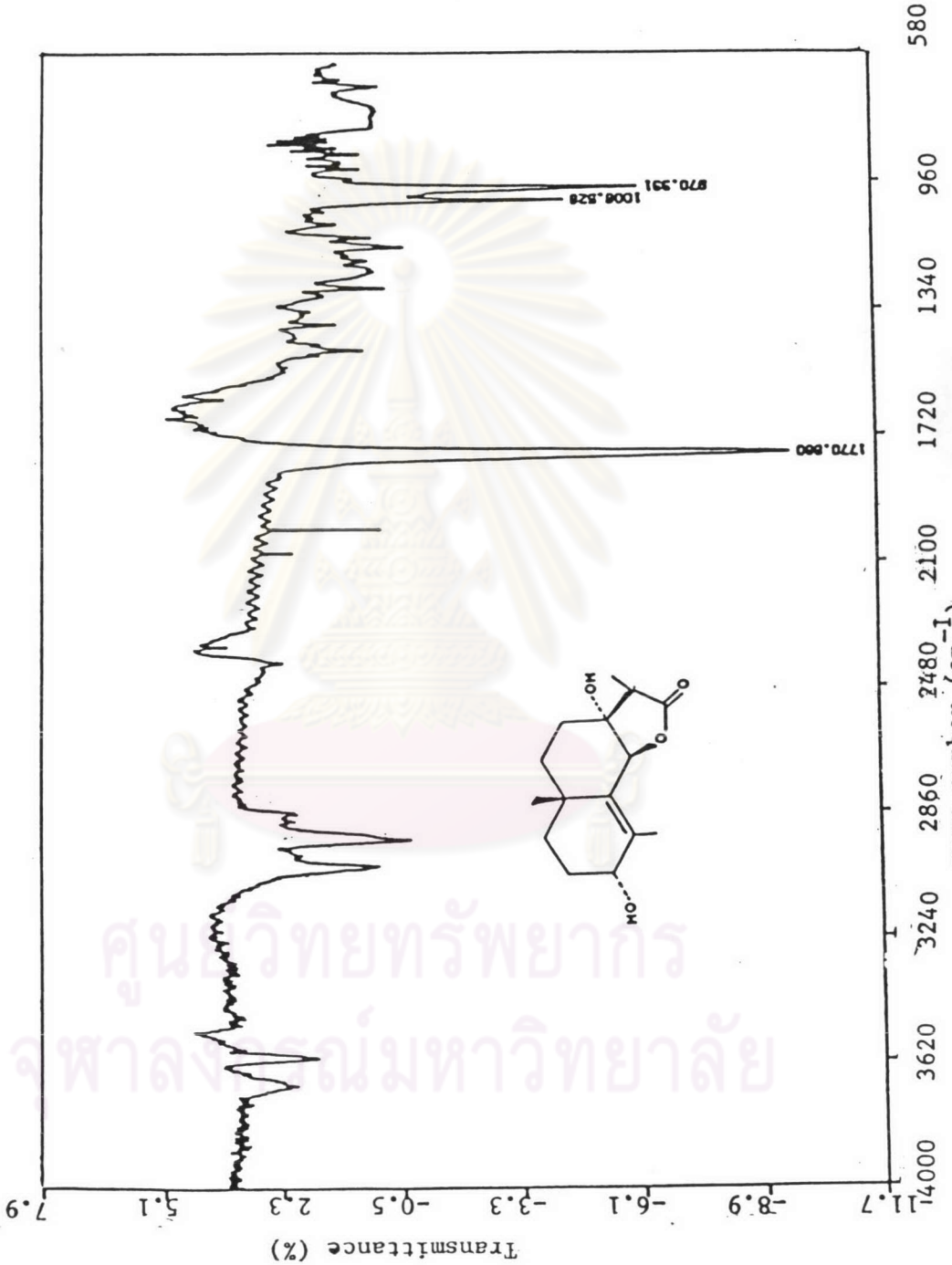


Figure 46 Infrared spectrum of GM-3 from *Grangea maderaspatana* Poir.in $CHCl_3$.

