

Piperine–Chlorogenic Acid Hybrid Inhibits the Proliferation of the SK-MEL-147 Melanoma Cells by Modulating Mitotic Kinases

Carolina Giroto Pressete ¹, Flávia Pereira Dias Viegas ², Thâmara Gaspar Campos ², Ester Siqueira Caixeta ¹, João Adolfo Costa Hanemann ³, Guilherme Álvaro Ferreira-Silva ¹, Bruno Zavan ¹, Alexandre Ferro Aissa ¹, Marta Miyazawa ^{3,*}, Claudio Viegas Jr. ^{2,*} and Marisa Ionta ^{1,*}

¹ Institute of Biomedical Sciences, Federal University of Alfenas, Alfenas 37130-001, MG, Brazil

² Institute of Chemistry, Laboratory of Research in Medicinal Chemistry, Federal University of Alfenas, Alfenas 37133-840, MG, Brazil

³ Department of Clinic and Surgery, School of Dentistry, Federal University of Alfenas, Alfenas 37130-001, MG, Brazil

* Correspondence: marta.miyazawa@unifal-mg.edu.br (M.M.);

claudio.viegas@unifal-mg.edu.br (C.V.J.); marisa.ionta@unifal-mg.edu.br (M.I.)

Table S1. Sequences of the primers used for amplification in real-time PCR.

Gene	Sequence	Reference
<i>CDKN1A</i>	F 5'- CCATAGCCTCTACTGCCACCATC-3' R 5'- GTCCAGCGACCTTCCTCATCCA-3'	NM_001291549.1
<i>CCNB1</i>	F 5'- GTACCCTCCAGAAATTGGTGA-3' R 5'- GACTACATTCTTAGCCAGGTG-3'	NM_031966.2
<i>NRF2</i>	F 5'- CAATGAGGTTTCTTCGGCTACG -3' R 5'- AAGACTGGGCTCTCGATGTG -3'	NM_006164.4
<i>CHK2</i>	F 5'- CCCAAGGCTCCTCCTCACA -3' R 5'- AGTGAGAGGACTGGCTGGAGTT -3'	NM_007194.3
<i>AURKA</i>	F 5'- TCTTCACAGGAGGCAAATCCA-3' R 5'- AATAAGTTACACACTCACTCAGGTACTA-3'	NM_198434.3
<i>AURKB</i>	F 5'- AAAGAGCCTGTCACCCCATC-3' R 5'- CGCCCAATCTCAAAGTCATC-3'	NM_001313950.2
<i>BAX</i>	F:5'- TTCCTTACGTGTCTGATCAATCC-3' R:5'- GGGCAGAAGGCACTAATCAA -3'	NM_004324.3
<i>BCL-2</i>	F:5'- CAGAAGTCTGGGAATCGATCTG -3' R:5'- AATCTTCAGCACTCTCCAGTTATAG -3'	NM_000657.2
<i>FOXMI</i>	F: 5'-TGCCCAGCAGTCTCTTACCT-3' R: 5'-CTACCCACCTTCTGGCAGTC-3'	NM_001243089.1
<i>ACTB</i>	F 5'- AGAGCTACGAGCTGCCTGAC-3' R 5'- AGCACTGTGTTGGCGTACAG-3'	NM_001101.3
<i>GAPDH</i>	F 5'- GGATTTGGTCGTATTGGGC-3' R 5'- TGGAAGATGGTGATGGGATT-3'	NM_002046.4
<i>18srRNA</i>	F 5'- GTAACCCGTTGAACCCATT-3'	HQ387008.1

R 5' - CCATCCAATCGGTAGTAGCG-3'

F = forward primer; R = reverse primer

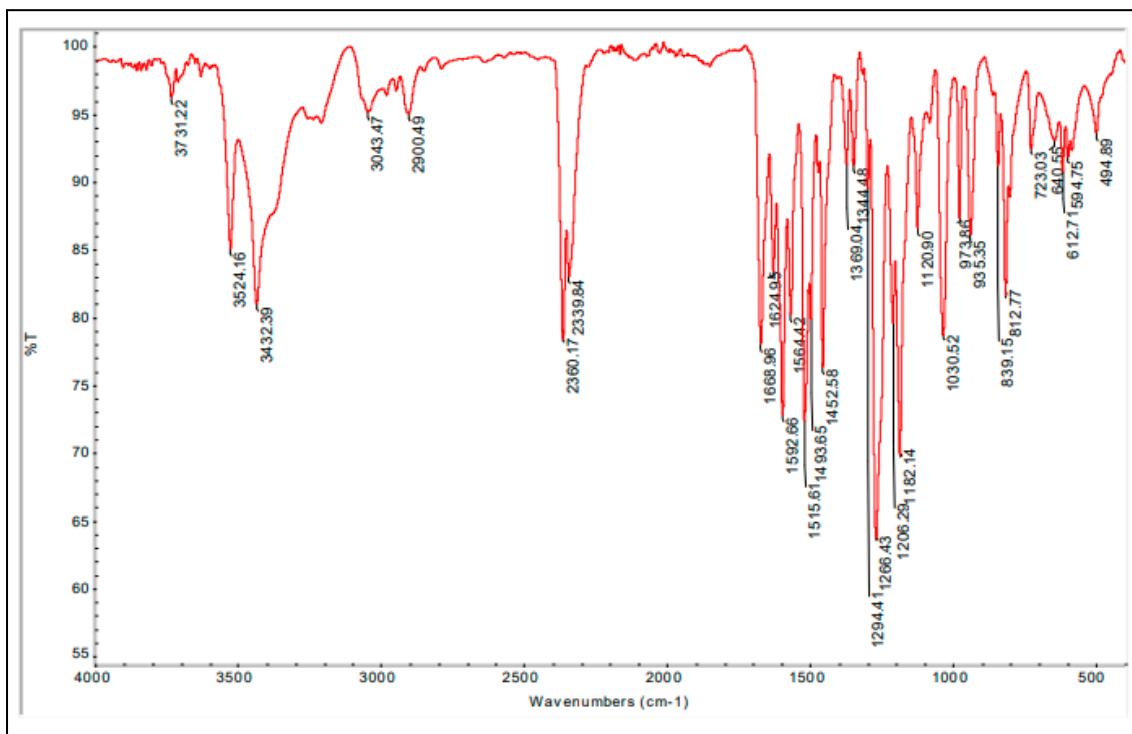


Figure S1 – Infrared absorption spectrum (ATR) of the compound **PQM-277 (3a)**.

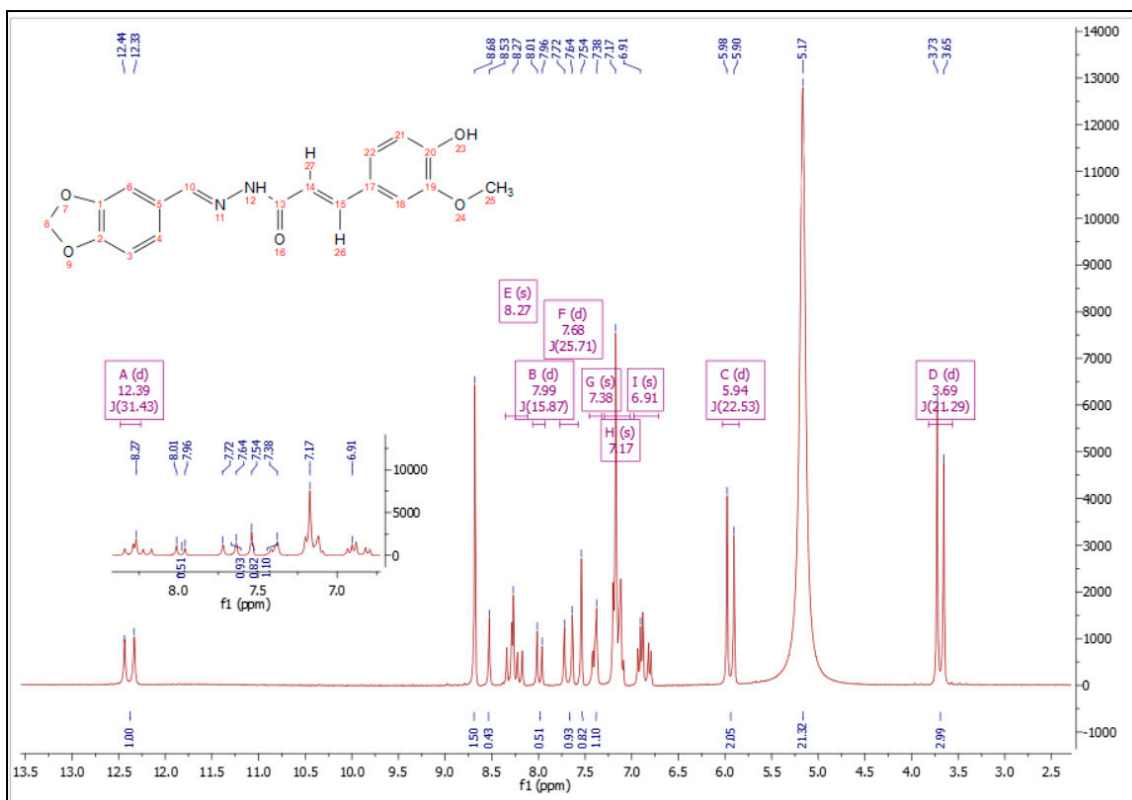


Figure S2 – ¹H spectrum (300 MHz, pyridine *d*₅) of the compound PQM-277 (3a).

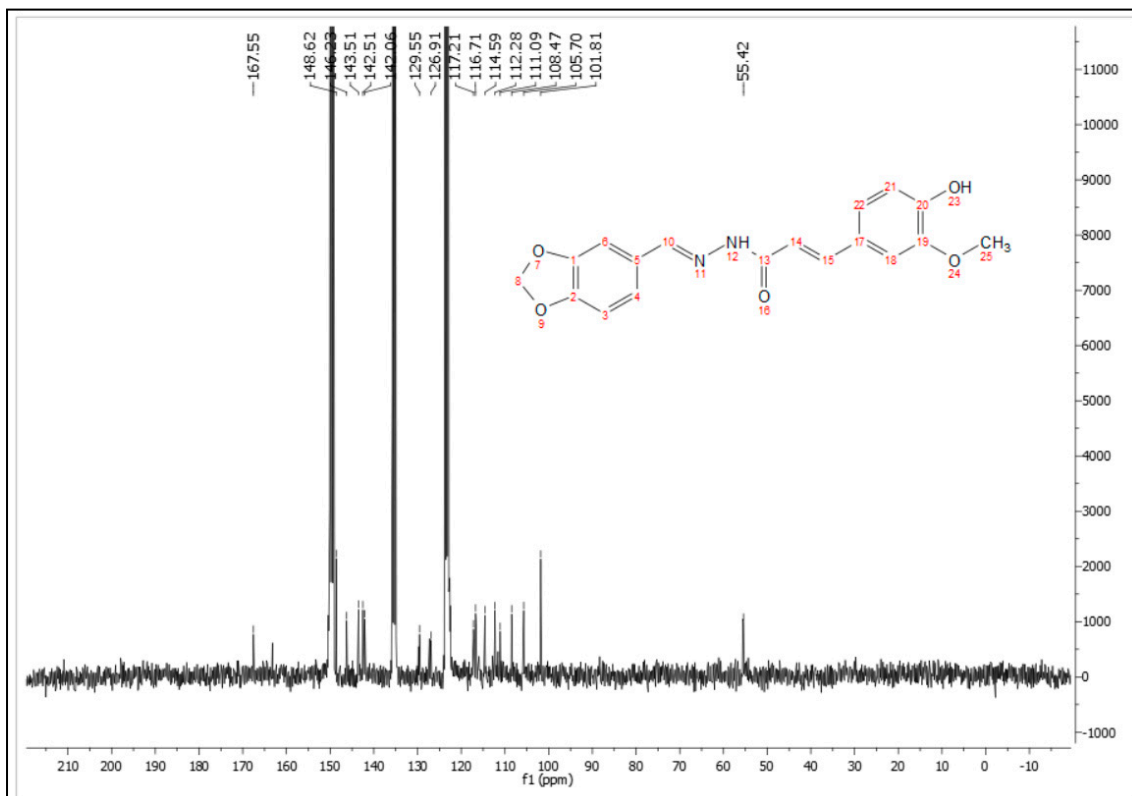


Figure S3 – ¹³C spectrum (75 MHz, pyridine *d*₅) of the compound PQM-277 (3a).

