

Synthesis and Antimicrobial Efficacy of Novel 1,3,4-Thiadiazole Derivatives Against Key Bacterial and Fungal Strains

Mohamed M. Eleribi,^{1*} Fakhri A. Elabbar,² and Basma Saad Baaiu²

¹ *Department of Chemistry, Faculty of Art and Science, Alabyar Branch, University of Benghazi, P. O. Box 1308, Benghazi, Libya.*

² *Department of Chemistry, Faculty of Science, Benghazi, University of Benghazi, P. O. Box 1308, Benghazi, Libya.*

**Corresponding author: E-mail: mohamed.eribi@uob.edu.ly*

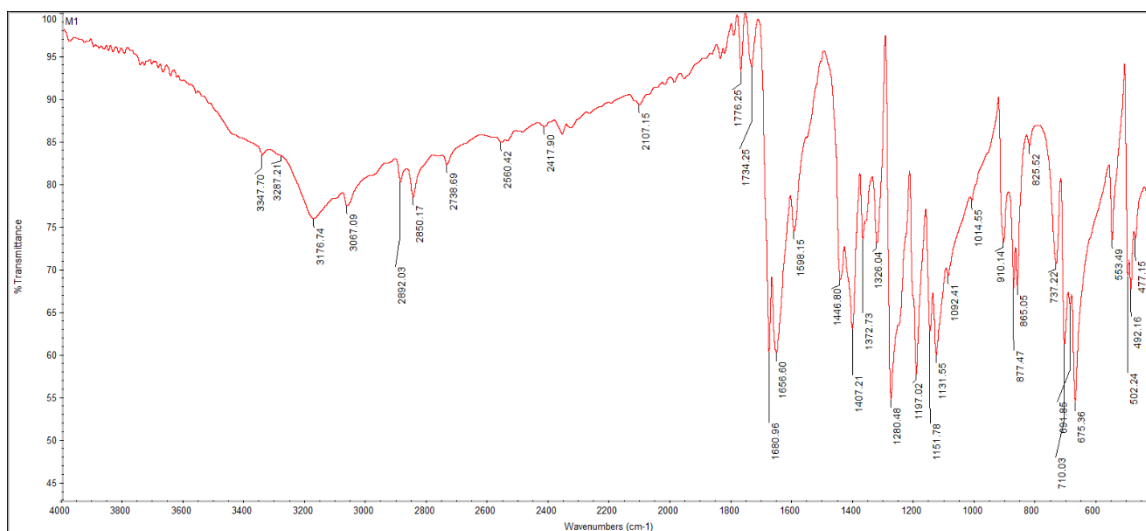


Figure 1:IR spectrum of Compound 2

entesar-M1 #55-58 RT: 0.94-0.99 AV: 4 SB: 2 0.89 , 0.84 NL: 2.02E2
T: + c EI Full ms [40.00-1000.00]

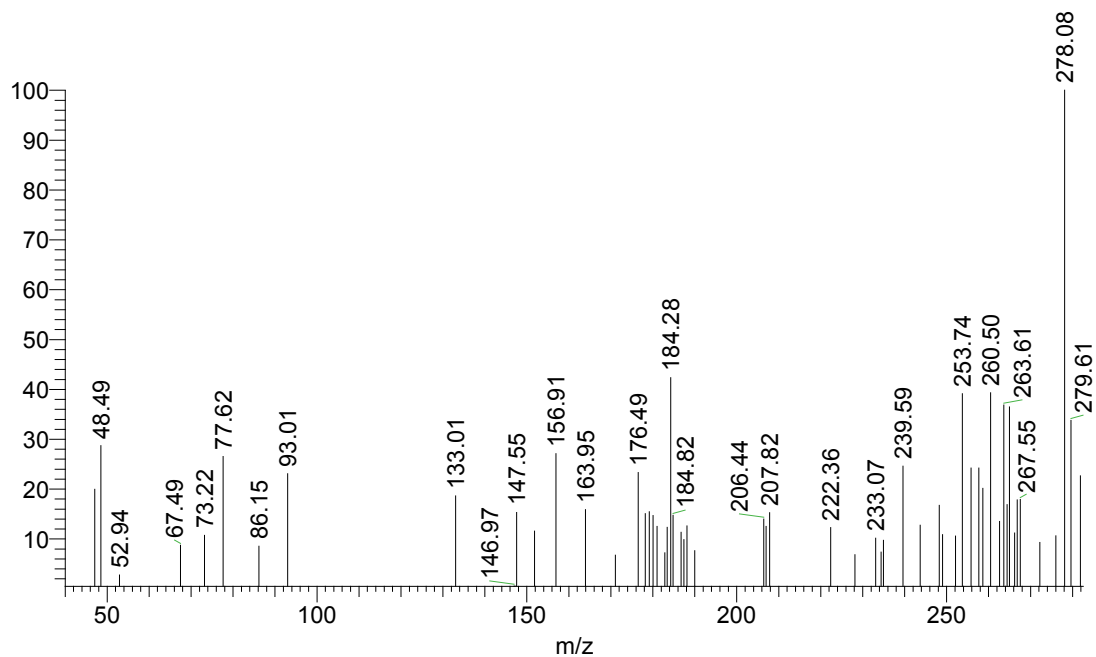


Figure 2:Mass spectrum of Compound 2

Entsar Badr-M1-Hnmr-RR

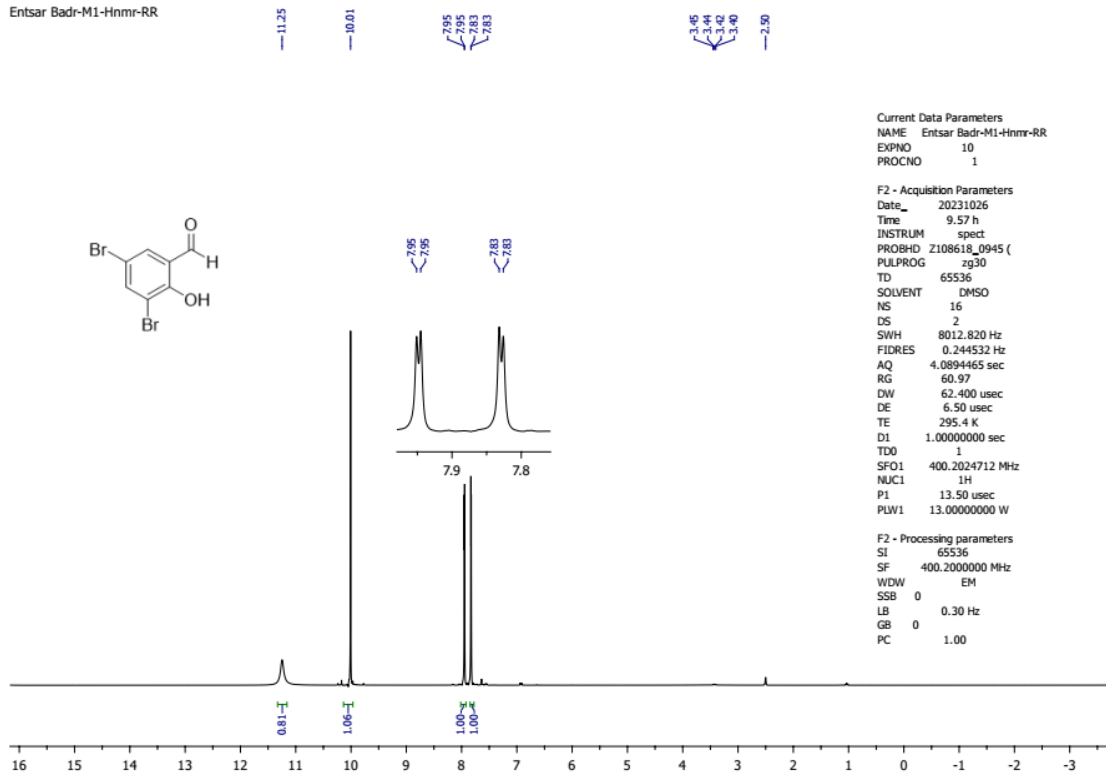


Figure 3: ¹H NMR spectrum of Compound 2

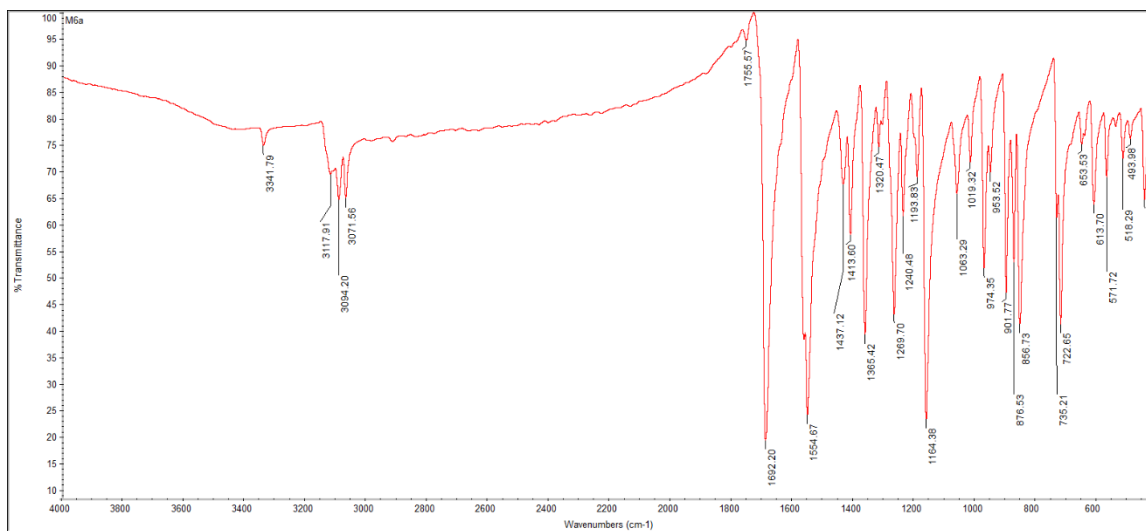


Figure 4: IR spectrum of Compound 3

entesar-M6A #185-188 RT: 3.11-3.16 AV: 4 SB: 26 1.21-1.34 , 0.87-1.14 NL: 6.78E3
T: {0,0} + c EI Full ms [40.00-1000.00]