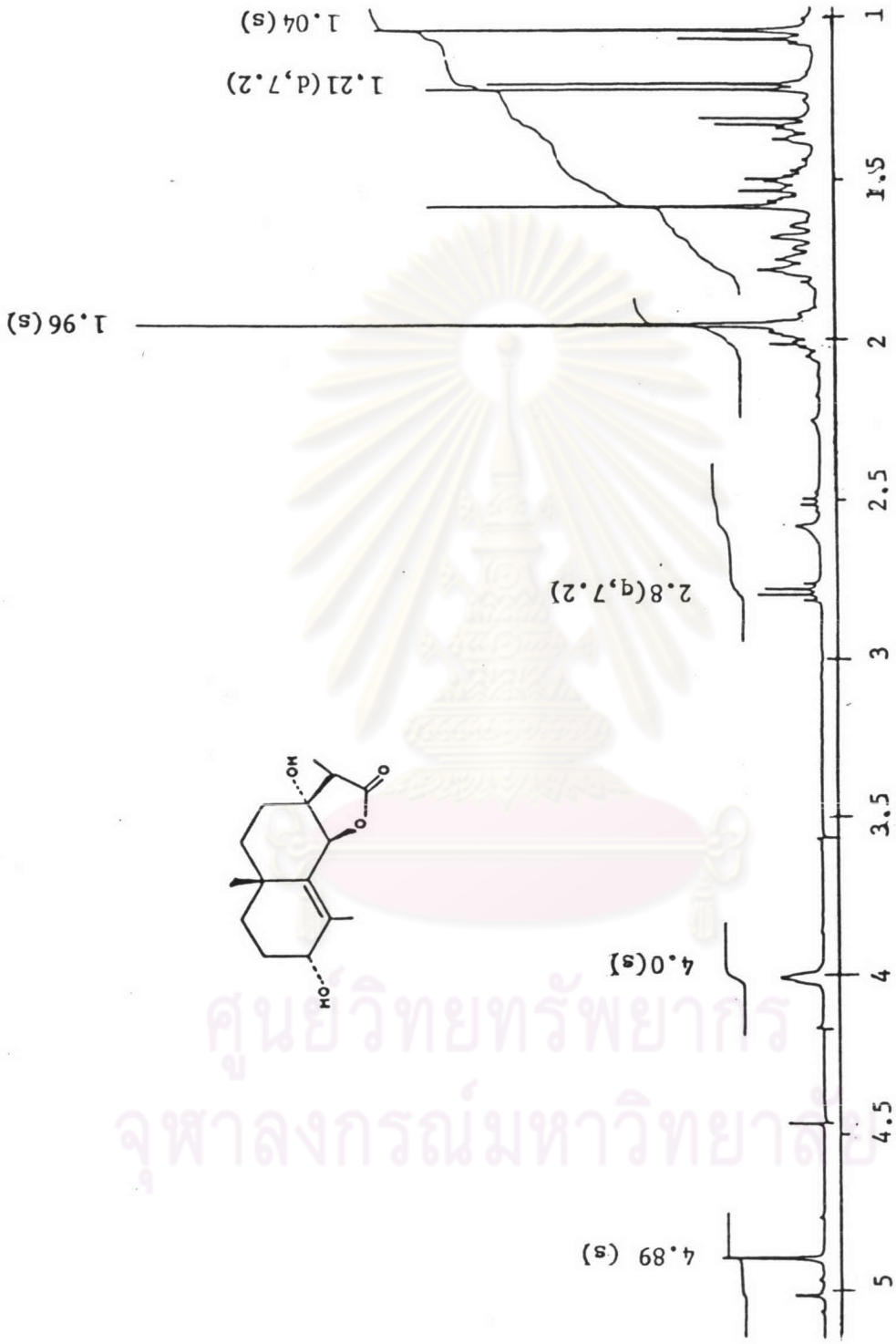


Figure 47 Proton NMR spectrum of GM-3 from *Grangea maderaspatana* Poir. in $CDCl_3$.