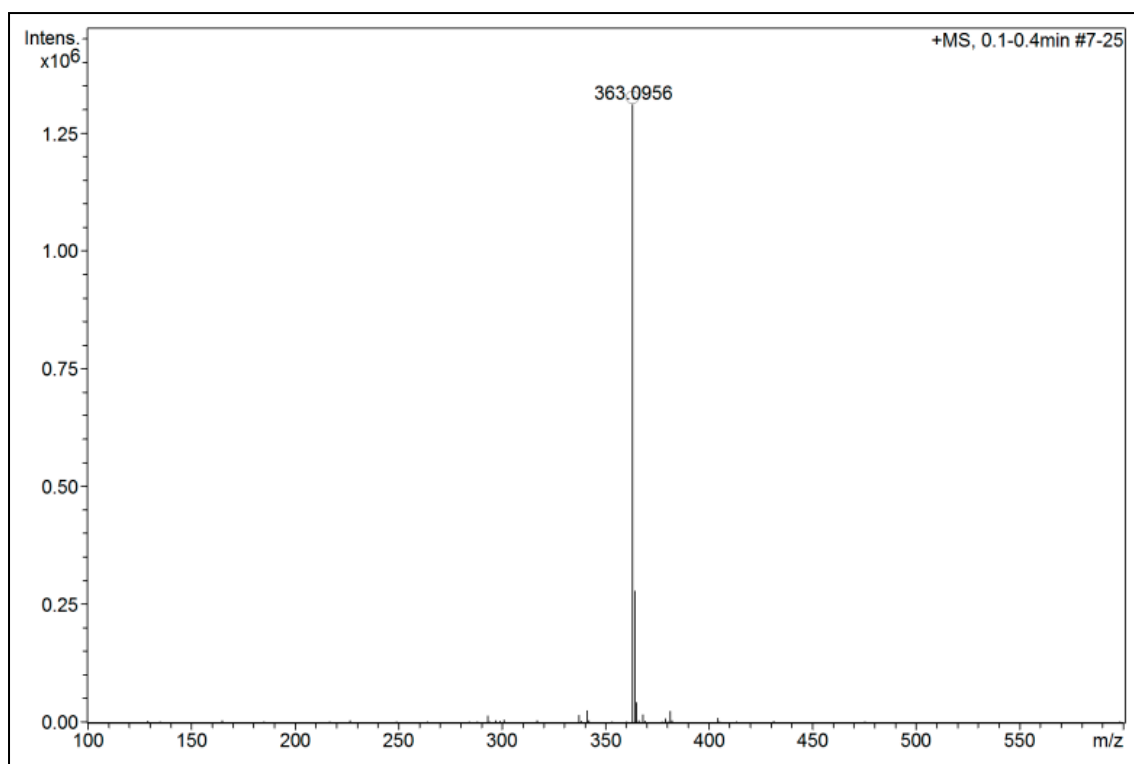


Figure S4 – Mass Spectrum (positive mode) of the compound **PQM-277 (3a)**.

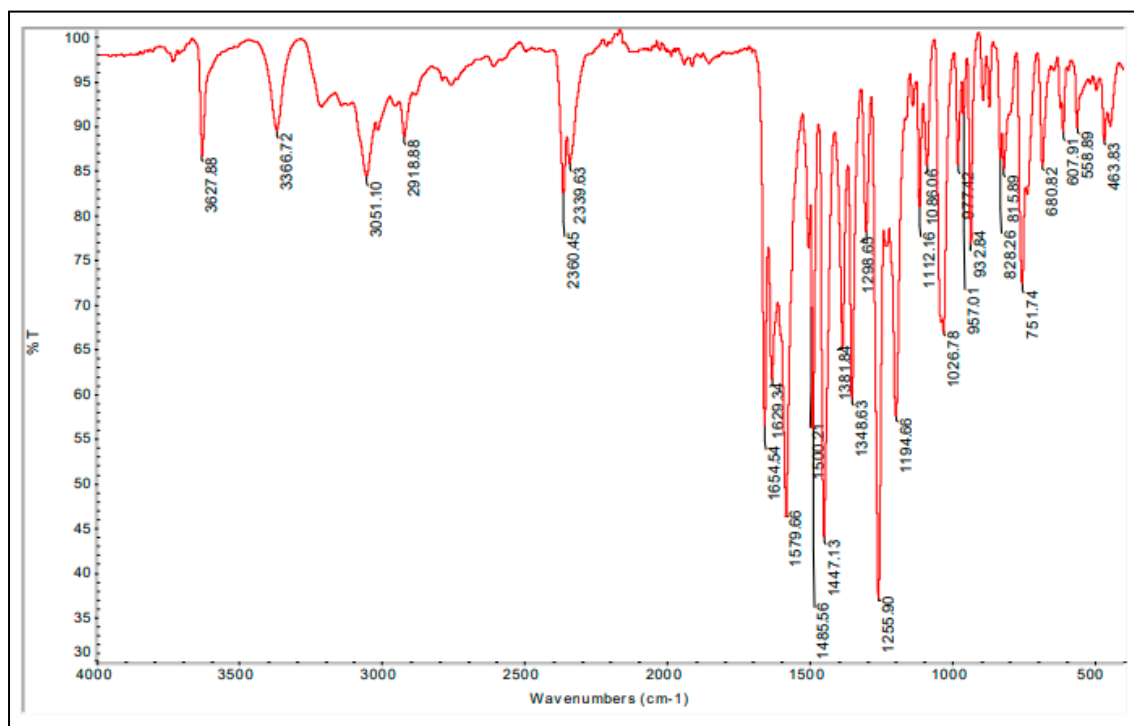


Figure S5 – Infrared absorption spectrum (ATR) of the compound **PQM-279 (3b)**.

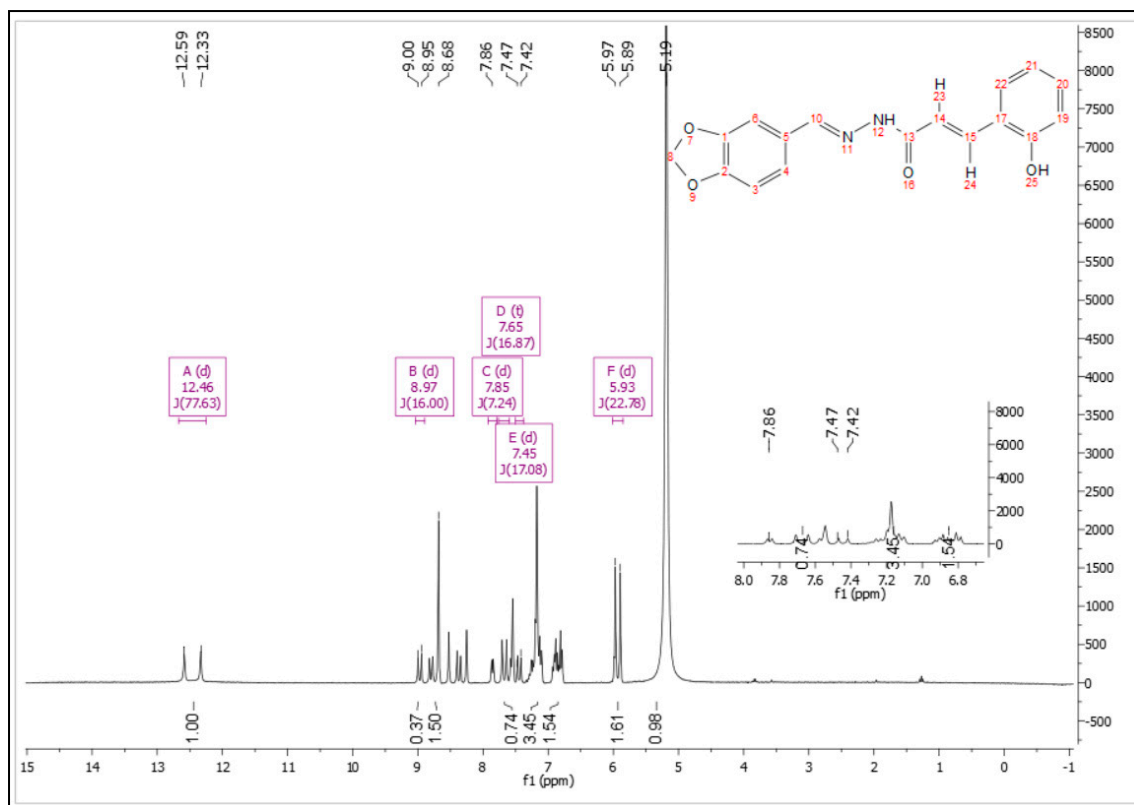


Figure S6 – ¹H spectrum (300 MHz, pyridine *d*₅) of the compound **PQM-279 (3b)**.

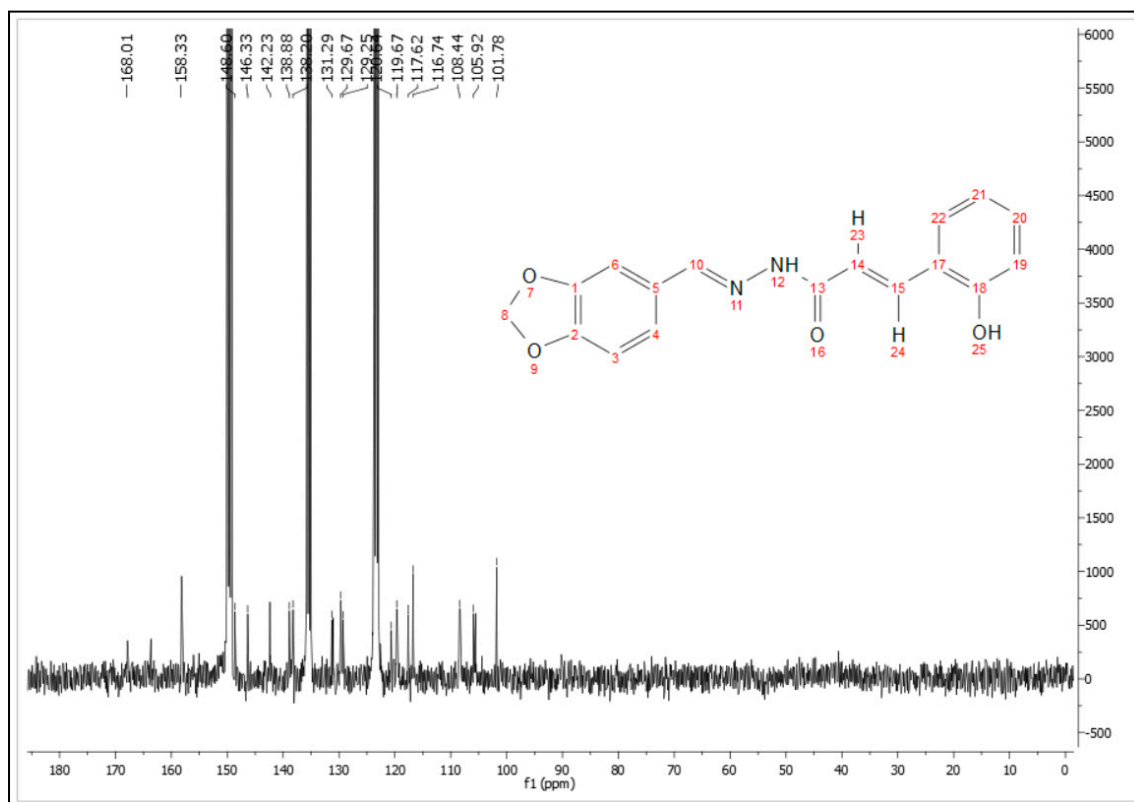


Figure S7 – ¹³C spectrum (75 MHz, pyridine *d*₅) of the compound **PQM-279 (3b)**.

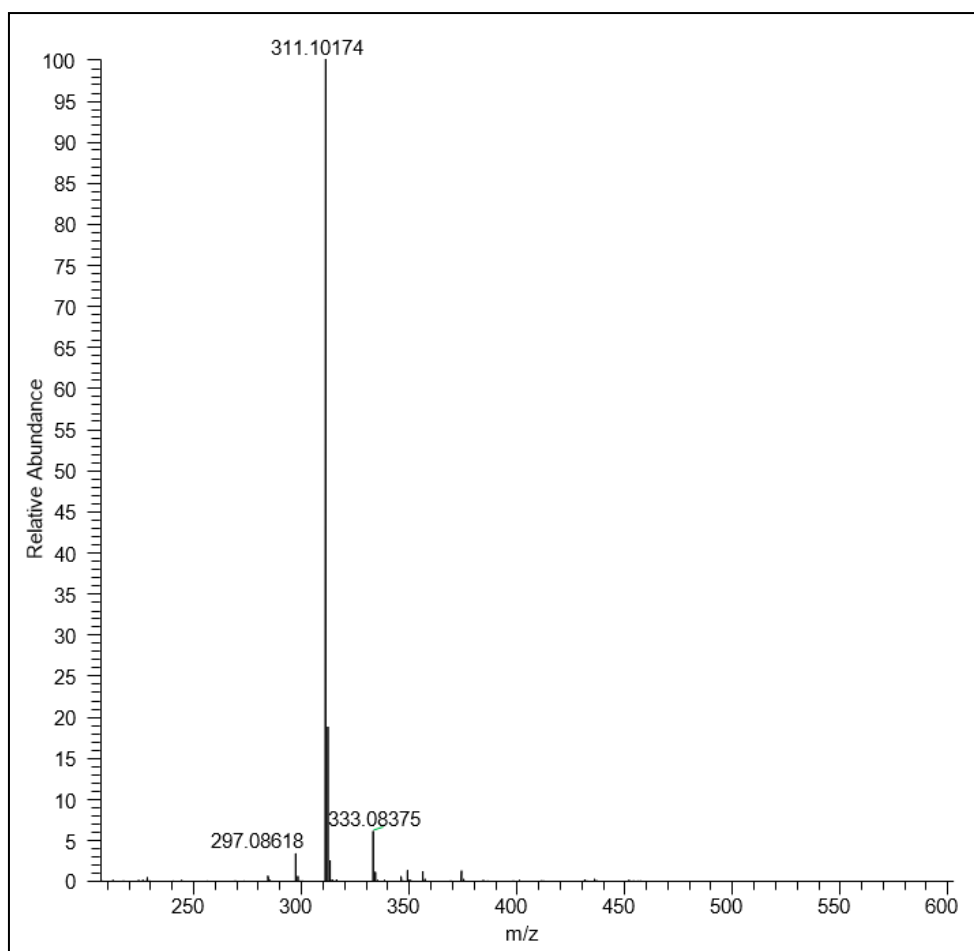


Figure S8 – Mass Spectrum (positive mode) of the compound **PQM-279 (3b)**.