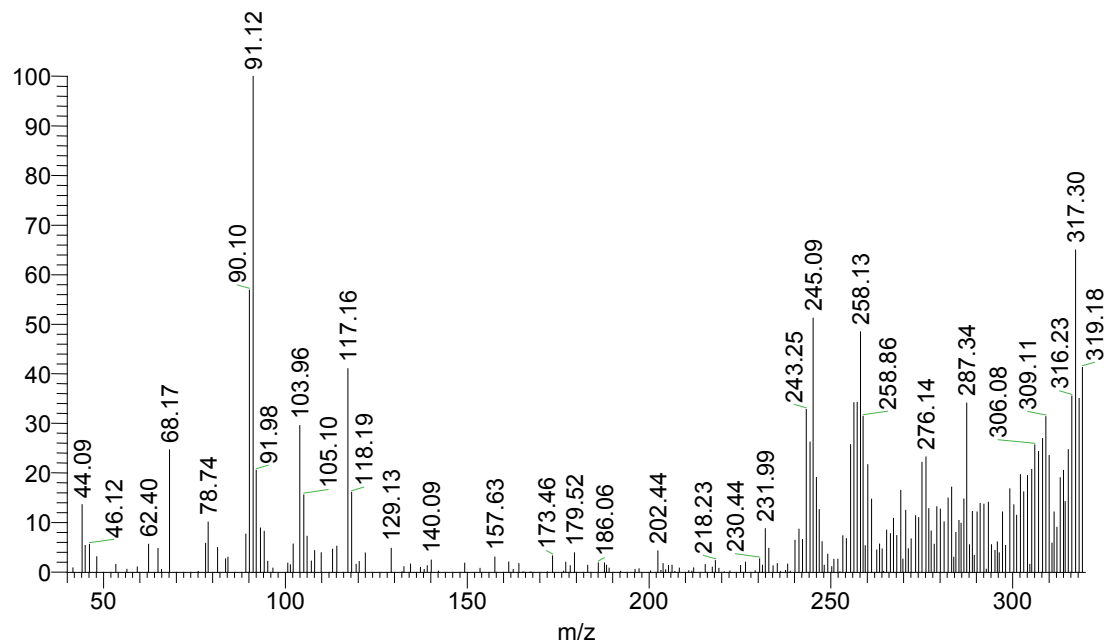


Figure 5: Mass spectrum of Compound 3

Entesar Badr-M6a-Hnmr-RR

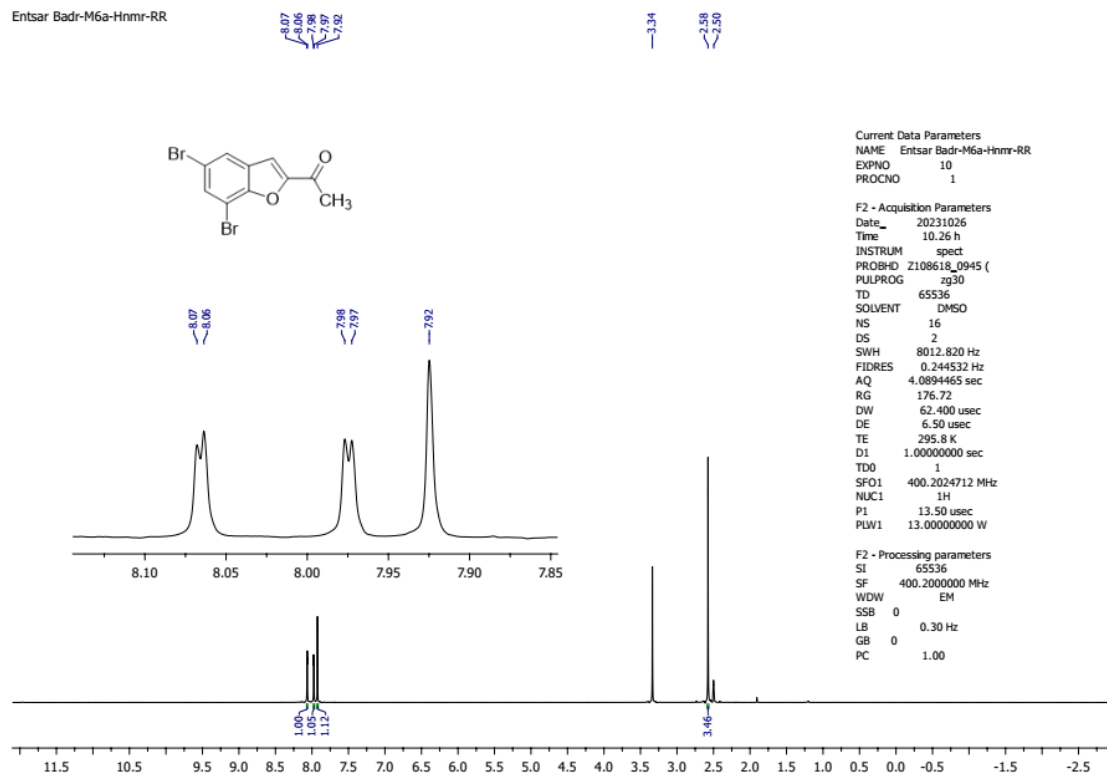


Figure 6: ¹H NMR spectrum of Compound 3

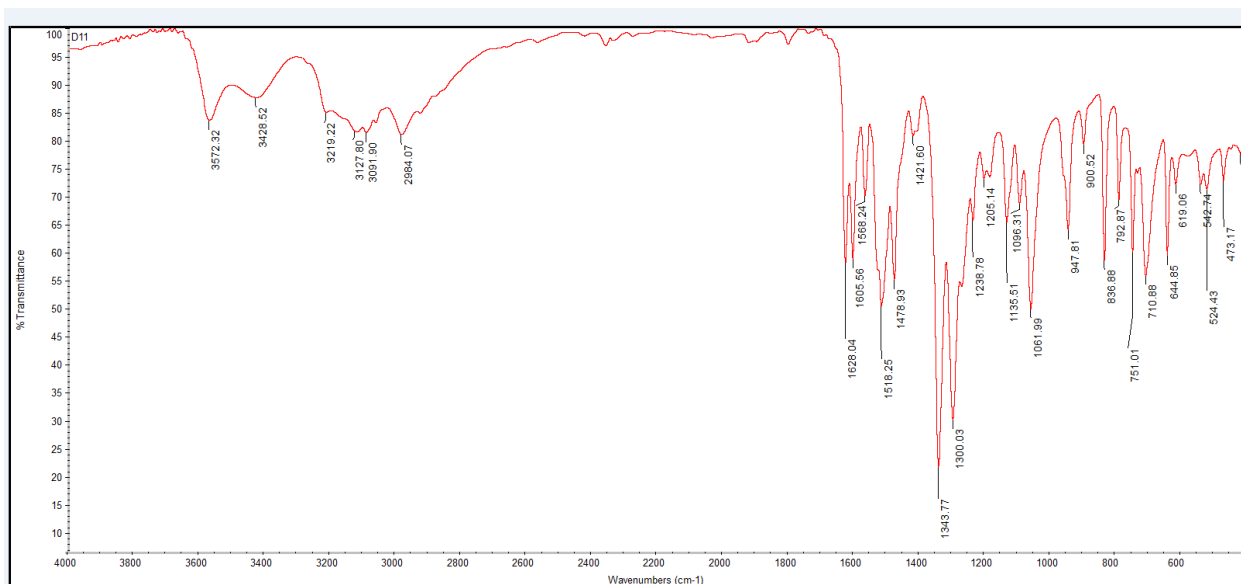


Figure 7: IR spectrum of Compound 4

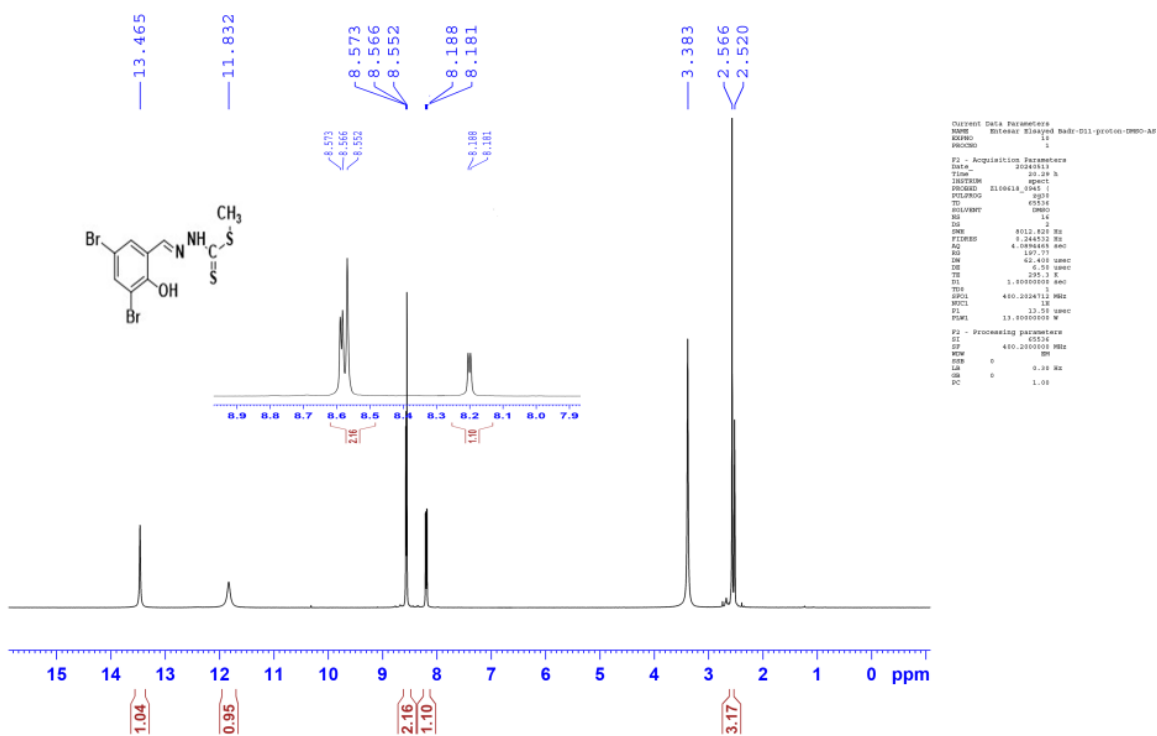


Figure 8: ¹H NMR spectrum of Compound 4

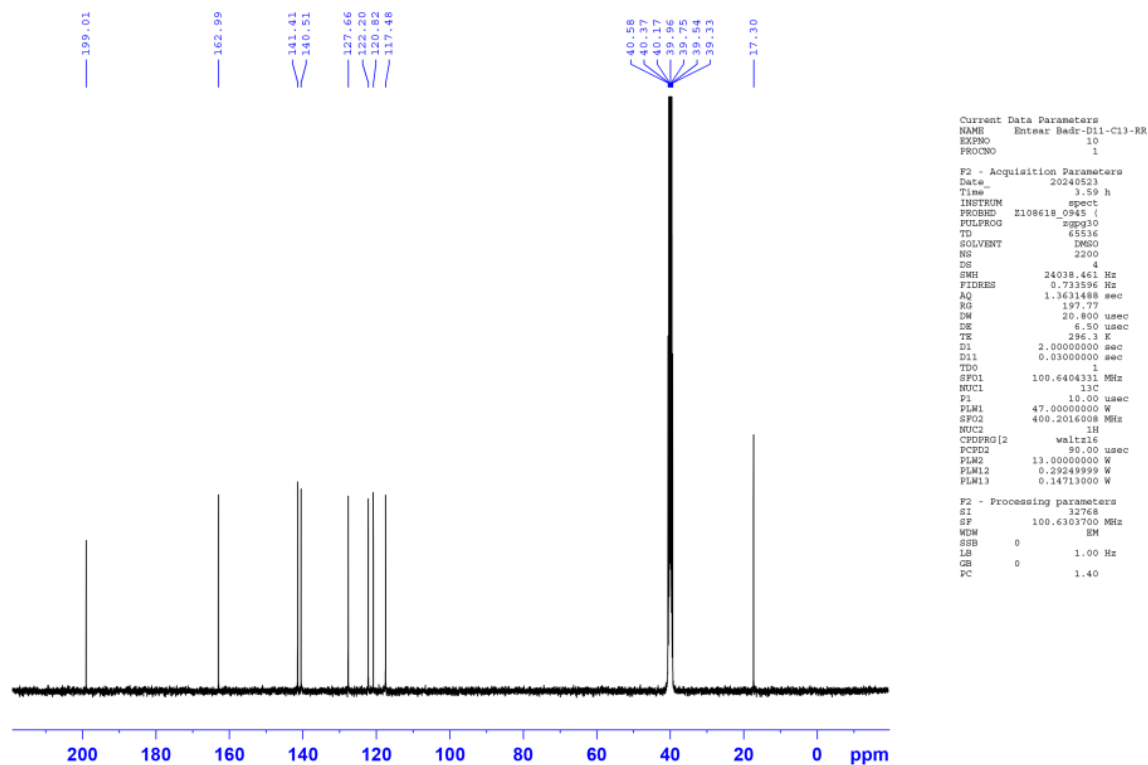


Figure 9: ^{13}C NMR spectrum of Compound 4

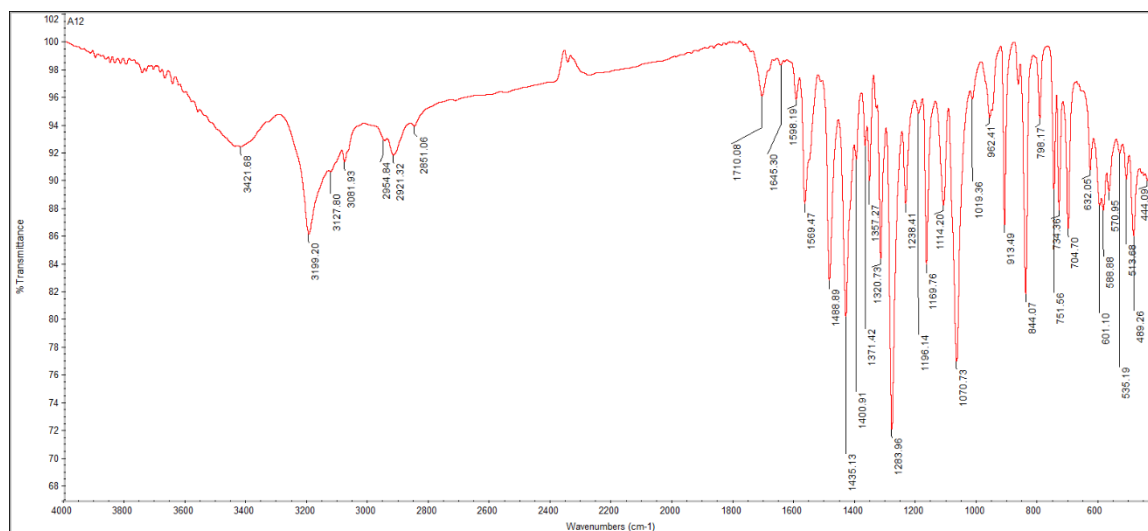


Figure 10: IR spectrum of Compound 5

A12 #219 RT: 3.68 P: + SB: 2 3.53, 3.50 NL: 4.23E3
T: {0,0} + c EI Full ms [40.00-1000.00]