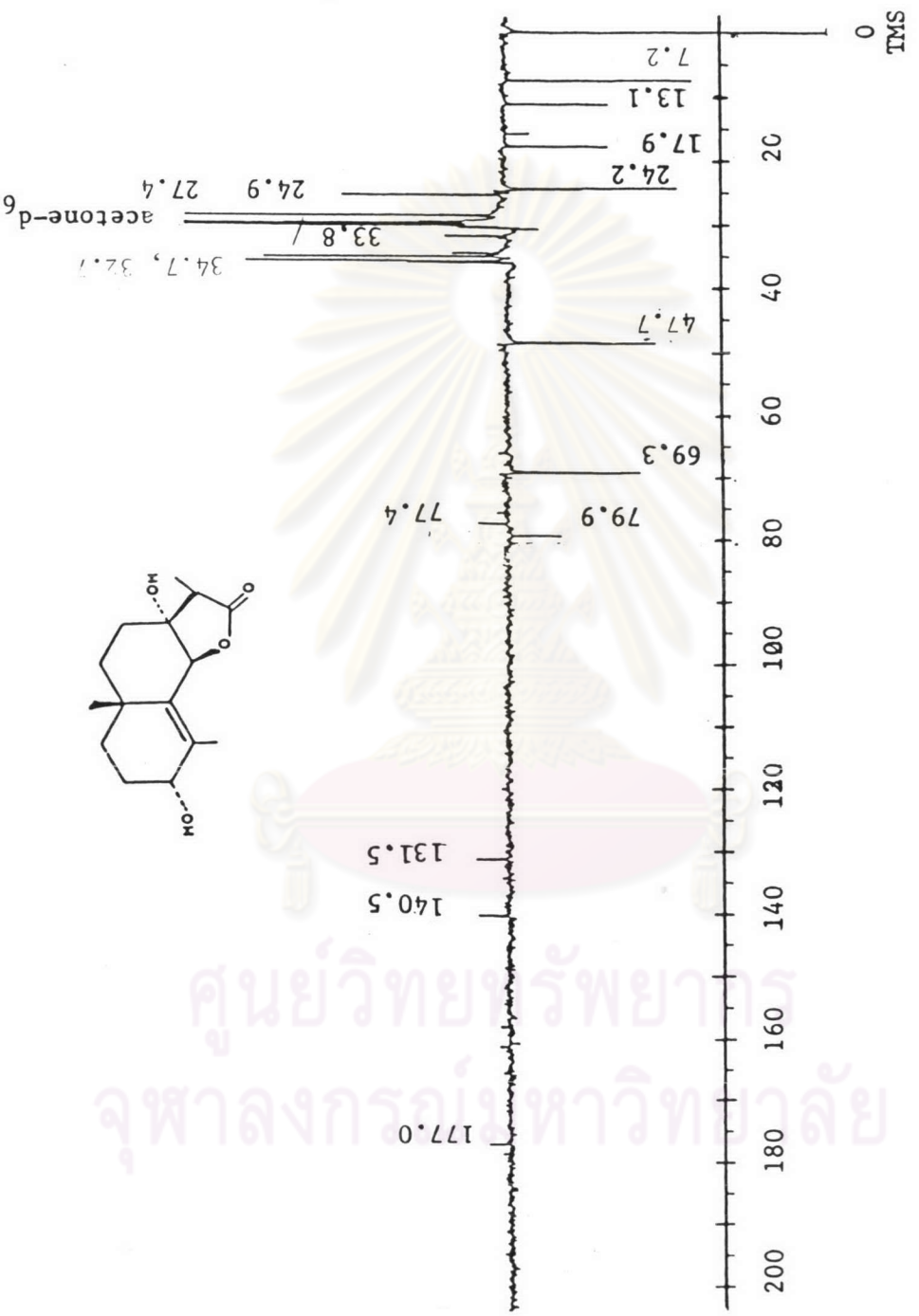


Figure 48 Carbon-13 NMR spectrum of GM-3 from *Crangea maderaspatana* Poir.in acetone-d_6.