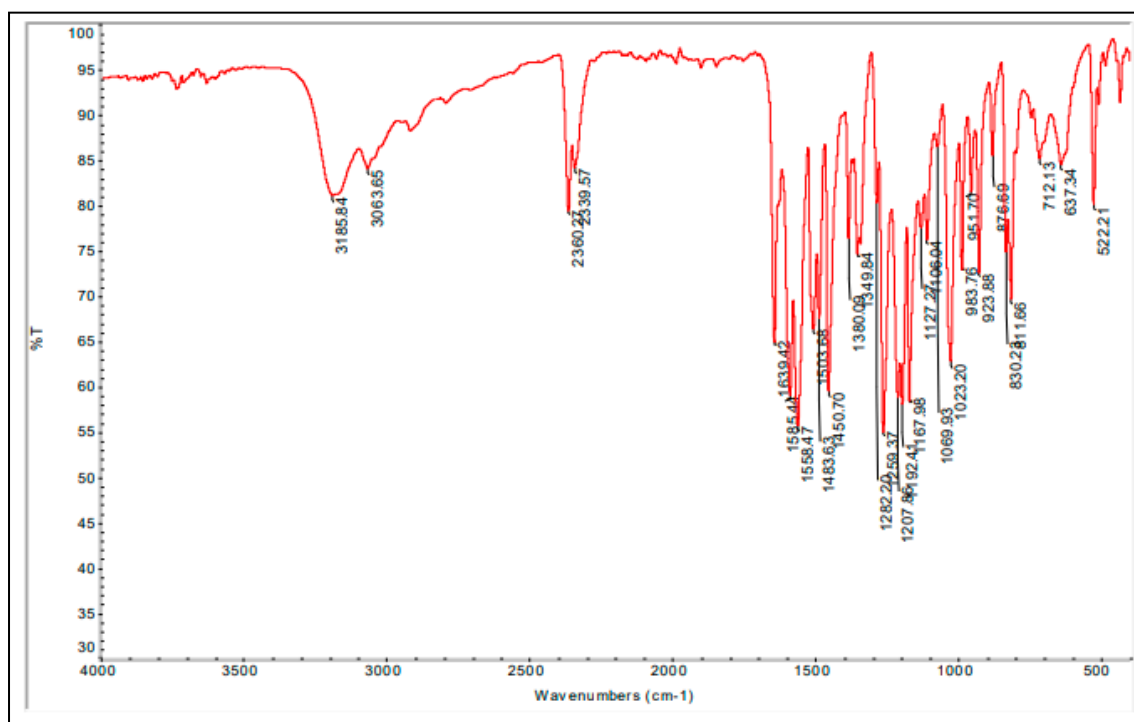


Figure S9 – Infrared absorption spectrum (ATR) of the compound **PQM-280 (3c)**.

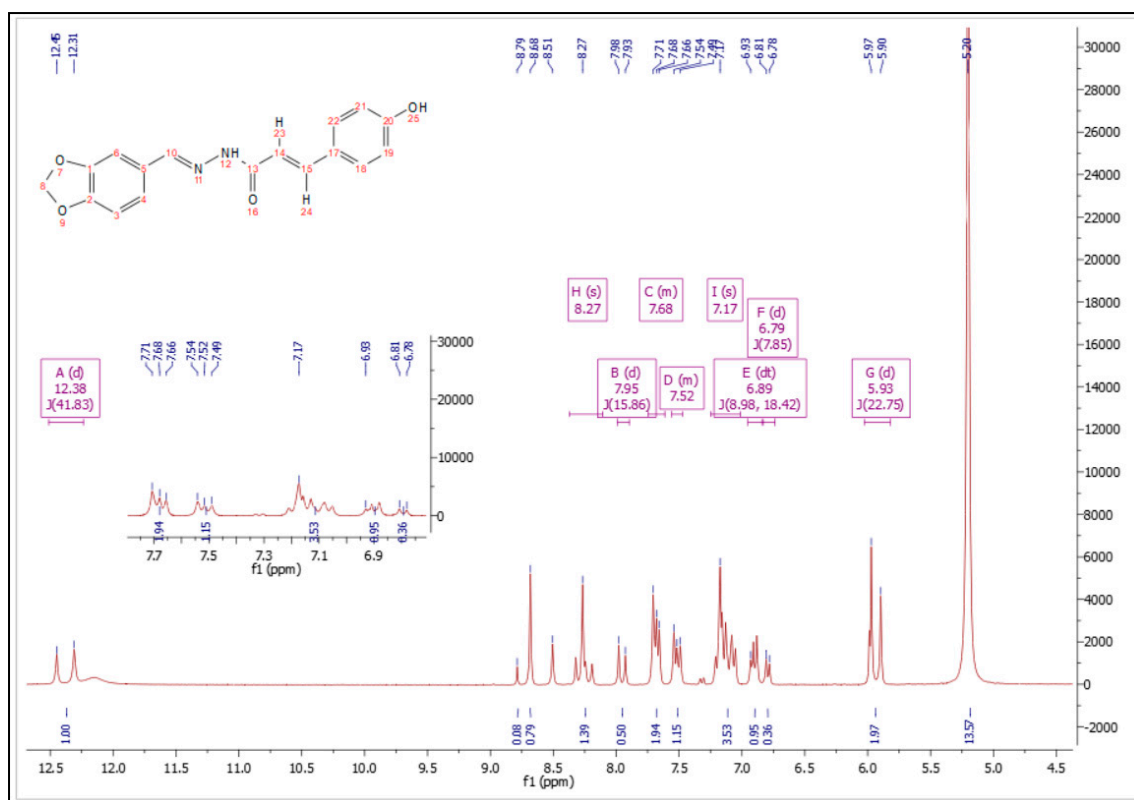


Figure S10 – ¹H spectrum (300 MHz, pyridine *d*₅) of the compound **PQM-280 (3c)**.

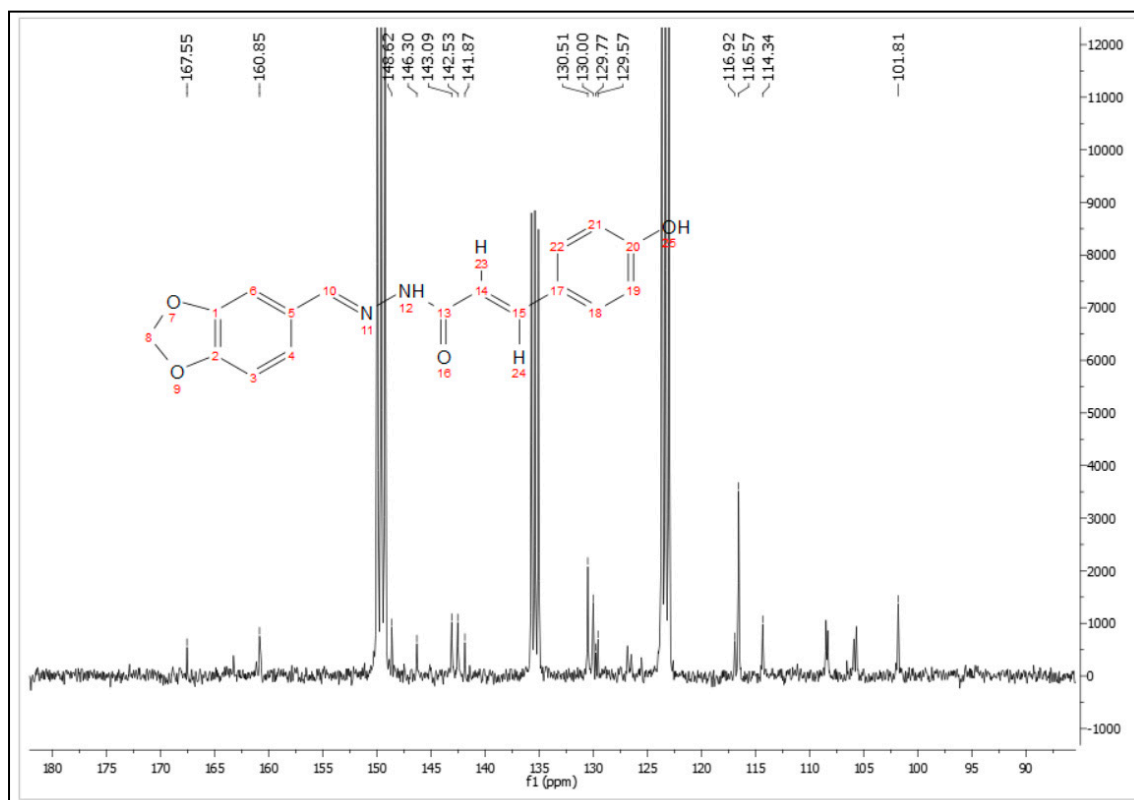


Figure S11 – ¹³C spectrum (75 MHz, pyridine *d*₅) of the compound **PQM-280 (3c)**.

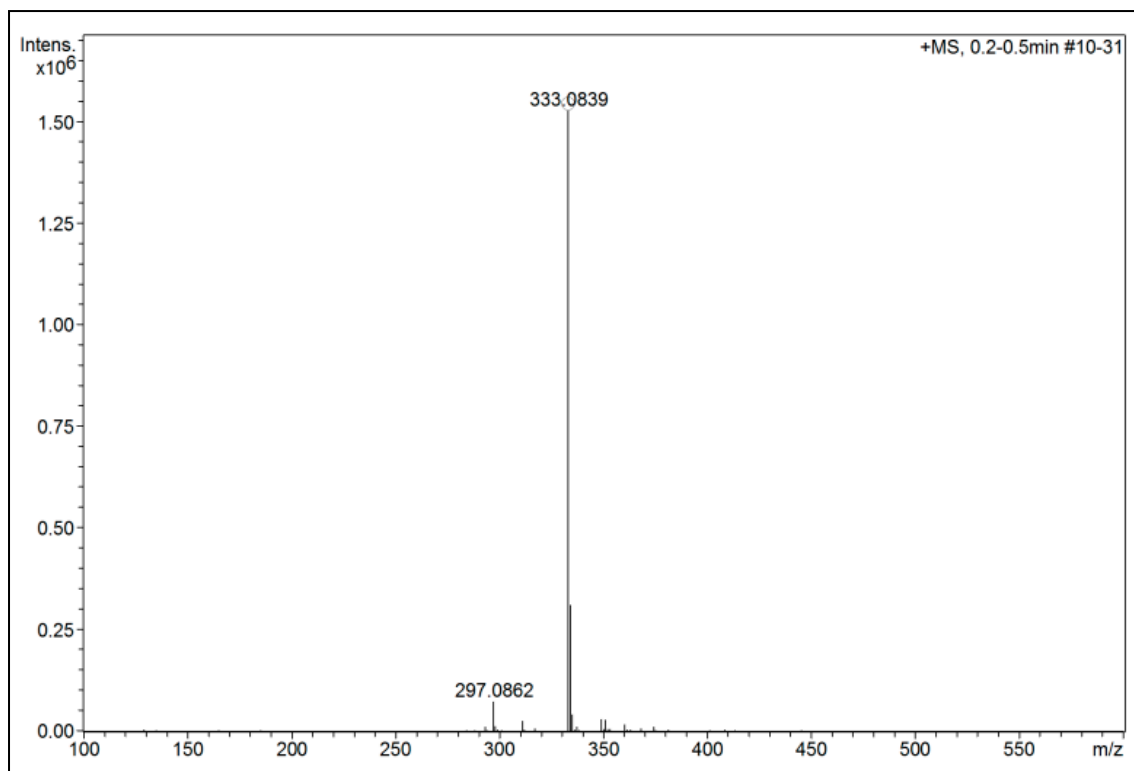


Figure S12 – Mass Spectrum (positive mode) of the compound **PQM-280 (3c)**.

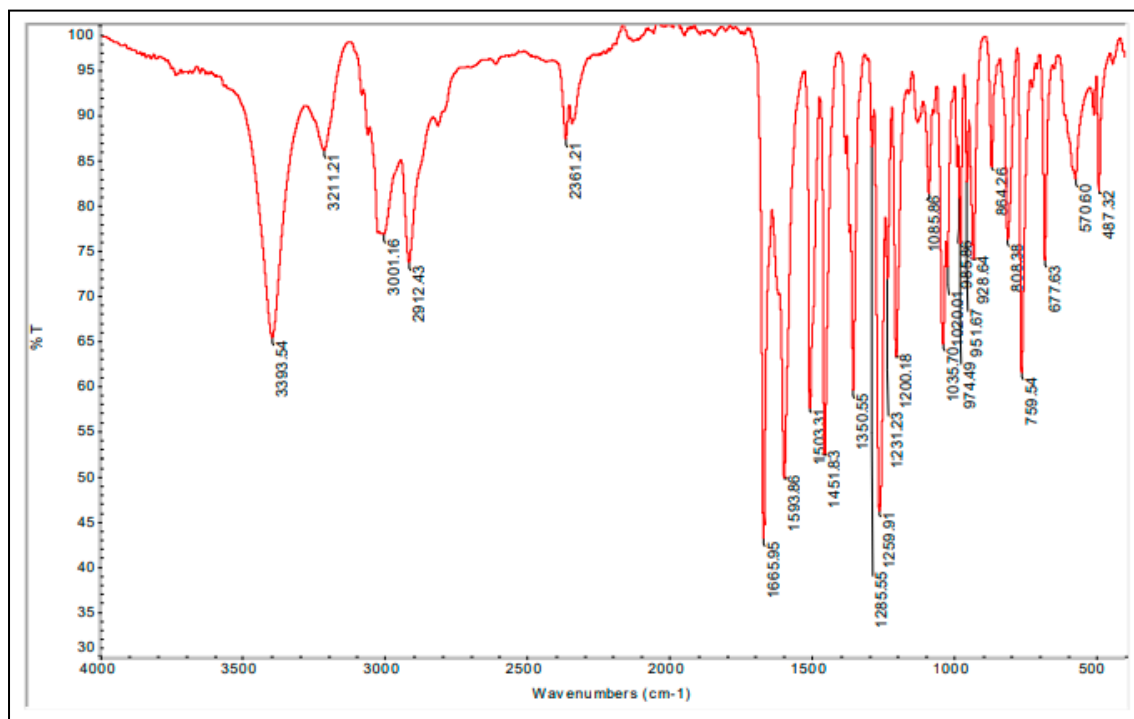


Figure S13 – Infrared absorption spectrum (ATR) of the compound **PQM-281 (3d)**.