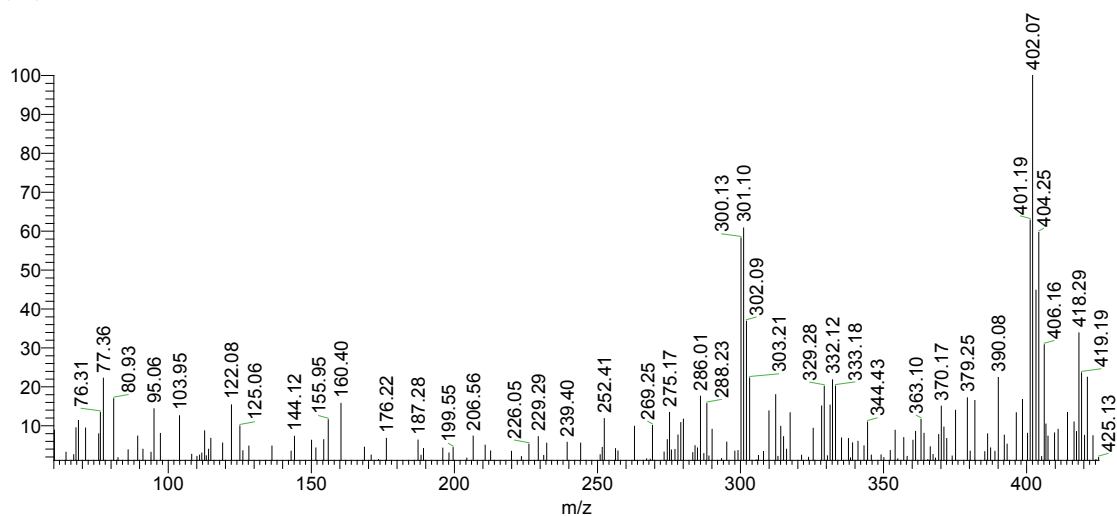


Figure 11: Mass spectrum of Compound 5

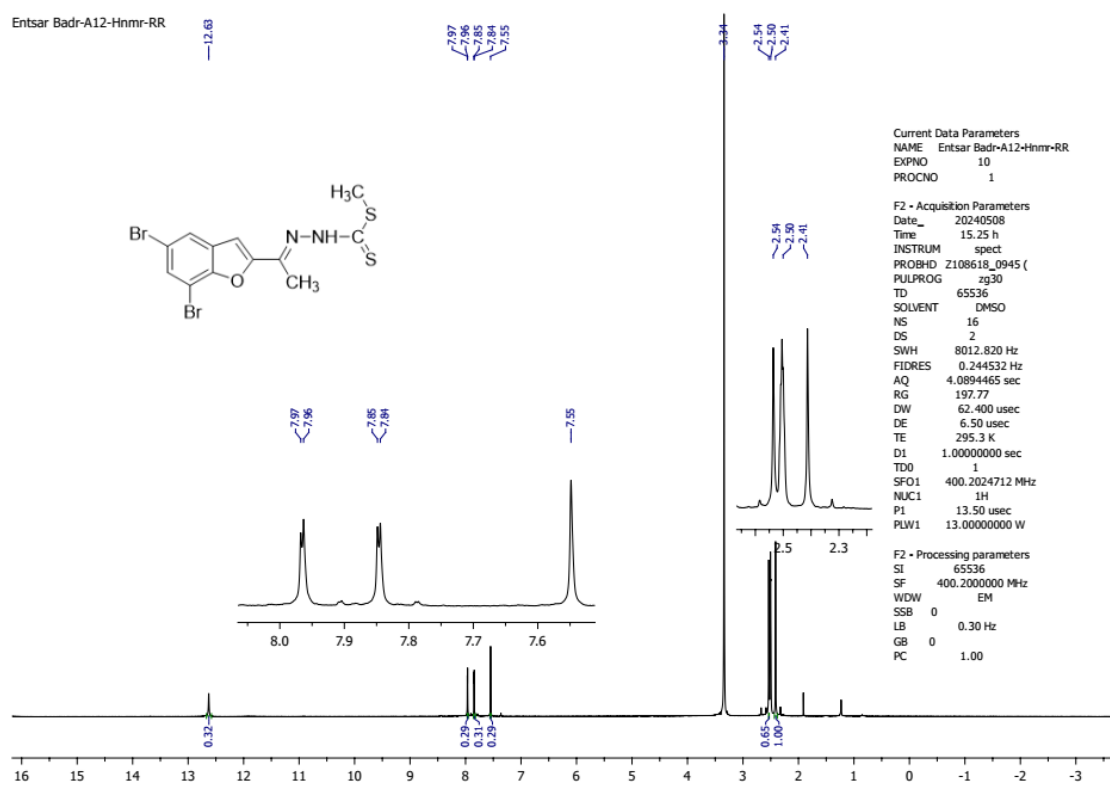


Figure 12: ¹H NMR spectrum of Compound 5

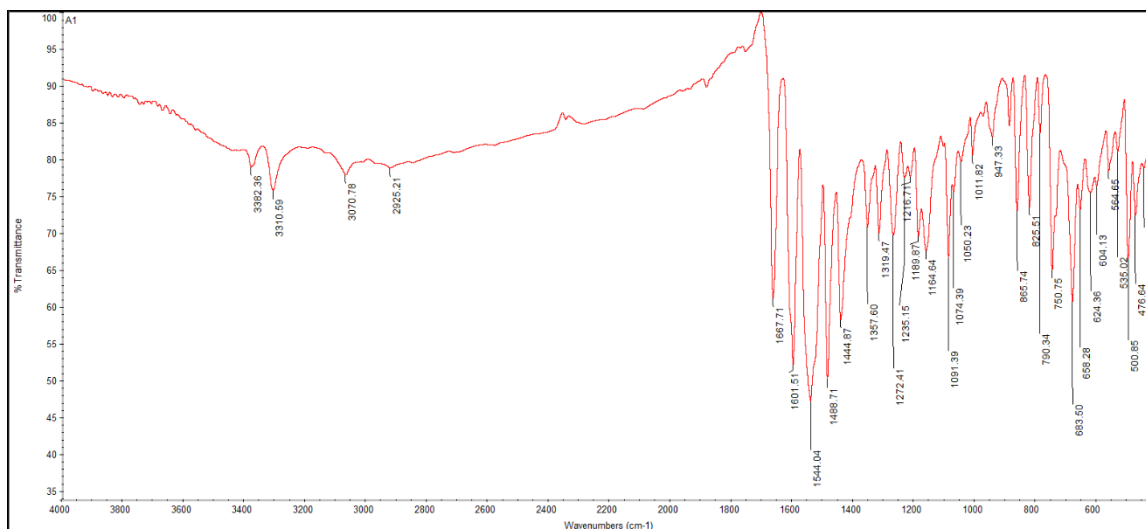


Figure 13: IR spectrum of Compound 10a

A1 #327 RT: 5.49 P: + NL: 3.50E2
T: {0,0} + c EI Full ms [40.00-1000.00]