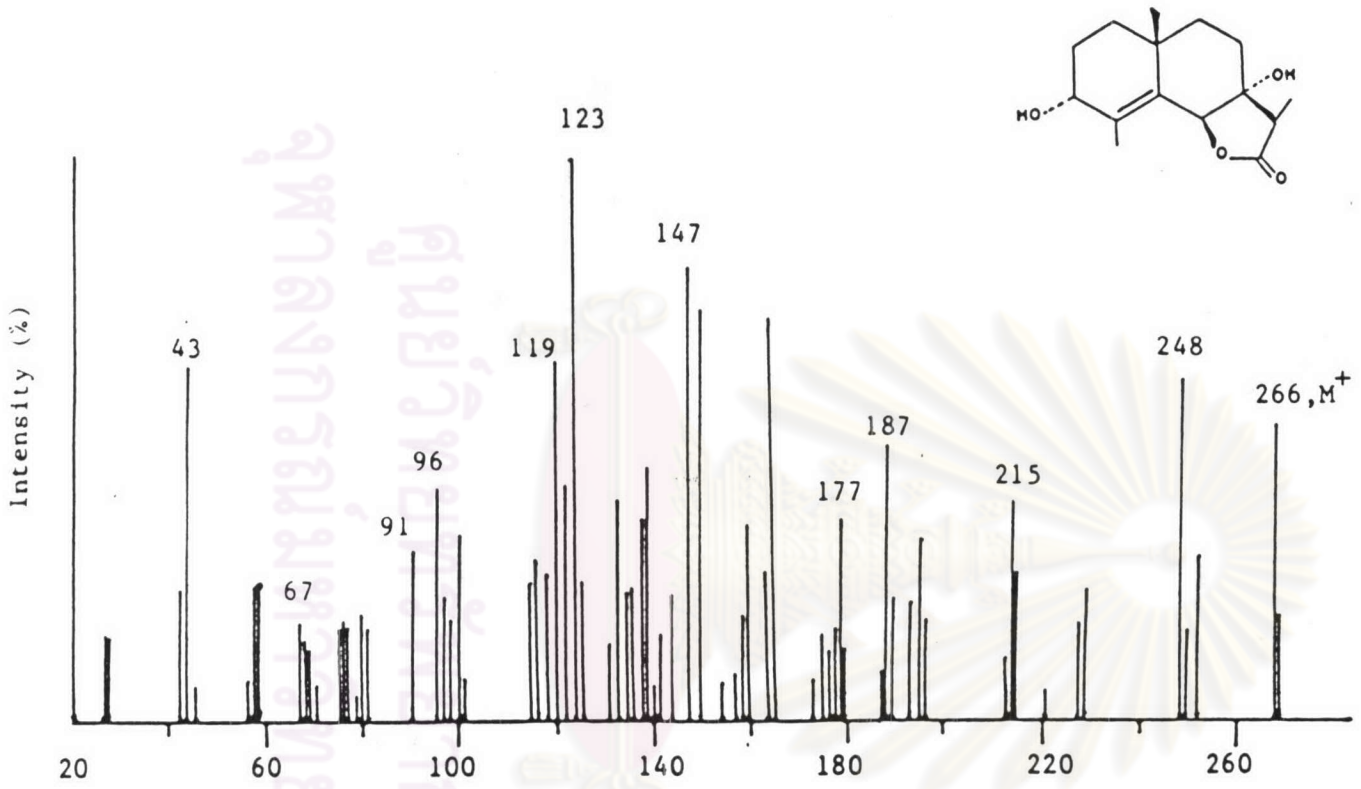


Figure 49 Mass spectrum of GM-3 from *Grangea maderaspatana* Poir.

VITA

Miss Srirat Kasiwong was born on February 2, 1964 in Patthalung, Thailand. She received her Bachelor of Science in Pharmacy (Second Class Honor) in 1986 from the Faculty of Pharmacy, Prince of Songkla University, Thailand.