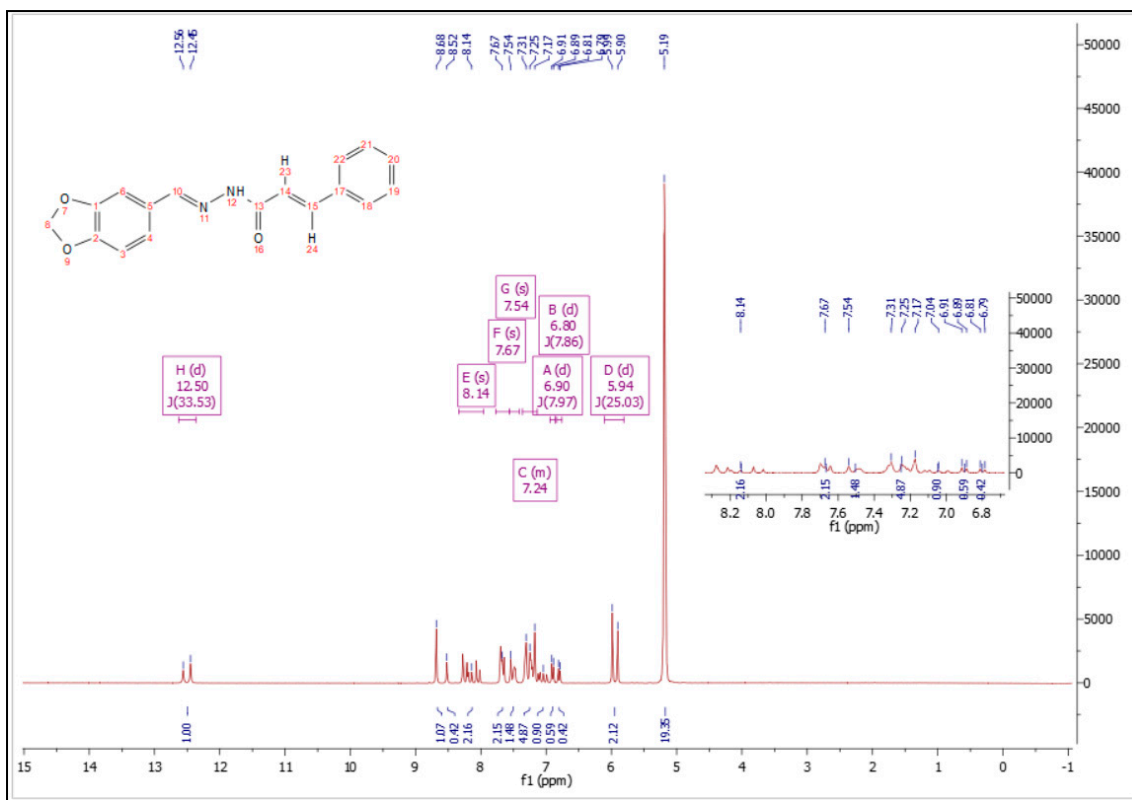


Figure S14 – ¹H spectrum (300 MHz, pyridine *d*₅) of the compound **PQM-281 (3d)**.

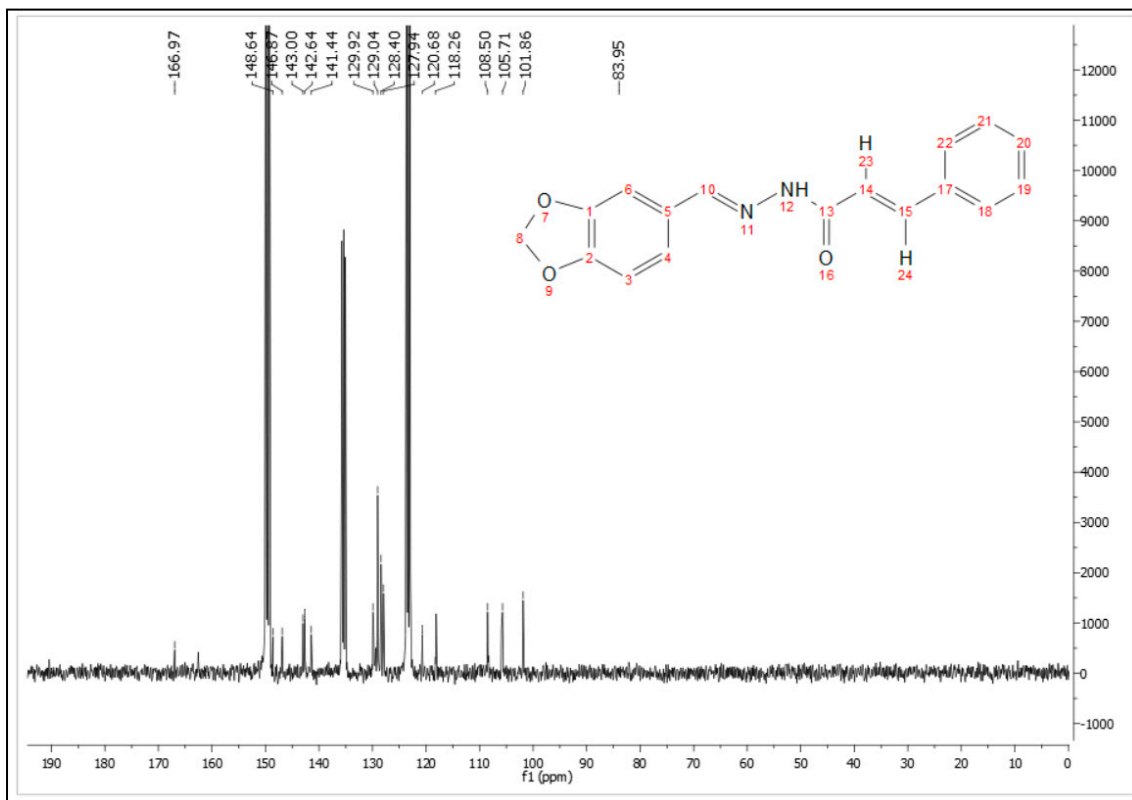


Figure S15 – ¹³C spectrum (75 MHz, pyridine *d*₅) of the compound **PQM-281 (3d)**.

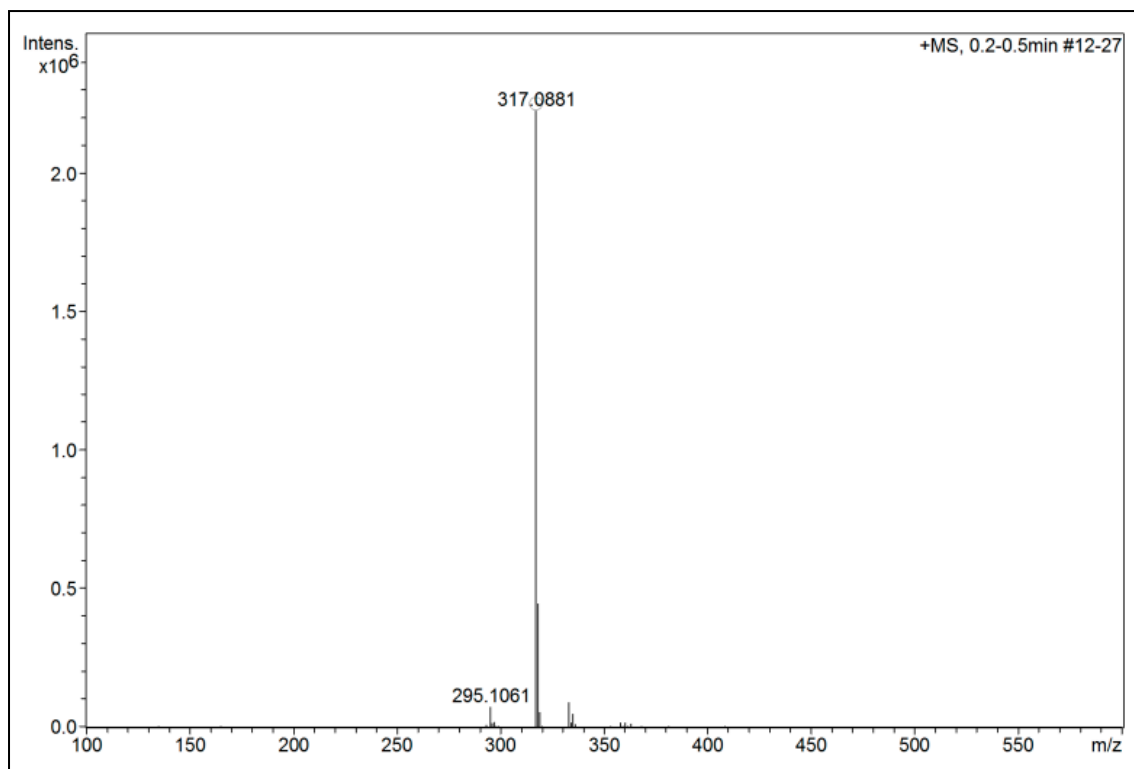


Figure S16 – Mass Spectrum (positive mode) of the compound **PQM-281 (3d)**.

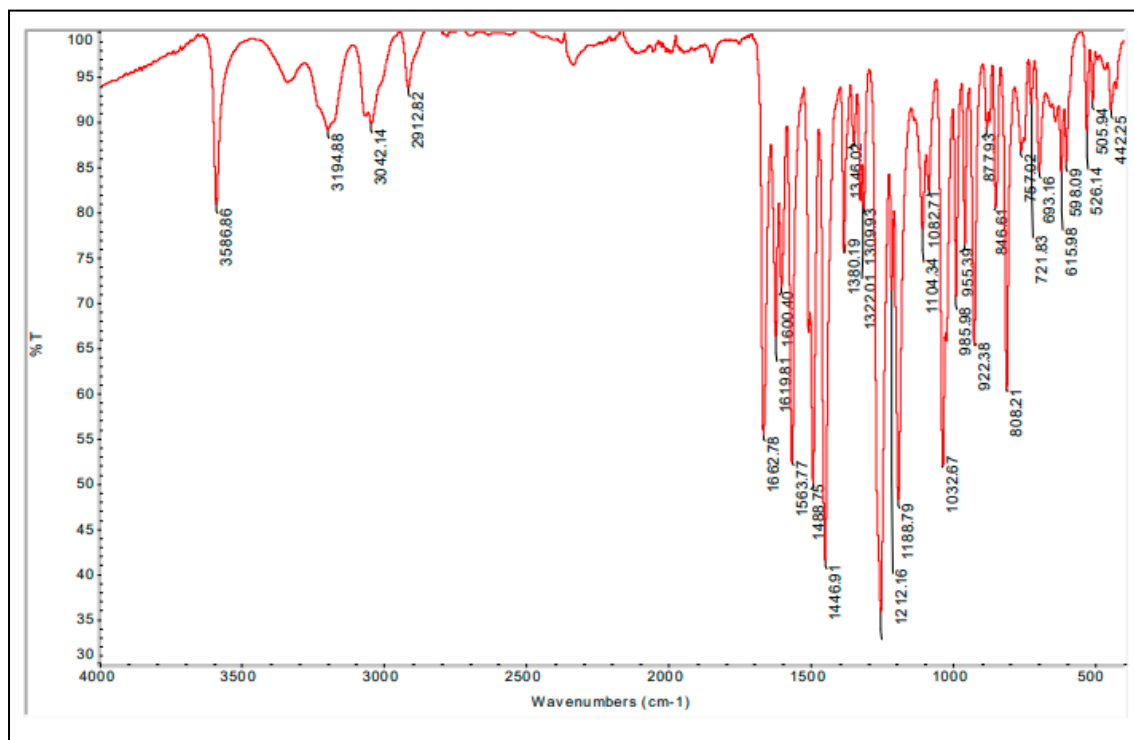


Figure S17 – Infrared absorption spectrum (ATR) of the compound **PQM-284 (3e)**.