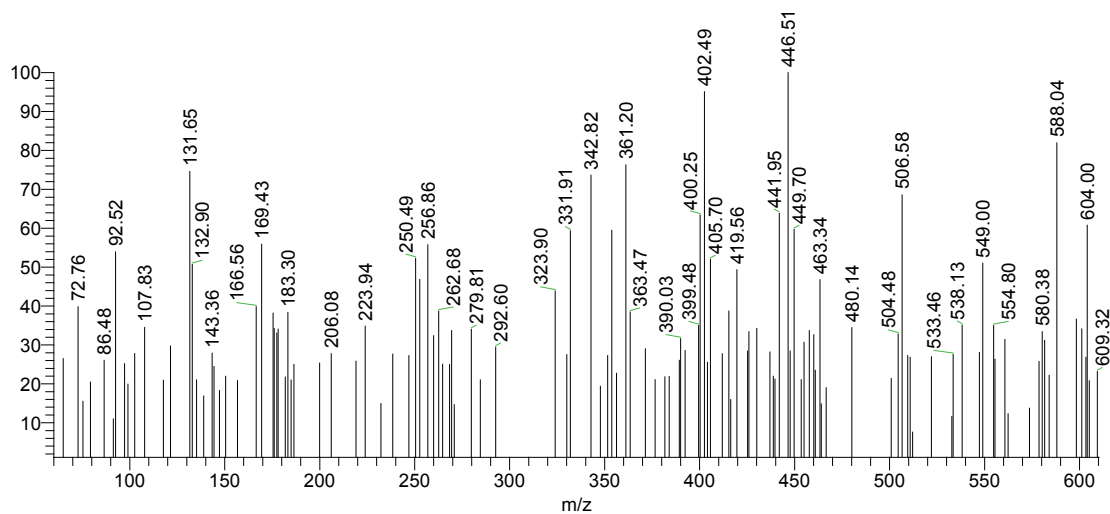


Figure 14: Mass spectrum of Compound 10a

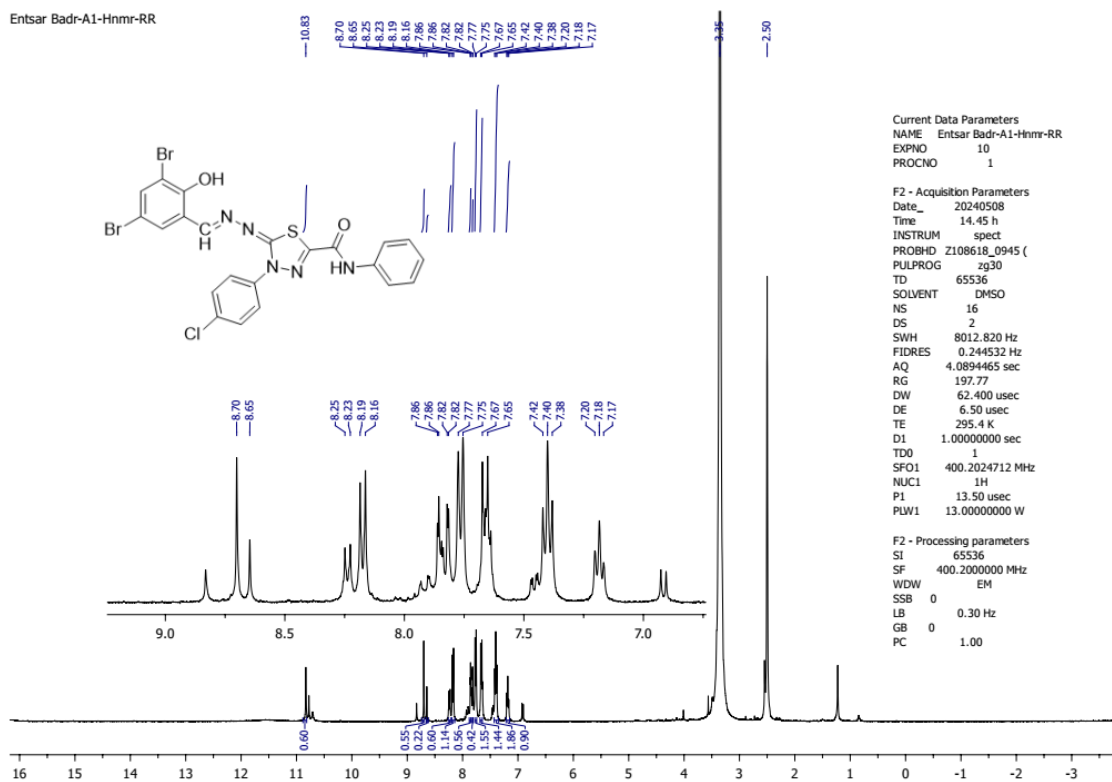


Figure 15: ^1H NMR spectrum of Compound 10a

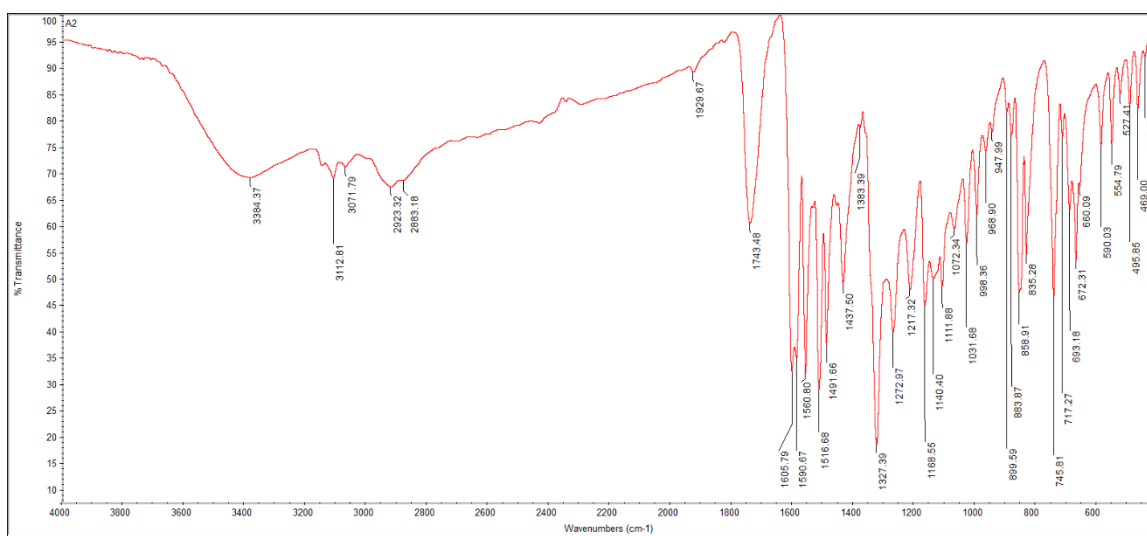


Figure 16: IR spectrum of Compound 10b

A2 #194 RT: 3.26 P: + SB: 2 3.28, 3.23 NL: 4.72E3
T: {0,0} + c EI Full ms [40.00-1000.00]

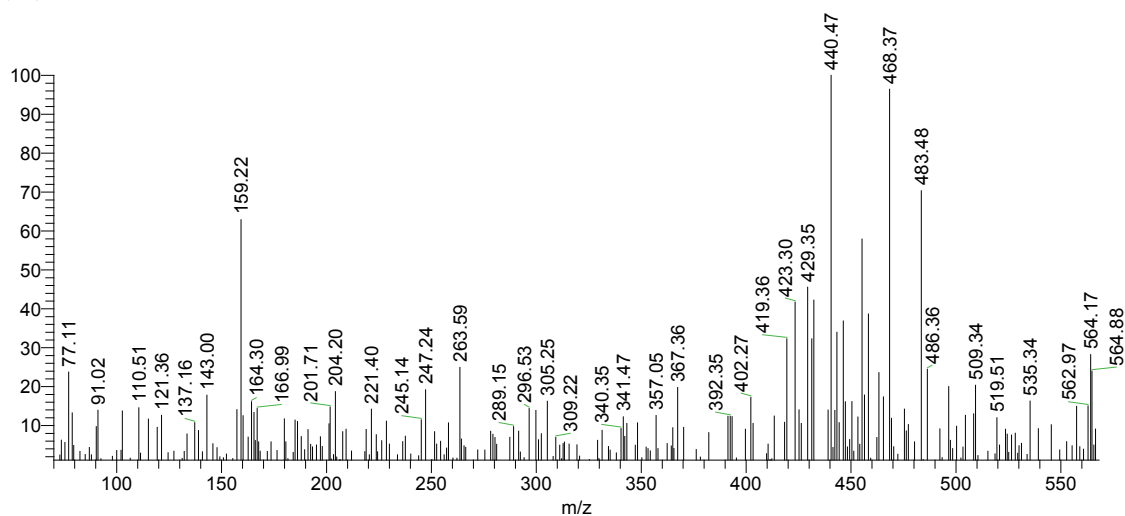


Figure 17: Mass spectrum of Compound 10b

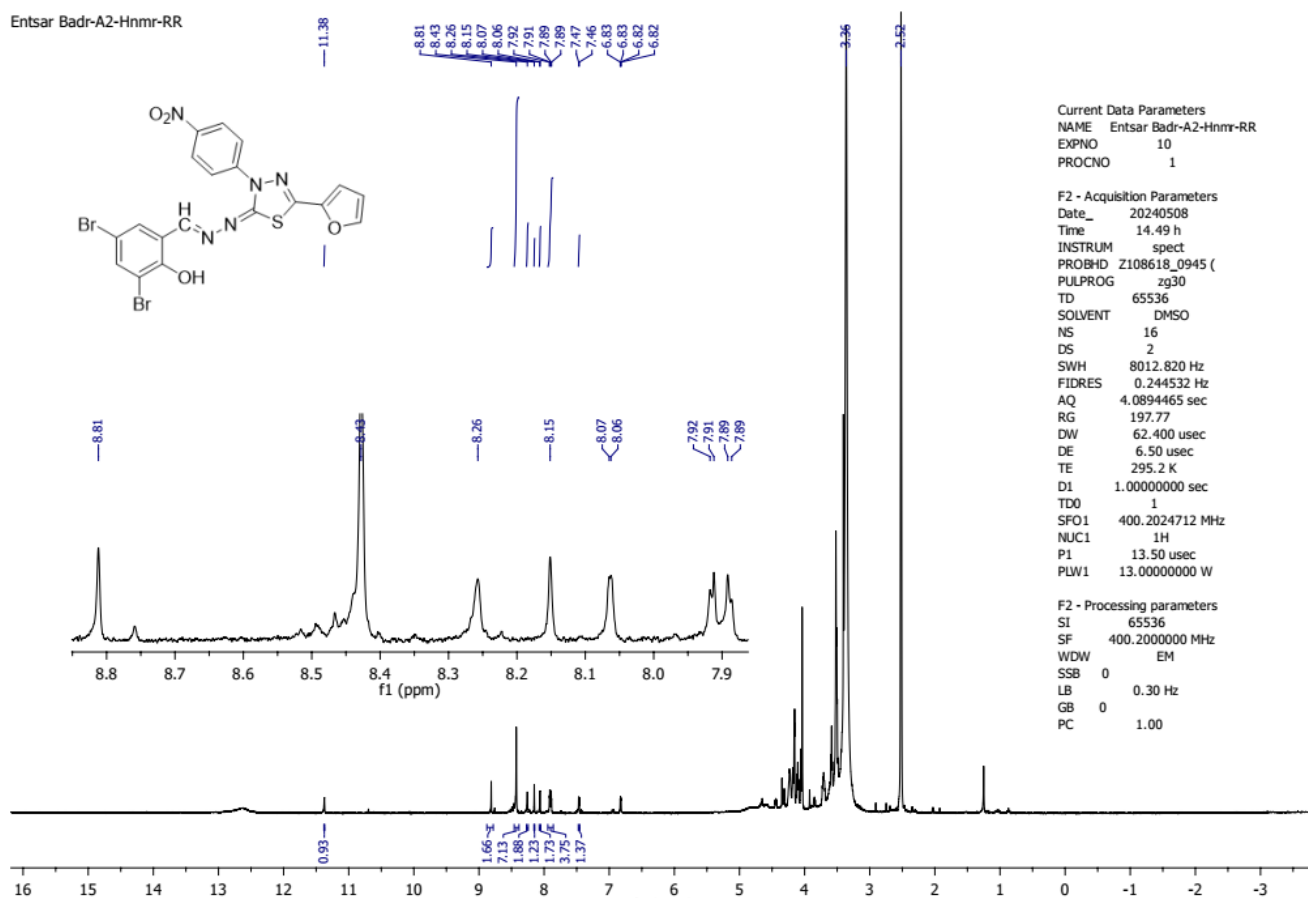


Figure 18: ¹H NMR spectrum of Compound 10b

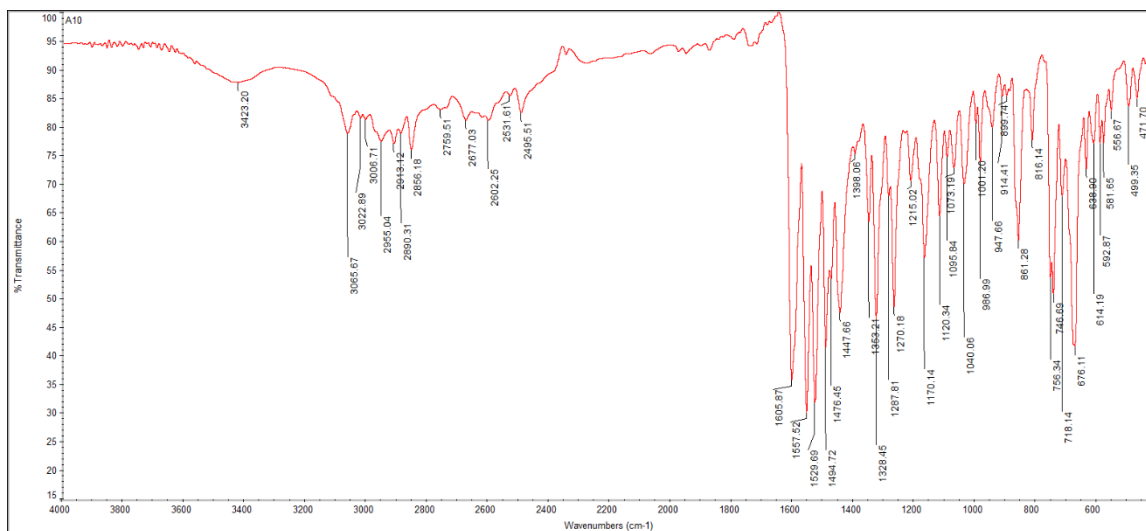


Figure 19: IR spectrum of Compound 10c

A10 #103-110 RT: 1.74-1.86 AV: 8 SB: 26 1.21-1.34, 0.87-1.14 NL: 6.43E1
T: {0,0} + c EI Full ms [40.00-1000.00]

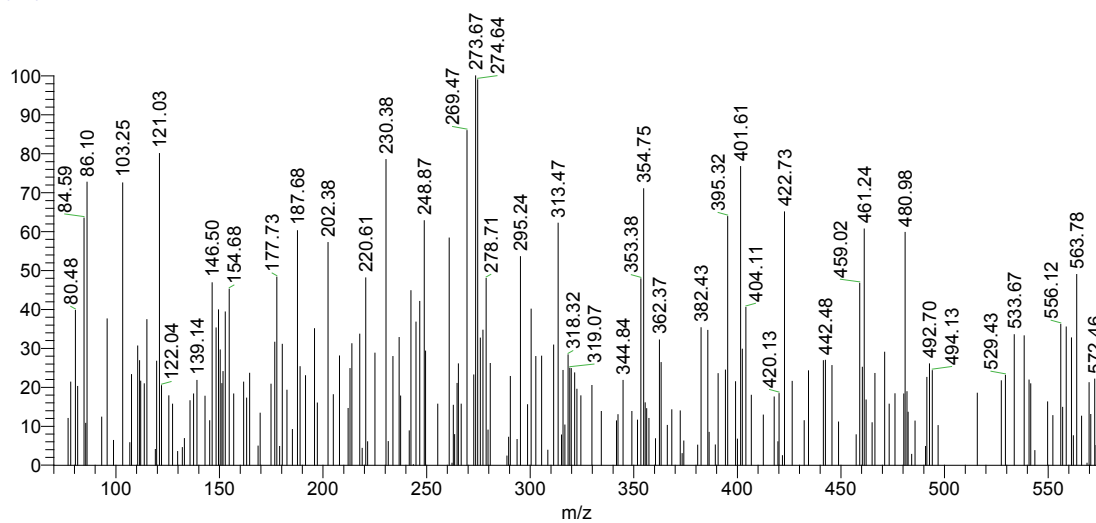


Figure 20: Mass spectrum of Compound 10c

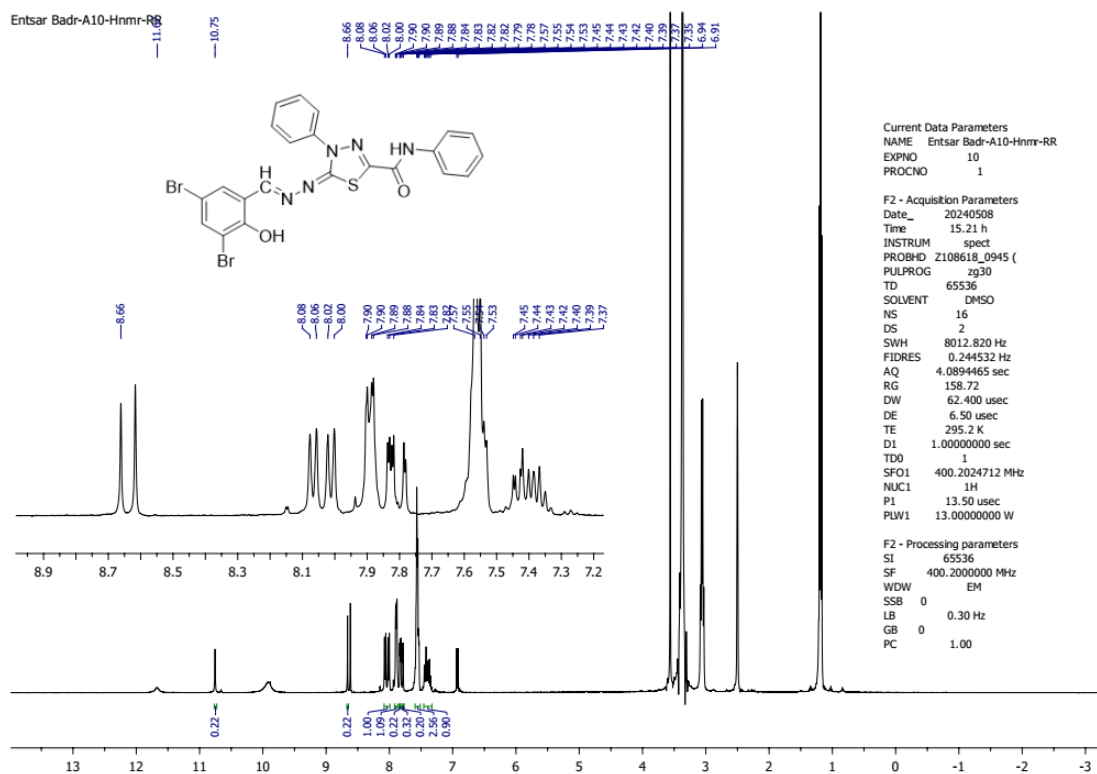


Figure 21: ^1H NMR spectrum of Compound 10c

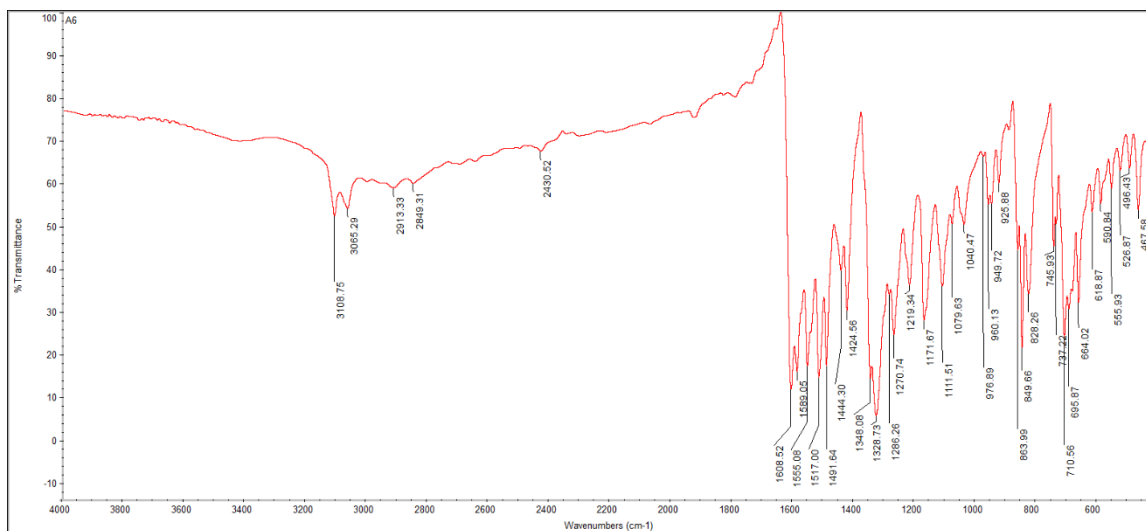


Figure 22: IR spectrum of Compound 10d

A6 #164 RT: 2.76 P: + SB: 2 2.64, 2.54 NL: 1.13E3
T: {0,0} + c EI Full ms [40.00-1000.00]