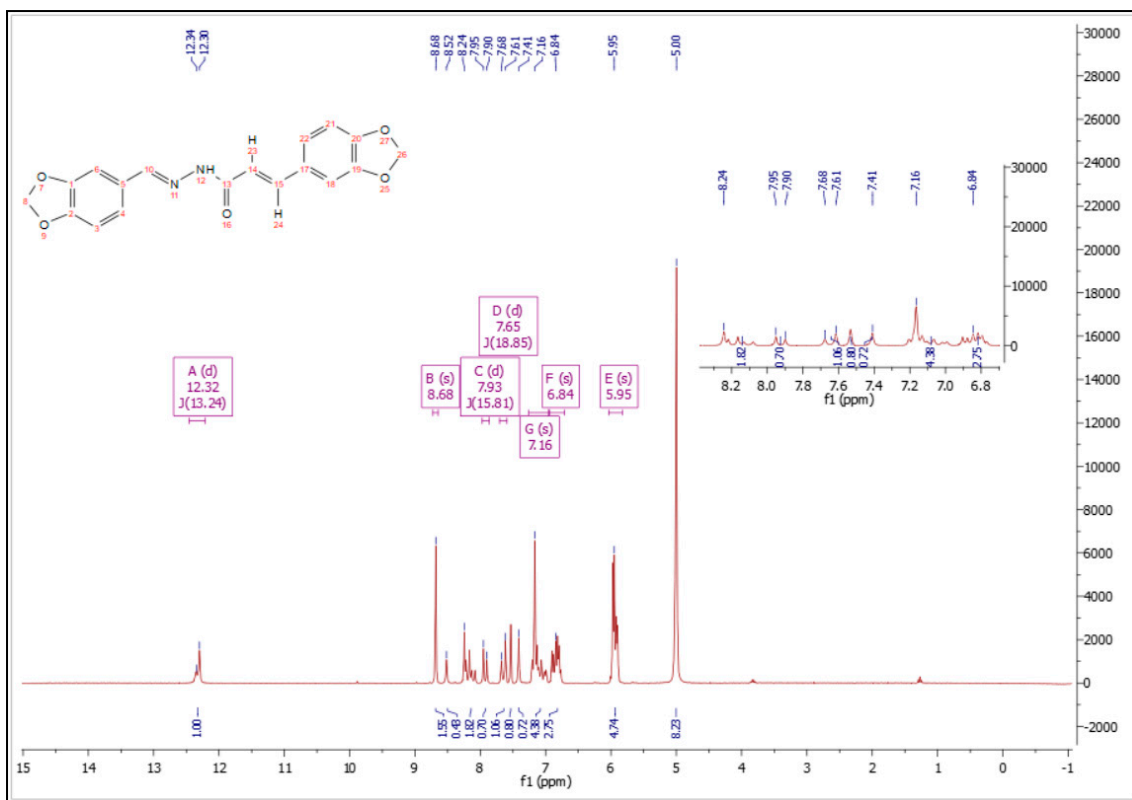


Figure S18 – ¹H spectrum (300 MHz, pyridine *d*₅) of the compound **PQM-284 (3e)**.

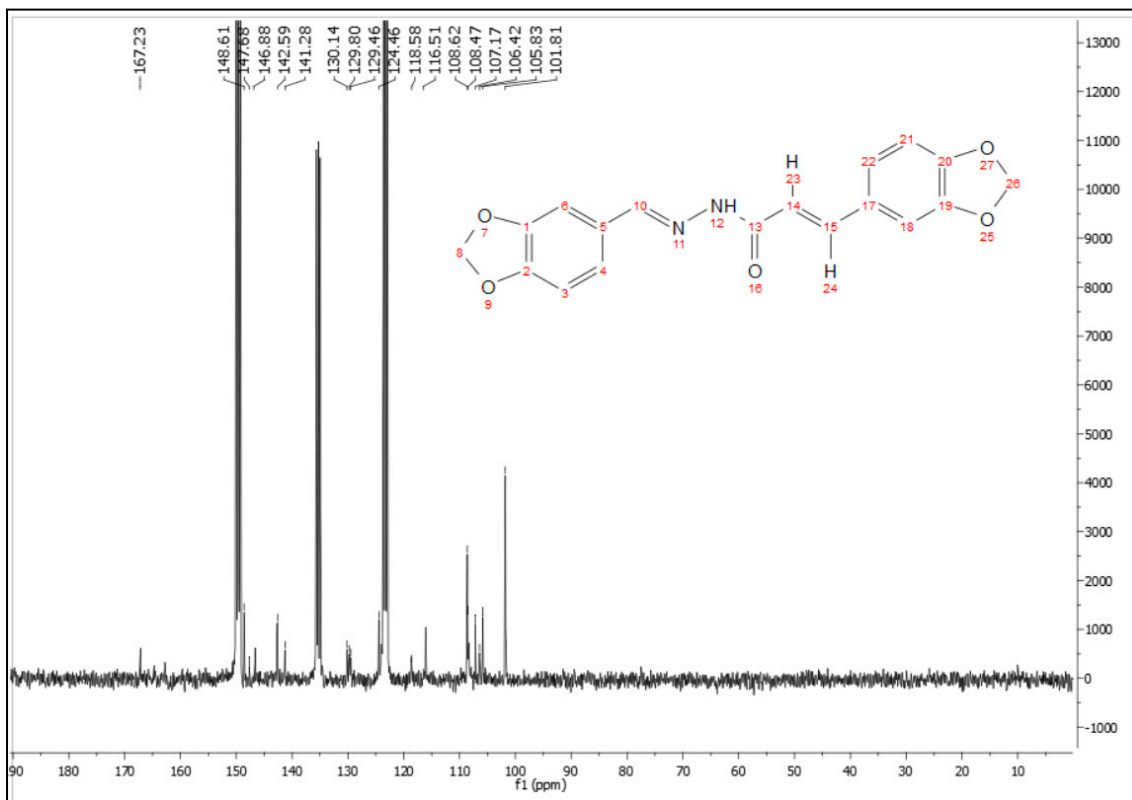


Figure S19 – ¹³C spectrum (75 MHz, pyridine *d*₅) of the compound **PQM-284 (3e)**.

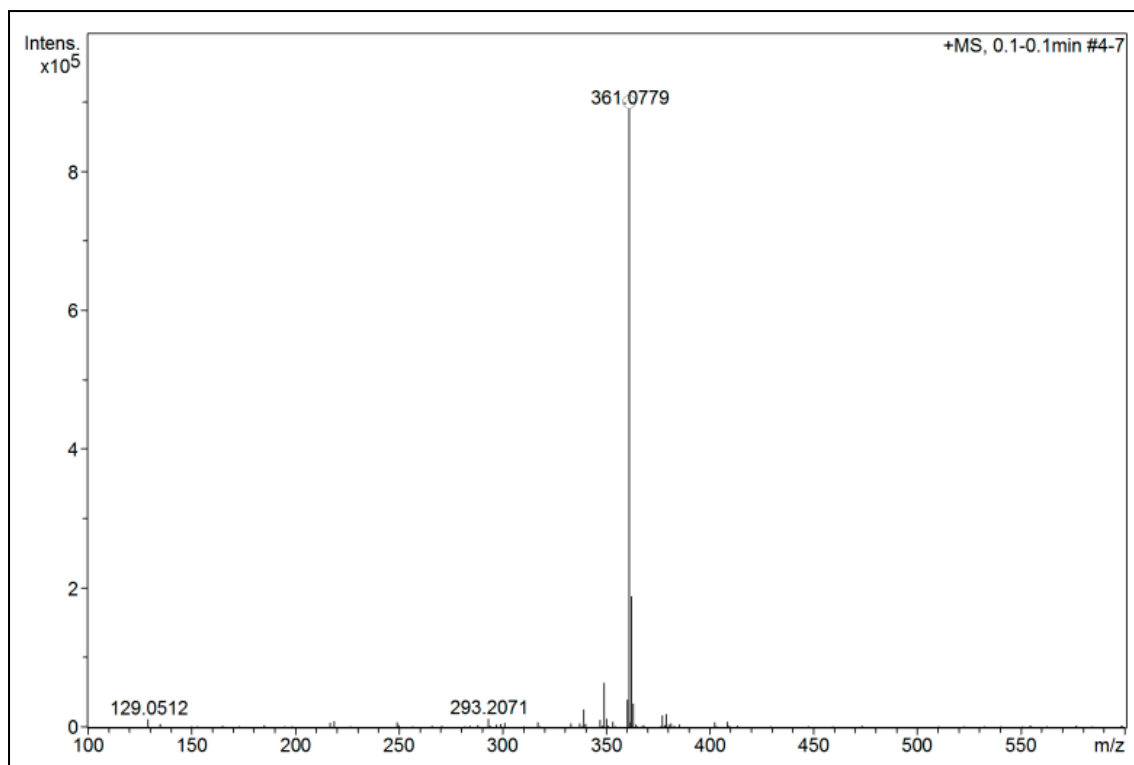


Figure S20 – Mass Spectrum (positive mode) of the compound **PQM-284 (3e)**.

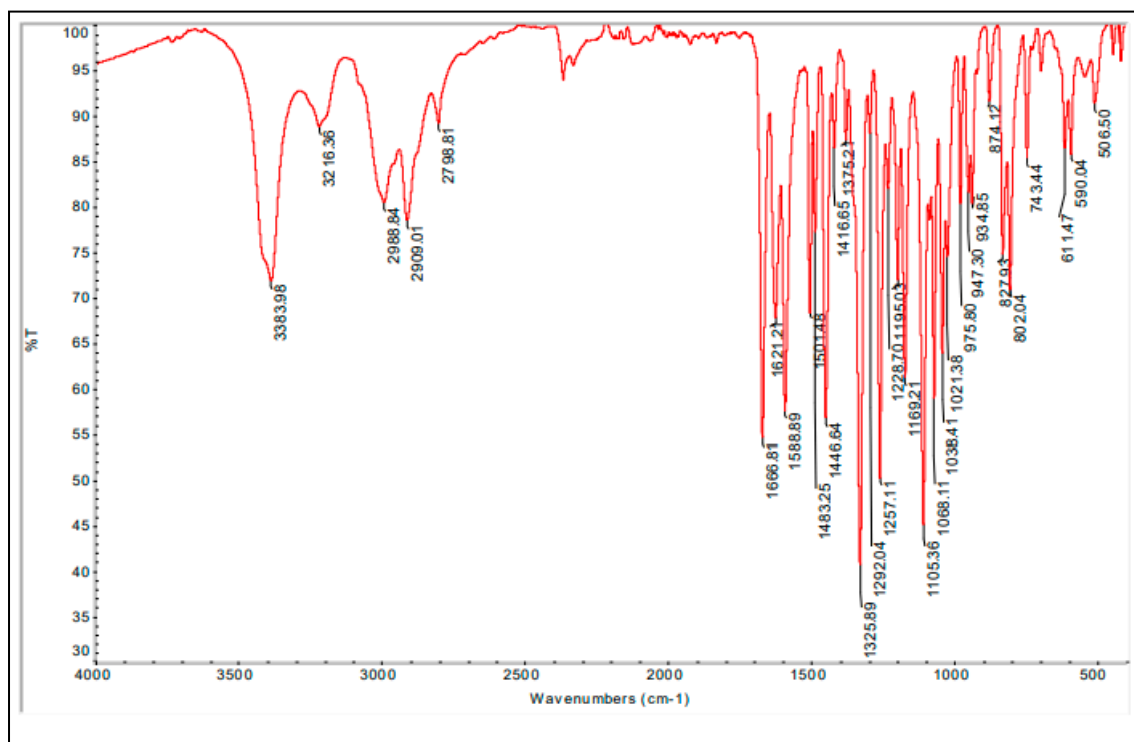


Figure S21 – Infrared absorption spectrum (ATR) of the compound **PQM-285 (3f)**.

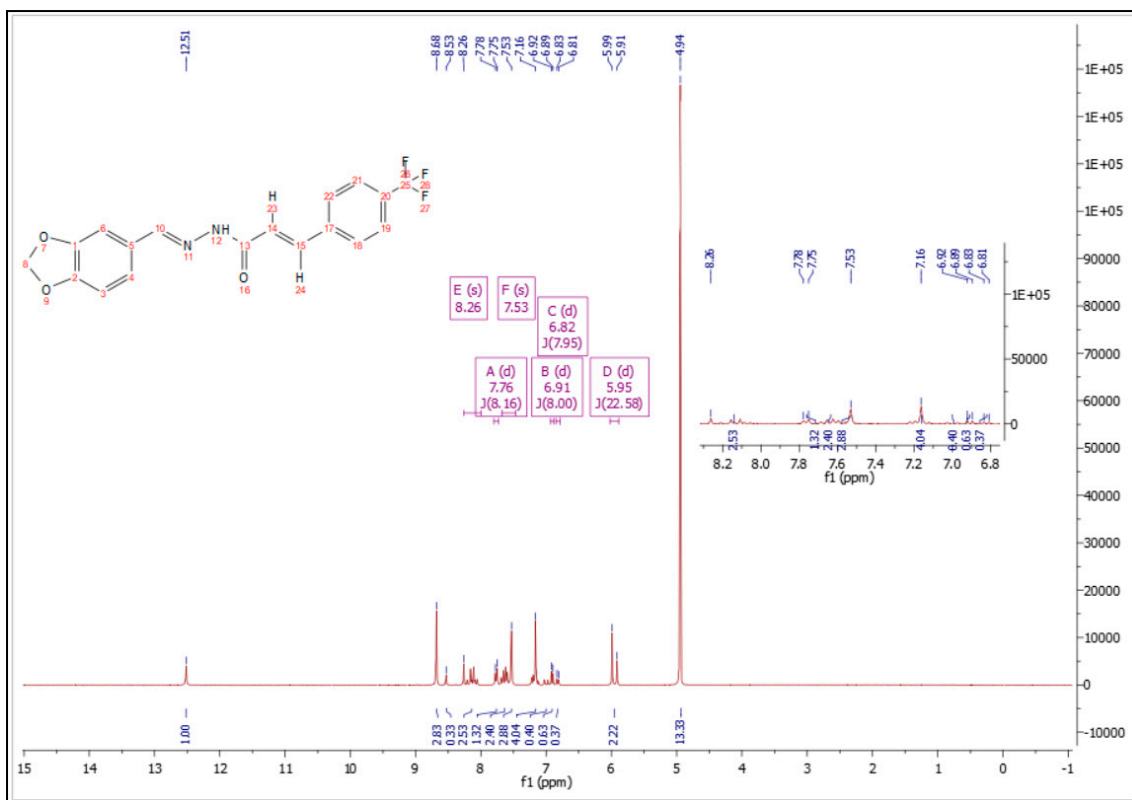


Figure S22 – ¹H spectrum (300 MHz, pyridine *d*₅) of the compound PQM-285 (3f).