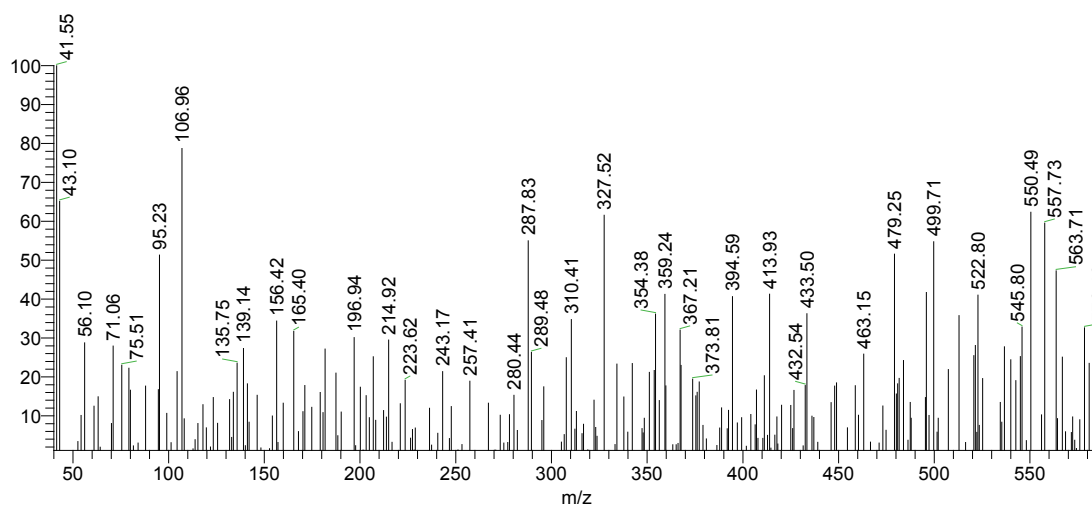


Figure 23: Mass spectrum of Compound 10d

Entsar Badr-A6-Hnmr-RR

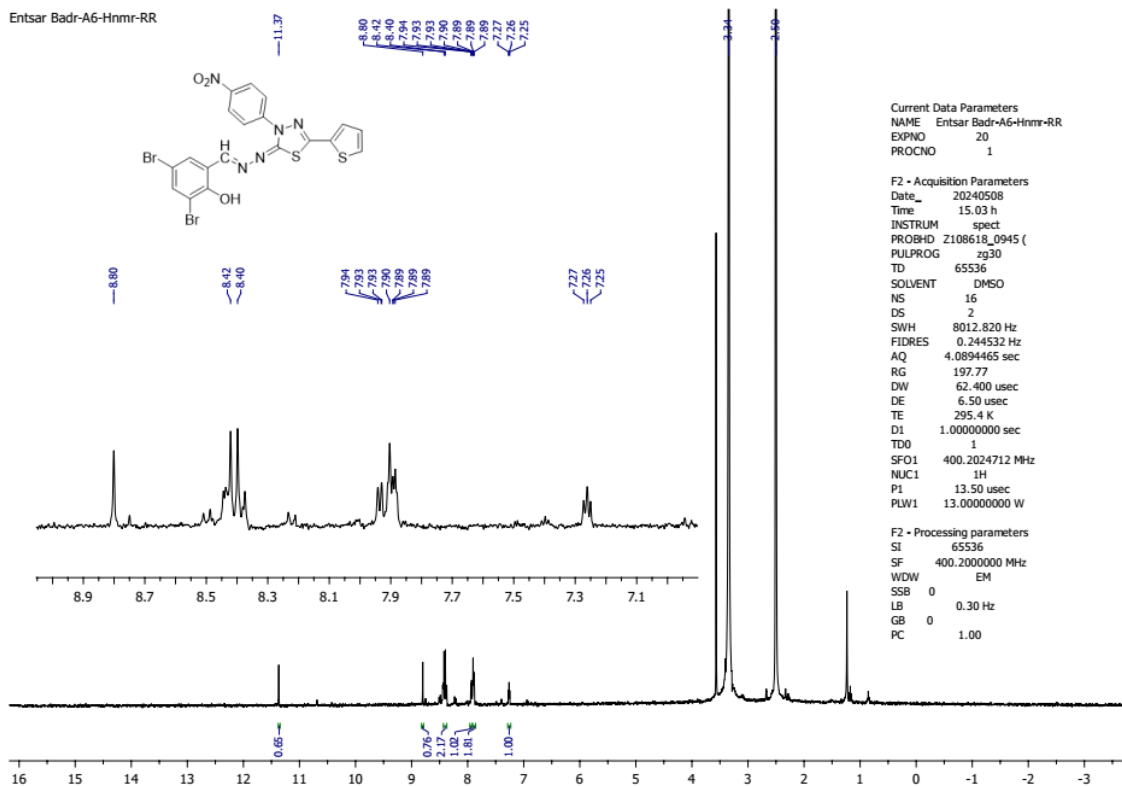


Figure 24: ¹H NMR spectrum of Compound 10d

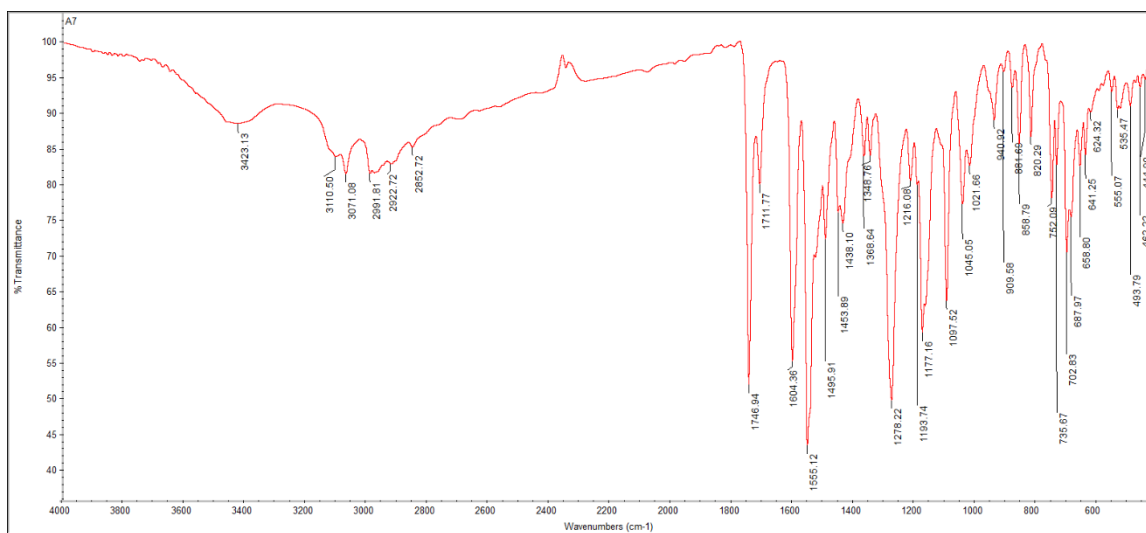


Figure 25: IR spectrum of Compound 10e

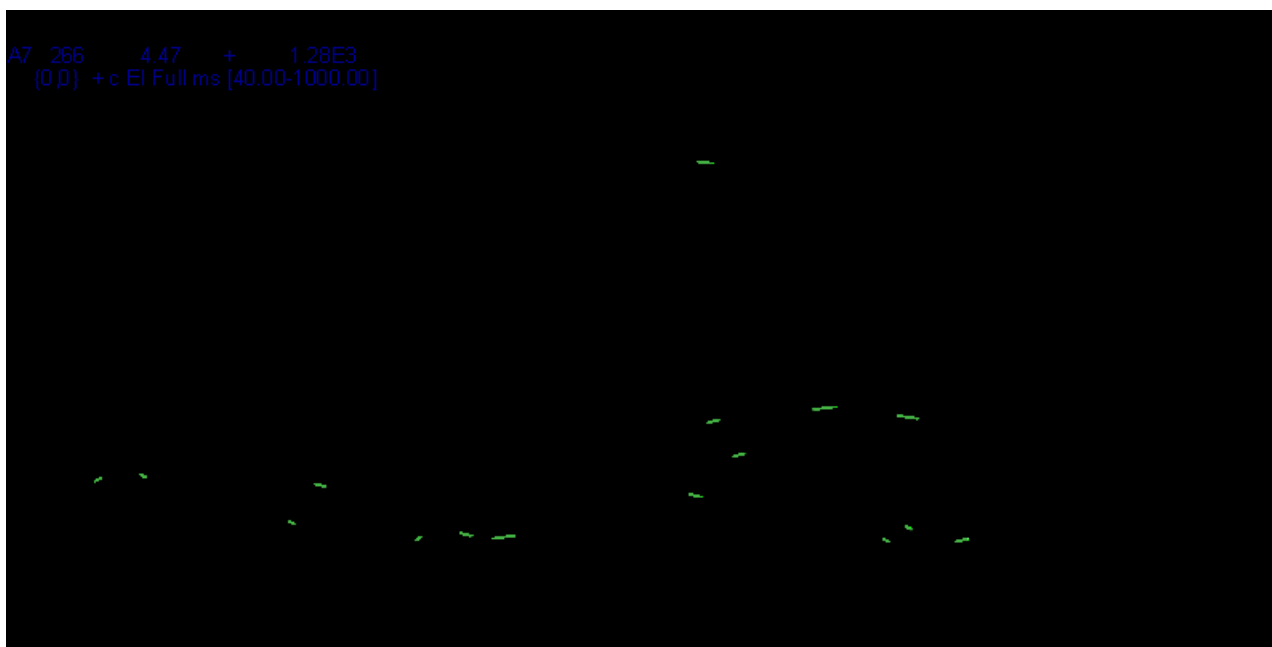


Figure 26: Mass spectrum of Compound 10e

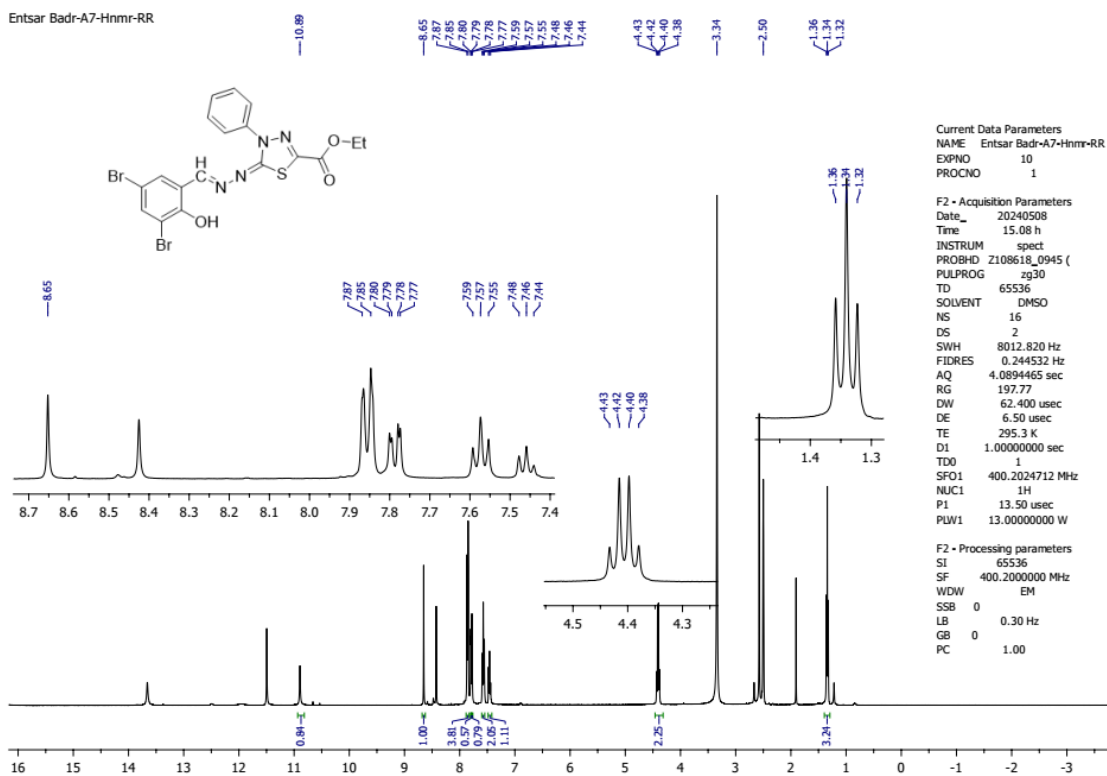


Figure 27: ¹H NMR spectrum of Compound 10e

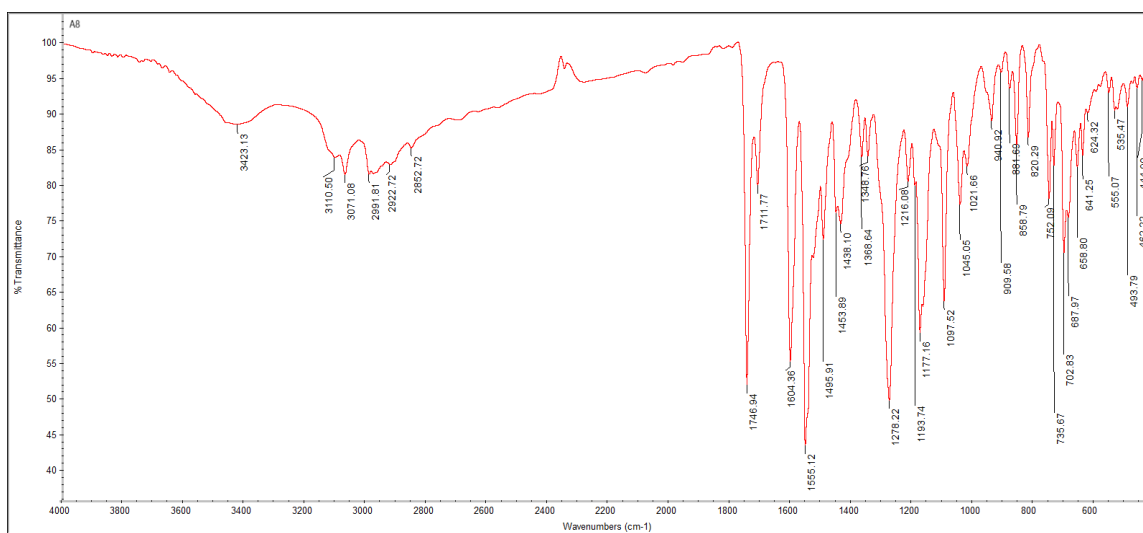


Figure 28: IR spectrum of Compound 10f

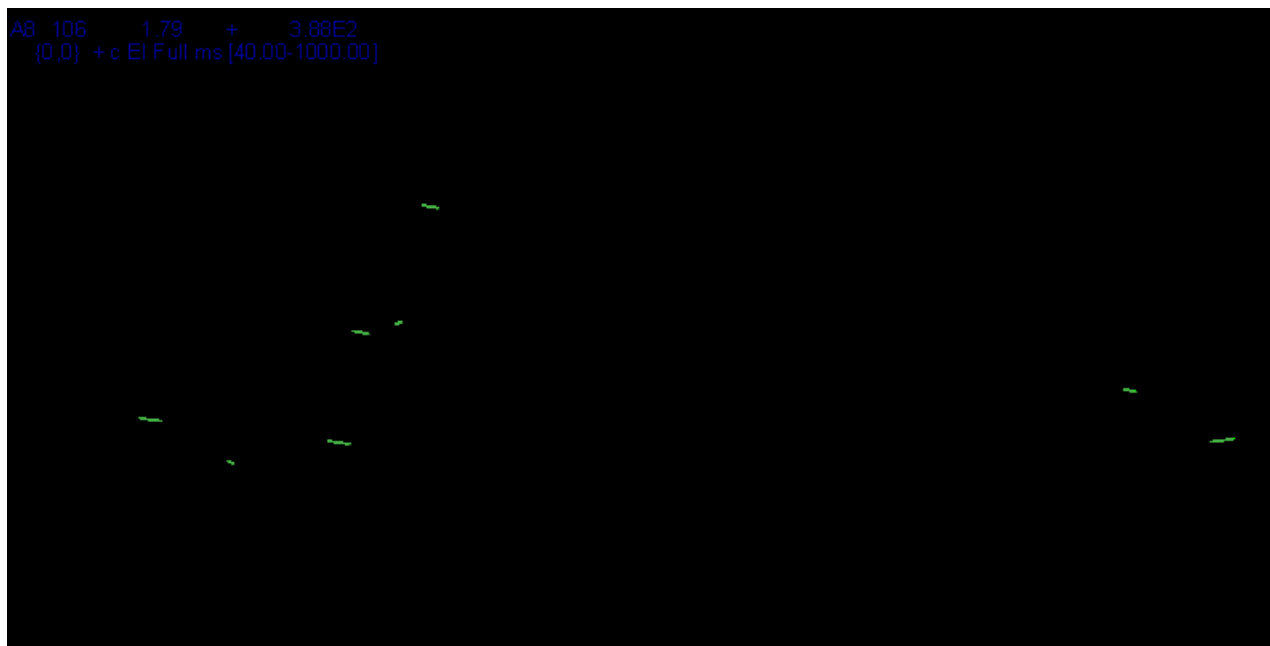


Figure 29: Mass spectrum of Compound 10f

Entsar Badr-A8-Hnmr-RR

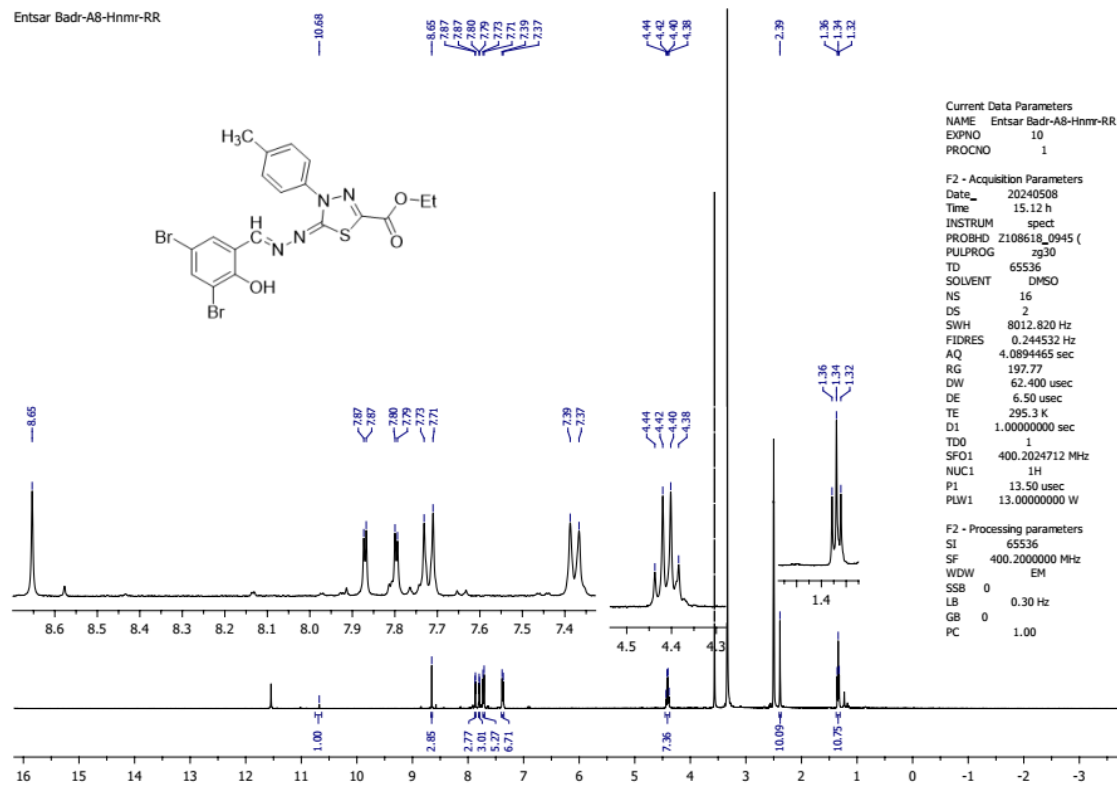


Figure 30: ¹H NMR spectrum of Compound 10f

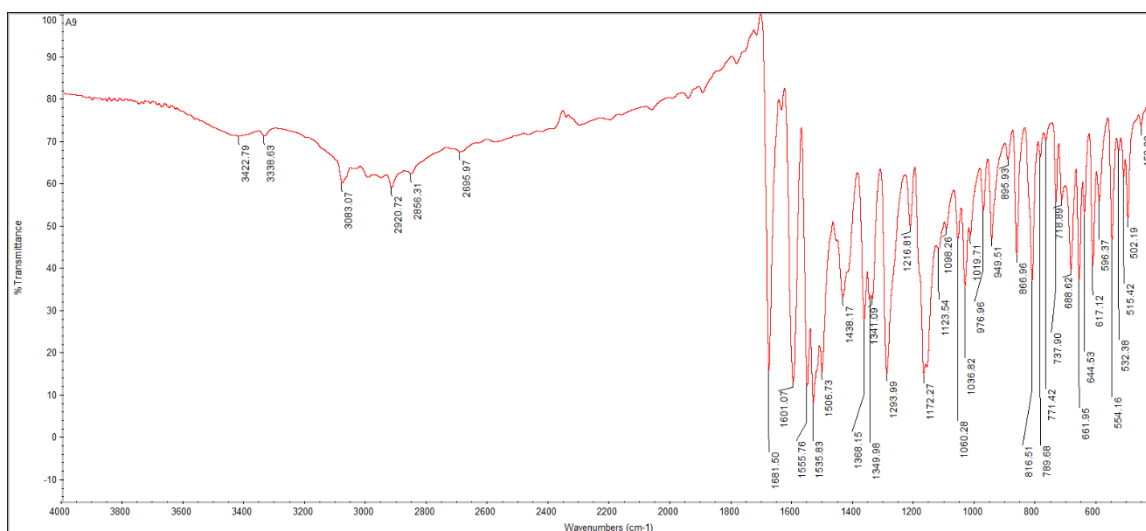


Figure 31: IR spectrum of Compound 10g

A9 #291 RT: 4.89 P: + NL: 1.74E4
T: {0,0} + c EI Full ms [40.00-1000.00]

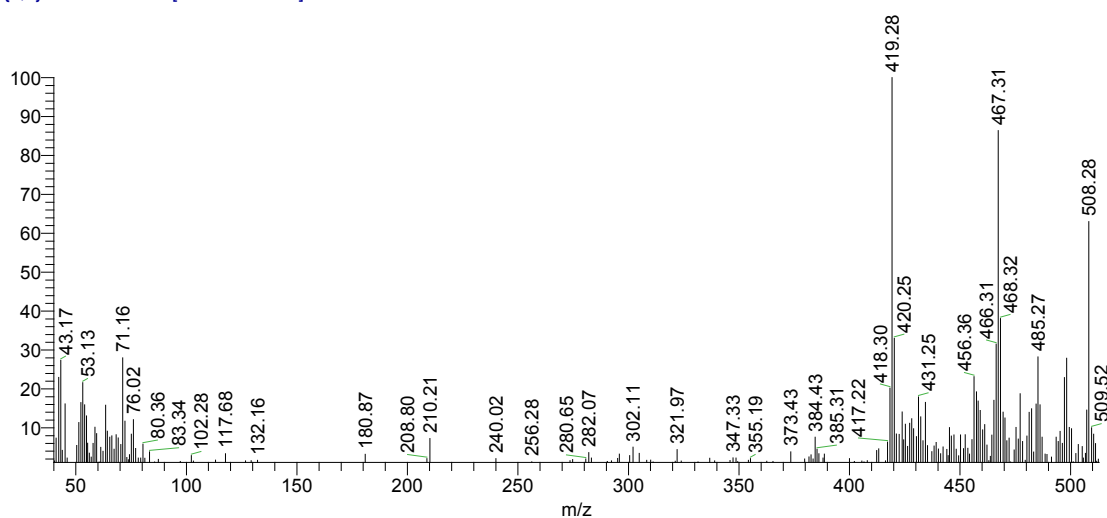


Figure 32: Mass spectrum of Compound 10g

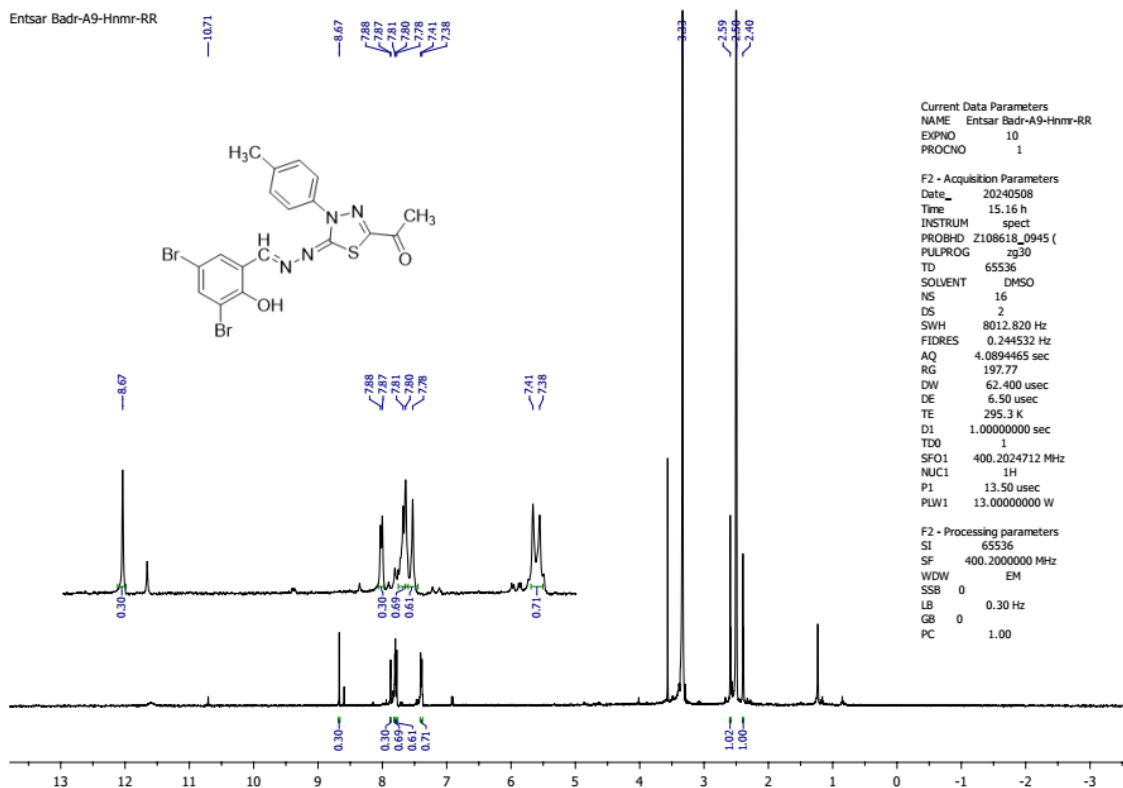


Figure 33: ^1H NMR spectrum of Compound 10g

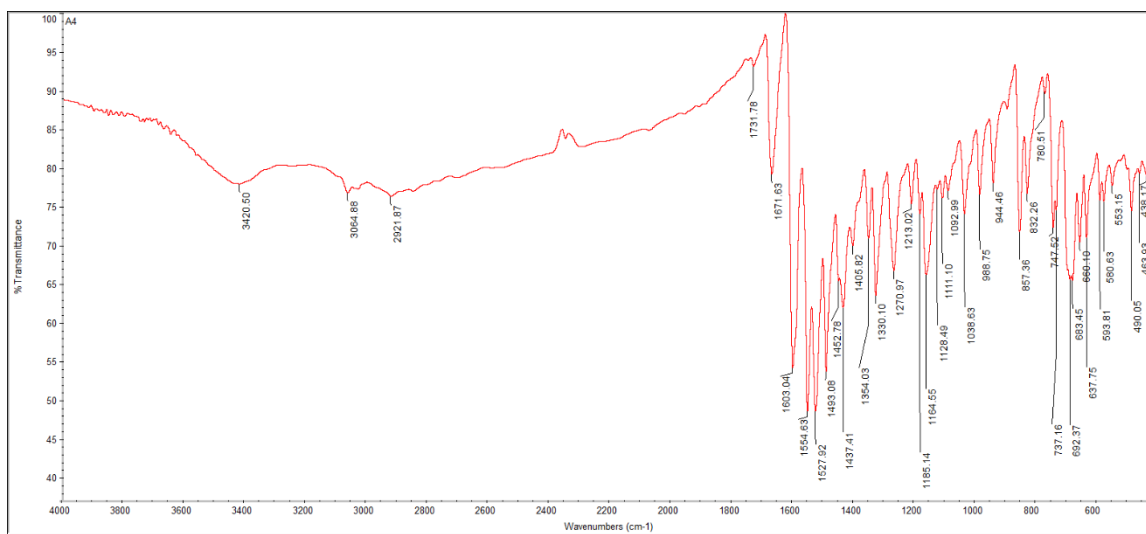


Figure 34: IR spectrum of Compound 10h

A4 #214 RT: 3.60 P: + NL: 3.97E2
T: {0,0} + c EI Full ms [40.00-1000.00]