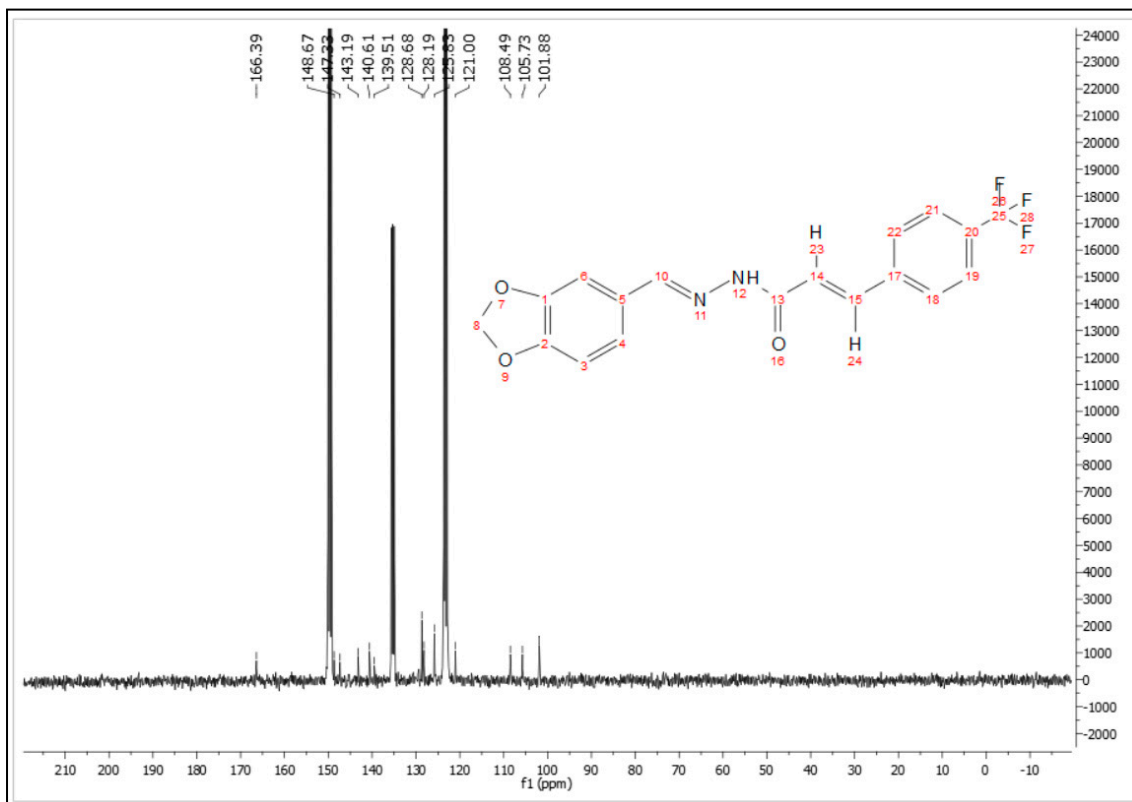


Figure S23 – ¹³C spectrum (75 MHz, pyridine *d*₅) of the compound PQM-285 (3f).

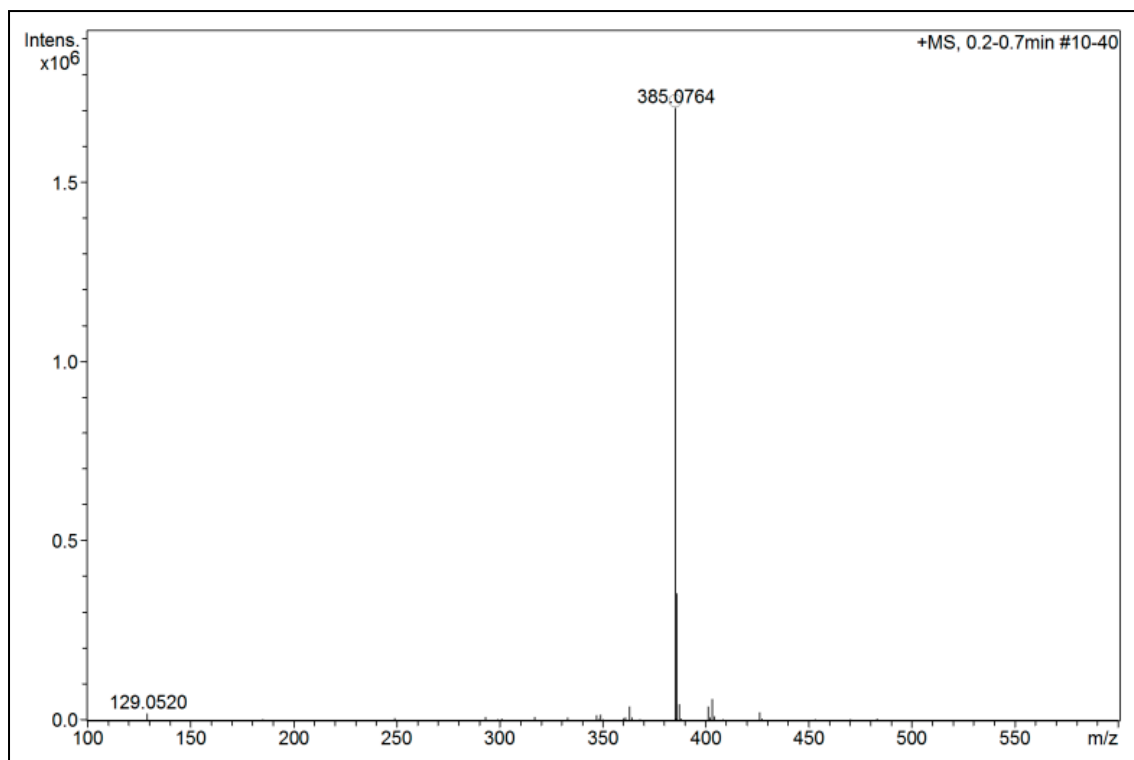


Figure S24 – Mass Spectrum (positive mode) of the compound PQM-285 (3f).

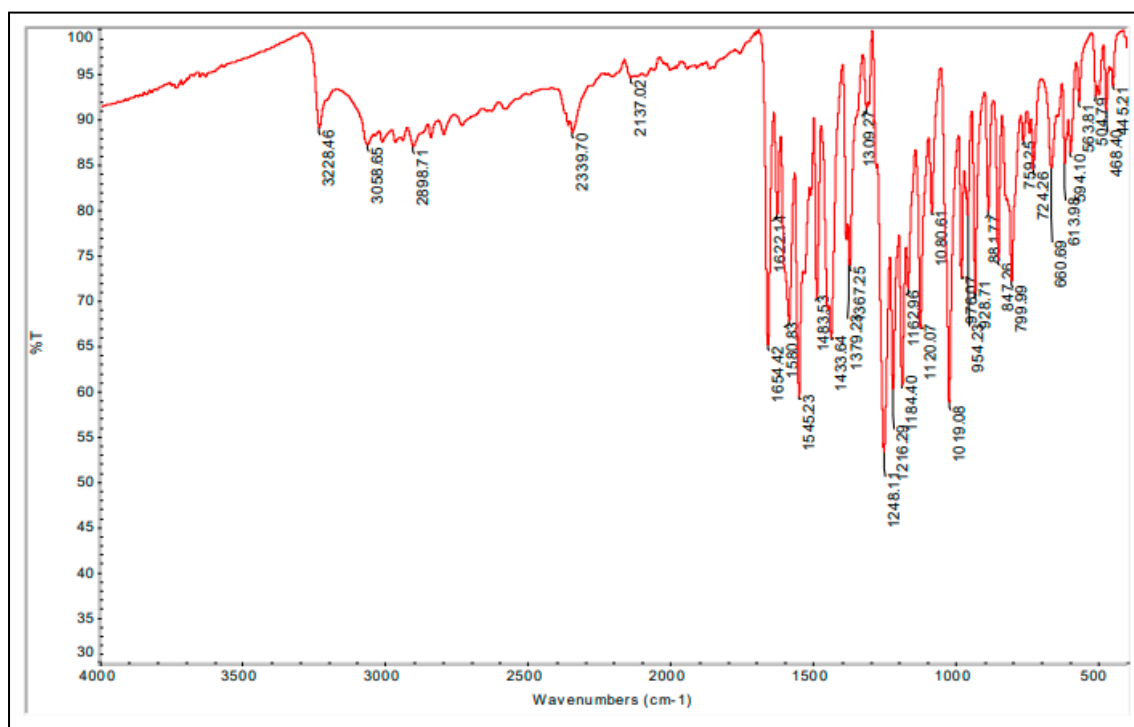


Figure S25 – Infrared absorption spectrum (ATR) of the compound PQM-286 (3g).

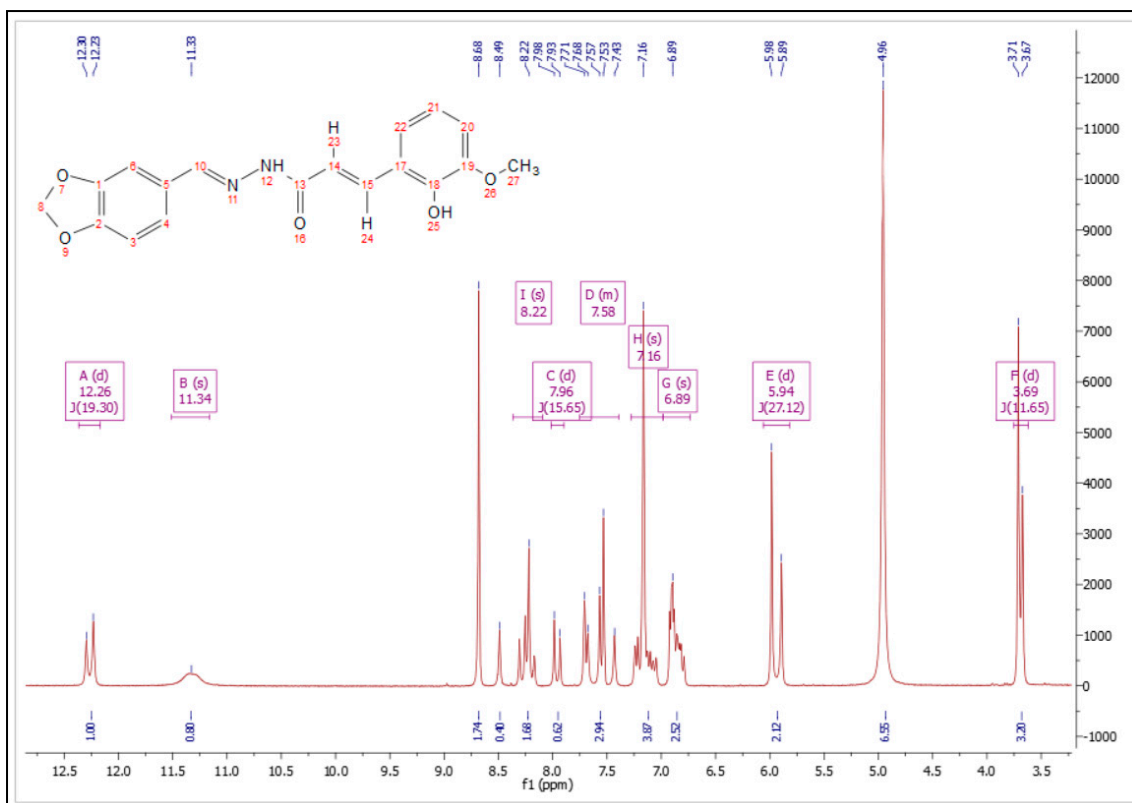


Figure S26 – ¹H spectrum (300 MHz, pyridine *d*₅) of the compound PQM-286 (3g).

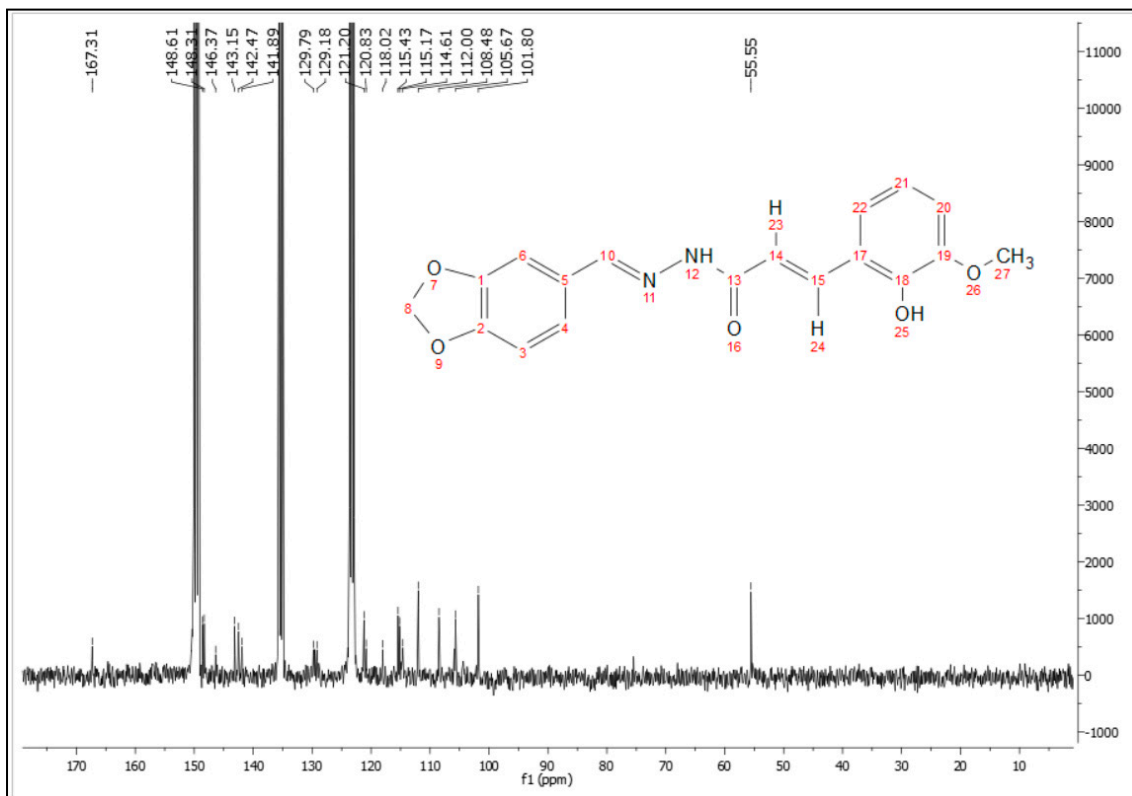


Figure S27 – ¹³C spectrum (75 MHz, pyridine *d*₅) of the compound PQM-286 (3g).

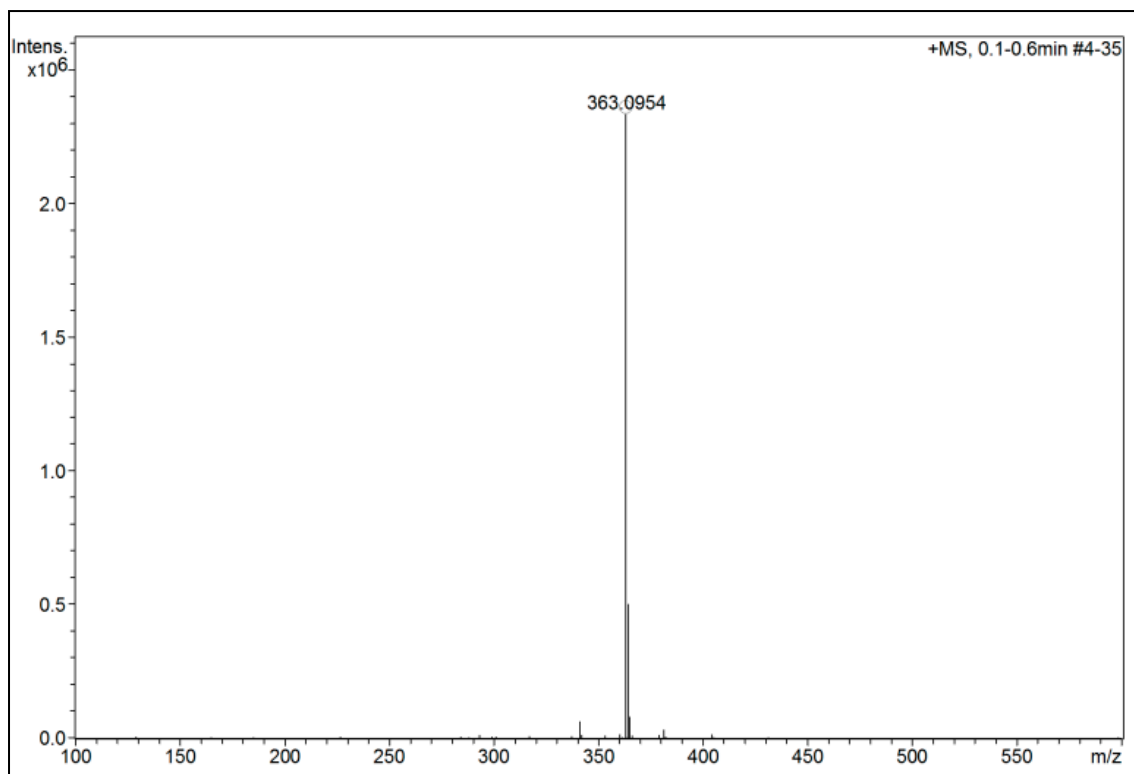


Figure S28 – Mass Spectrum (positive mode) of the compound **PQM-286 (3g)**.

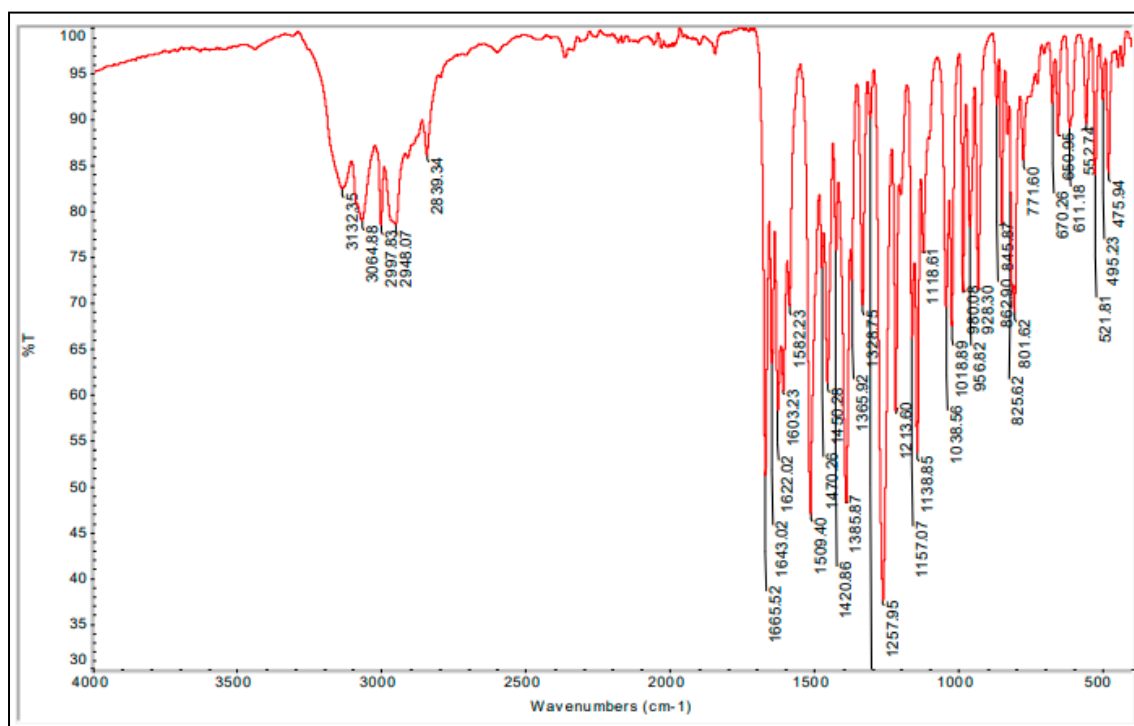


Figure S29 – Infrared absorption spectrum (ATR) of the compound **PQM-287 (3h)**.

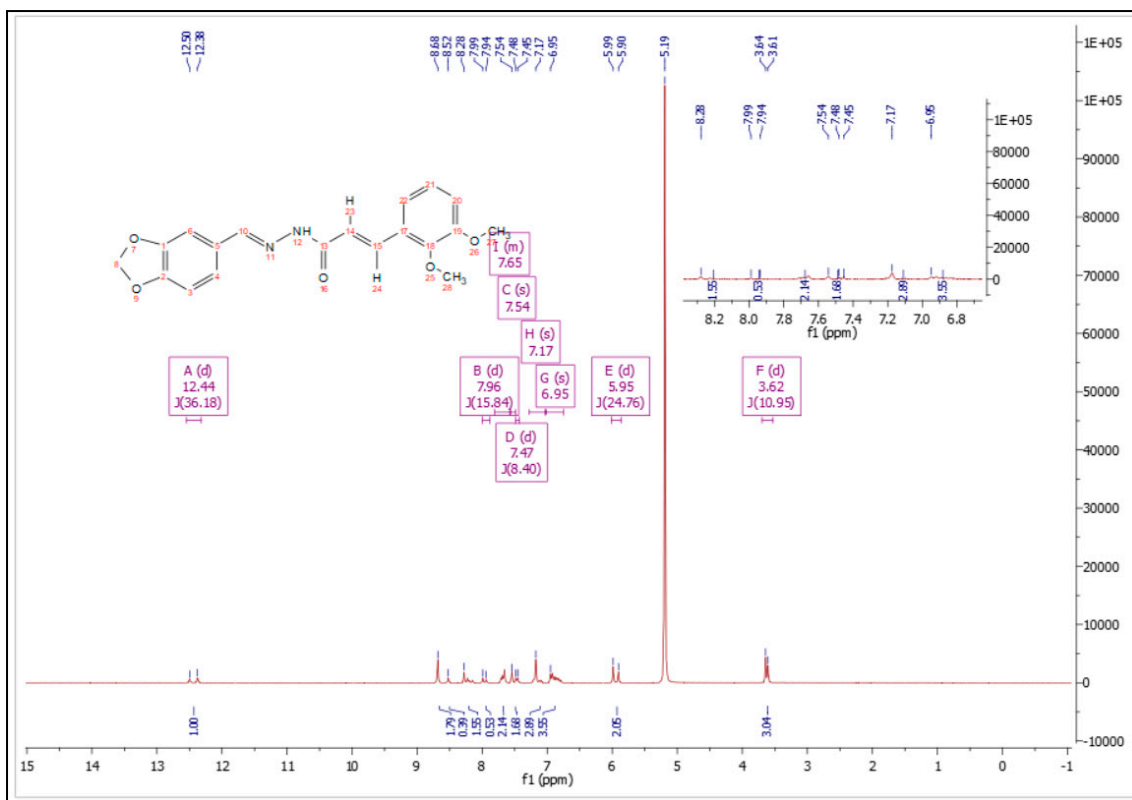


Figure S30 – ¹H spectrum (300 MHz, pyridine *d*₅) of the compound PQM-287 (3h).

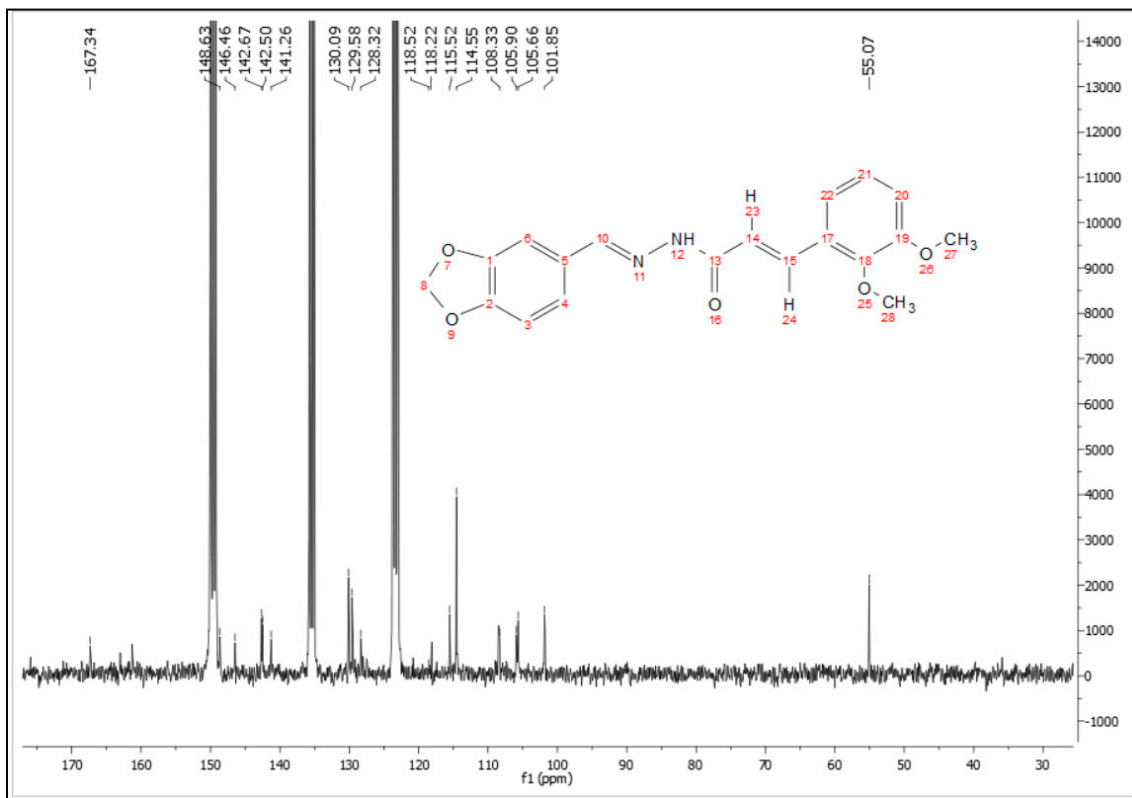


Figure S31 – ¹³C spectrum (75 MHz, pyridine *d*₅) of the compound PQM-287 (3h).

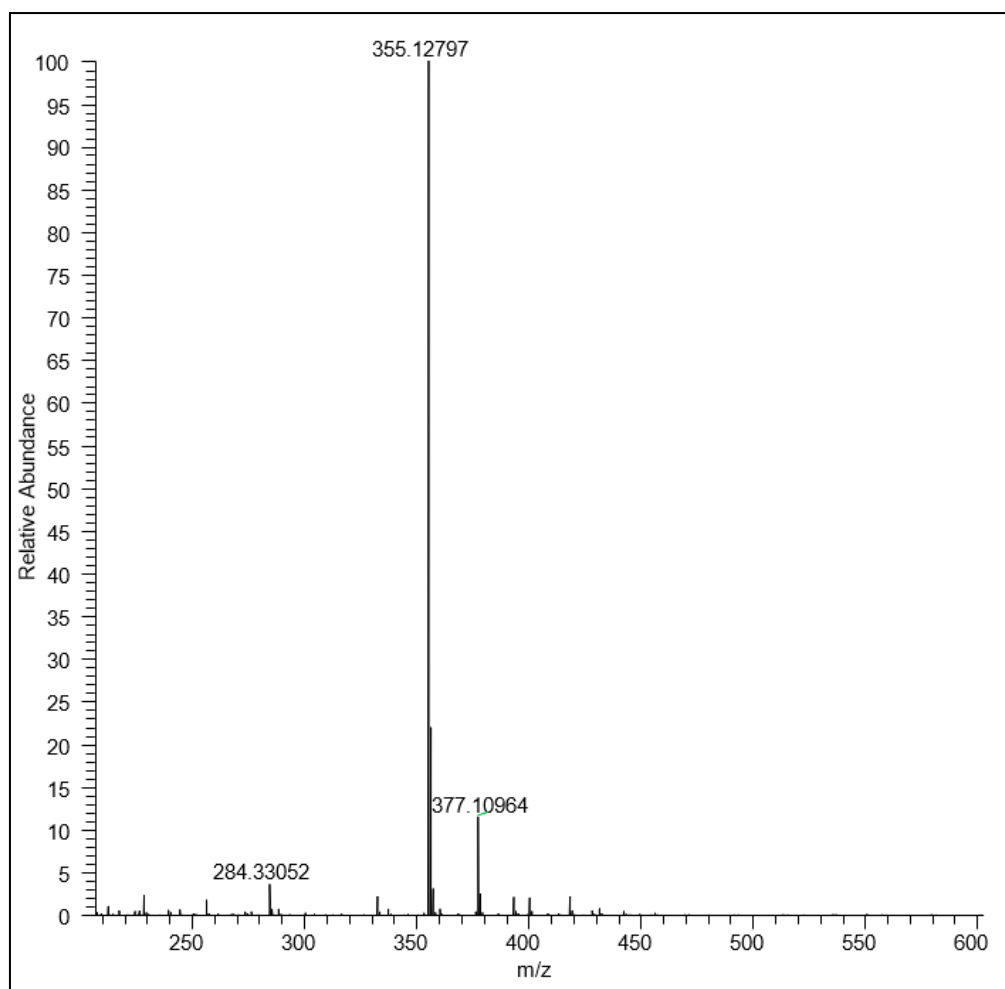


Figure S32 – Mass Spectrum (positive mode) of the compound PQM-287 (3h).

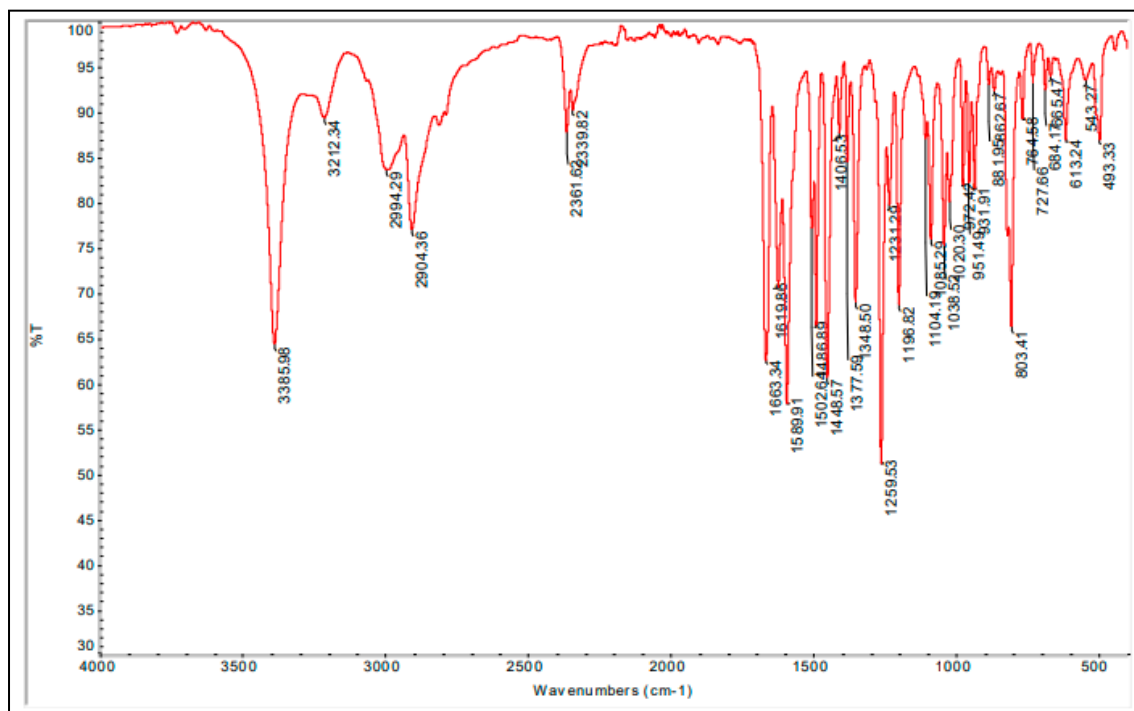


Figure S33 – Infrared absorption spectrum (ATR) of the compound PQM-288 (3i).

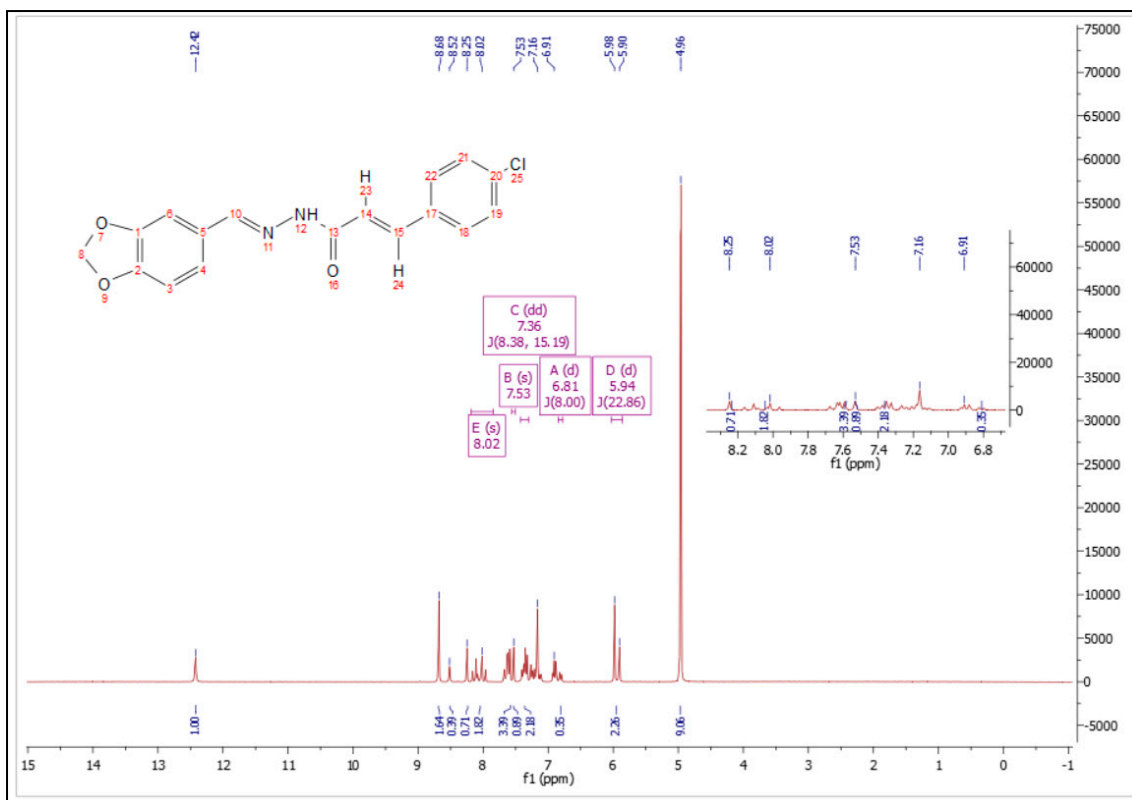


Figure S34 – ¹H spectrum (300 MHz, pyridine *d*₅) of the compound PQM-288 (3i).

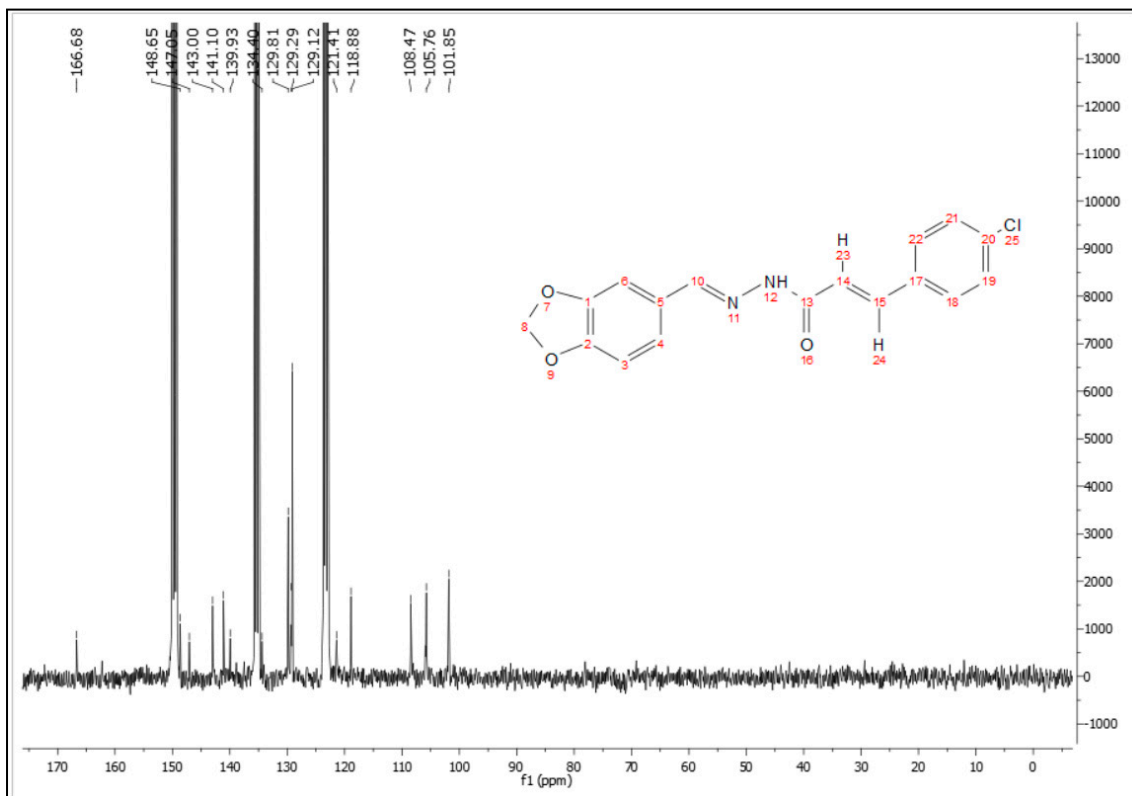


Figure S35 – ¹³C spectrum (75 MHz, pyridine *d*₅) of the compound PQM-288 (3i).

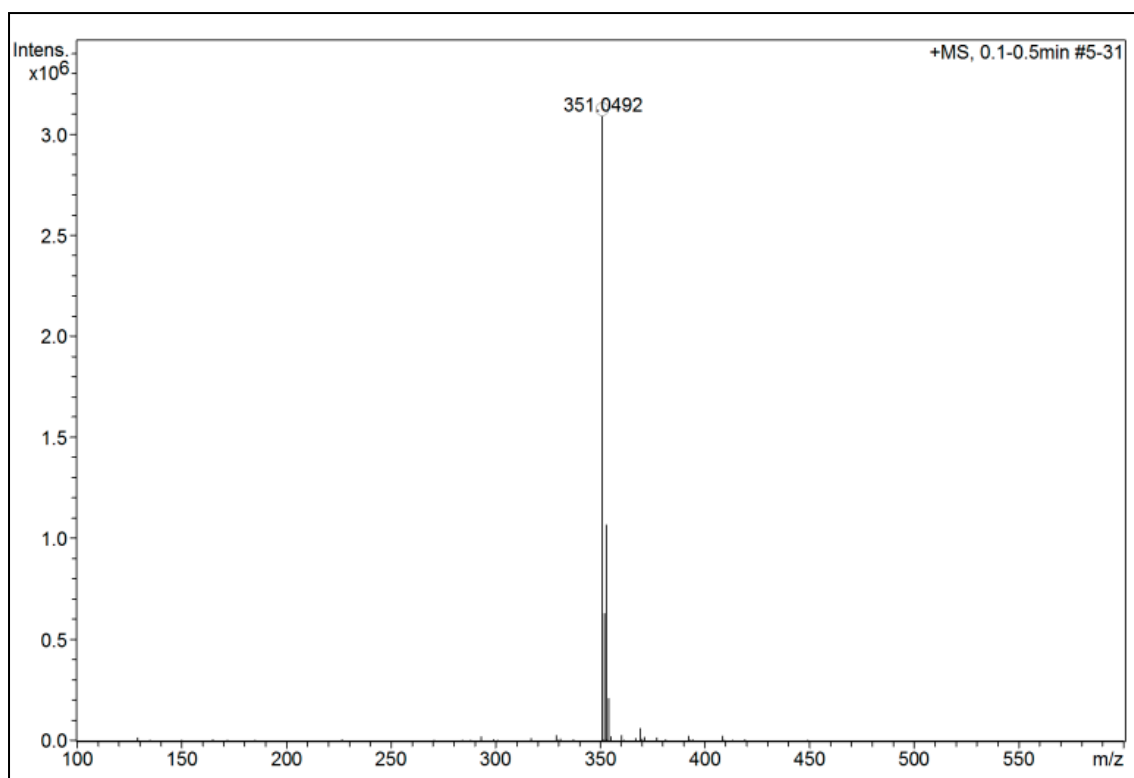


Figure S36 – Mass Spectrum (positive mode) of the compound **PQM-288 (3i)**.