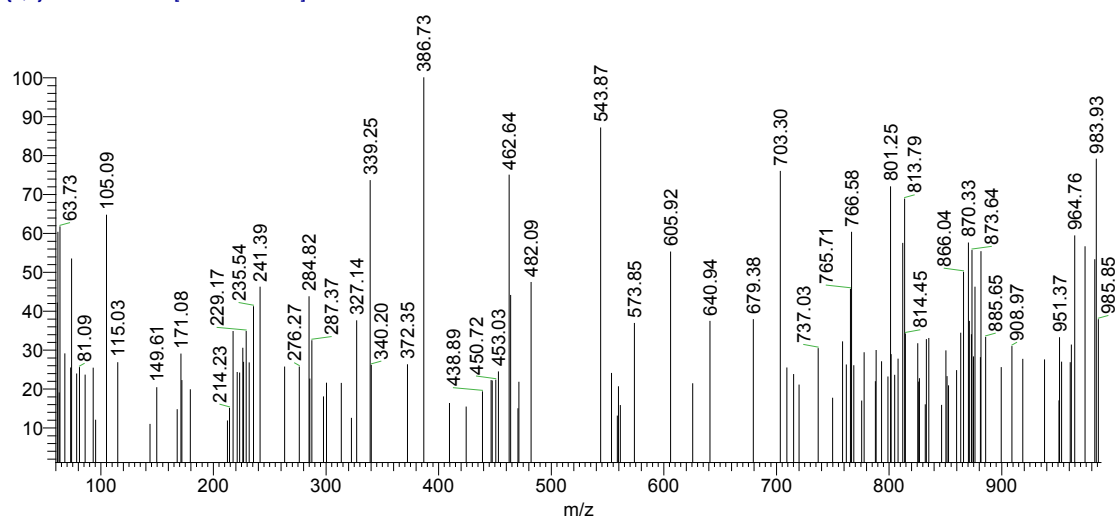


Figure 35: Mass spectrum of Compound 10h

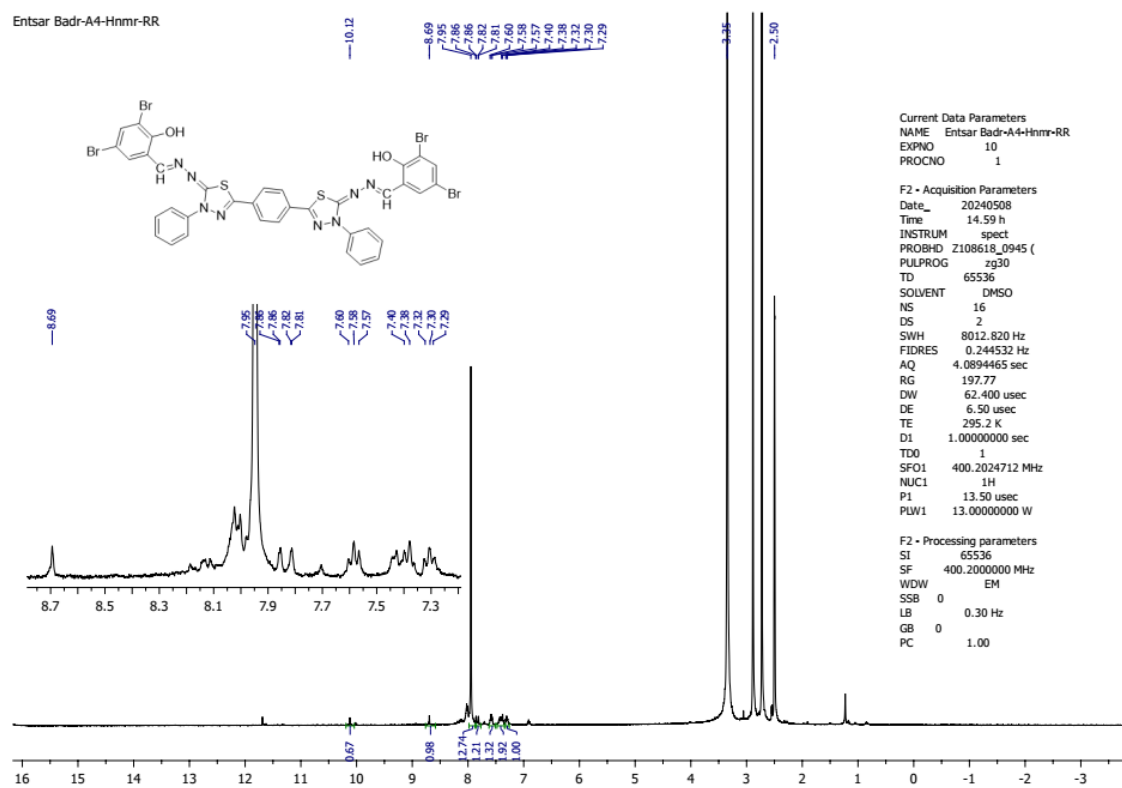


Figure 36: ¹H NMR spectrum of Compound 10h

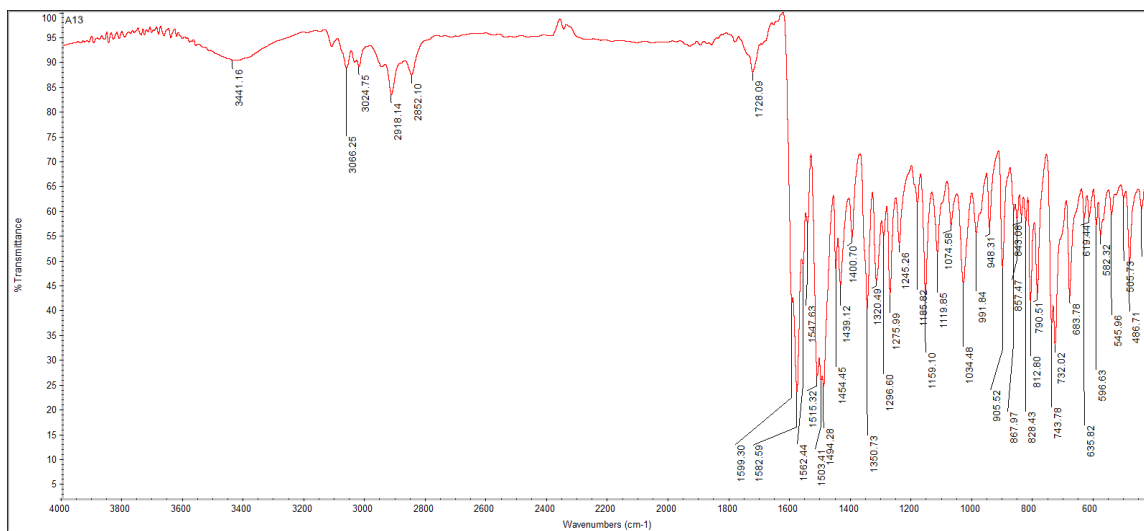


Figure 37: IR spectrum of Compound 11a

A13 #306 RT: 5.14 P: + SB: 16 5.17, 4.94-5.17 NL: 1.54E3
T: {0,0} + c EI Full ms [40.00-1000.00]

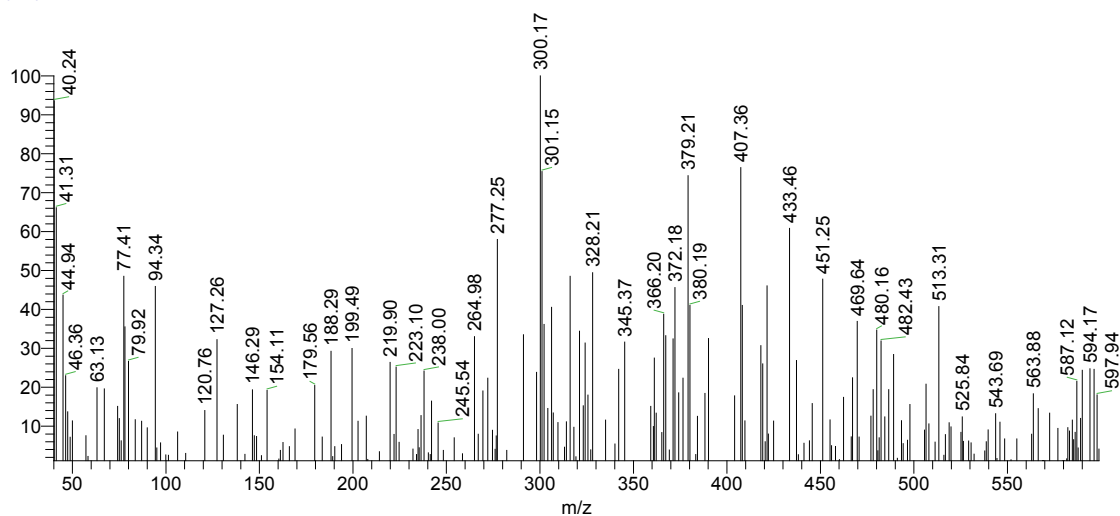


Figure 38: Mass spectrum of Compound 11a

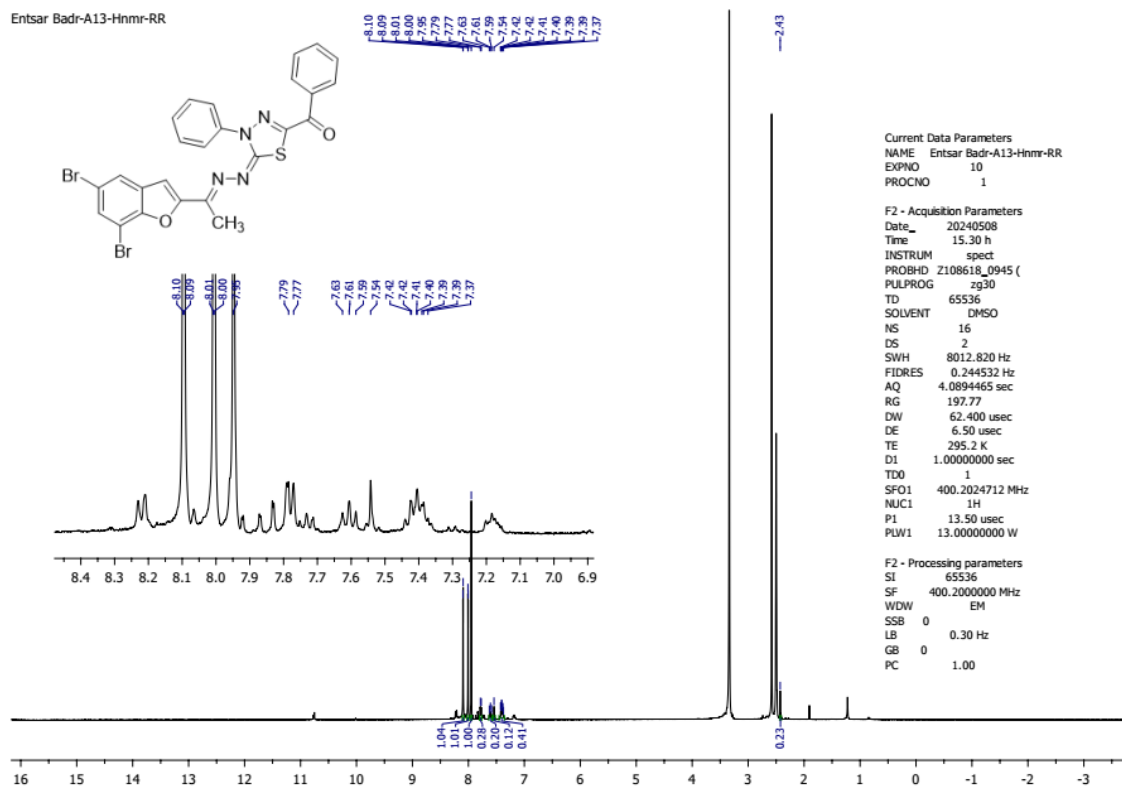


Figure 39: ^1H NMR spectrum of Compound 11a

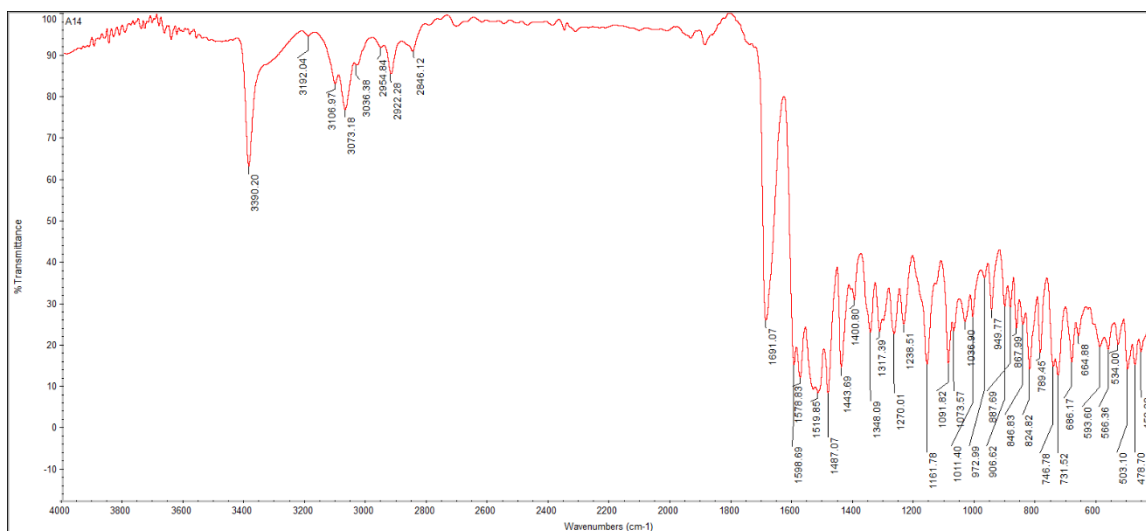


Figure 40: IR spectrum of Compound 11b

A14 #208 RT: 3.50 P: + NL: 9.54E2
T: {0,0} + c EI Full ms [40.00-1000.00]

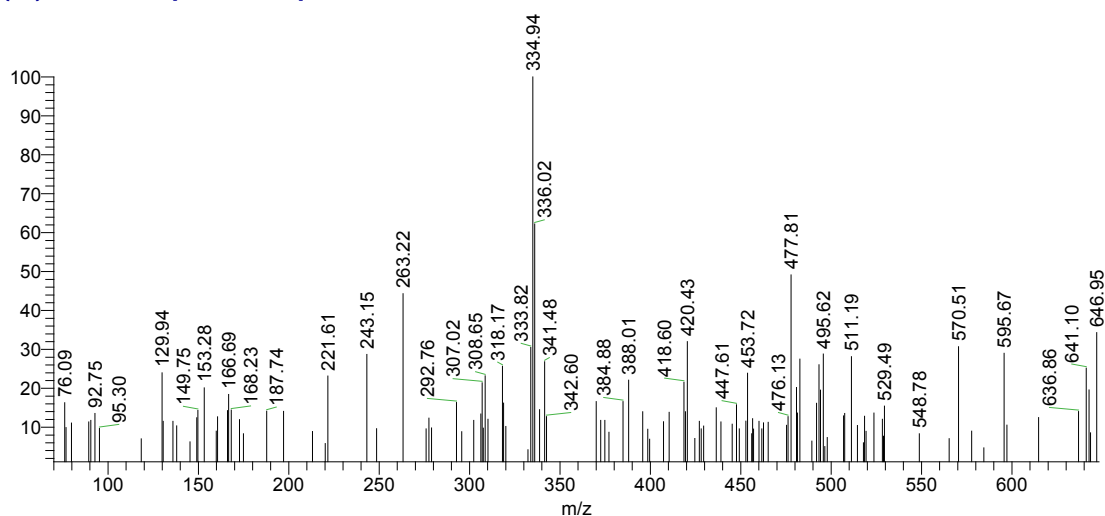


Figure 41: Mass spectrum of Compound 11b

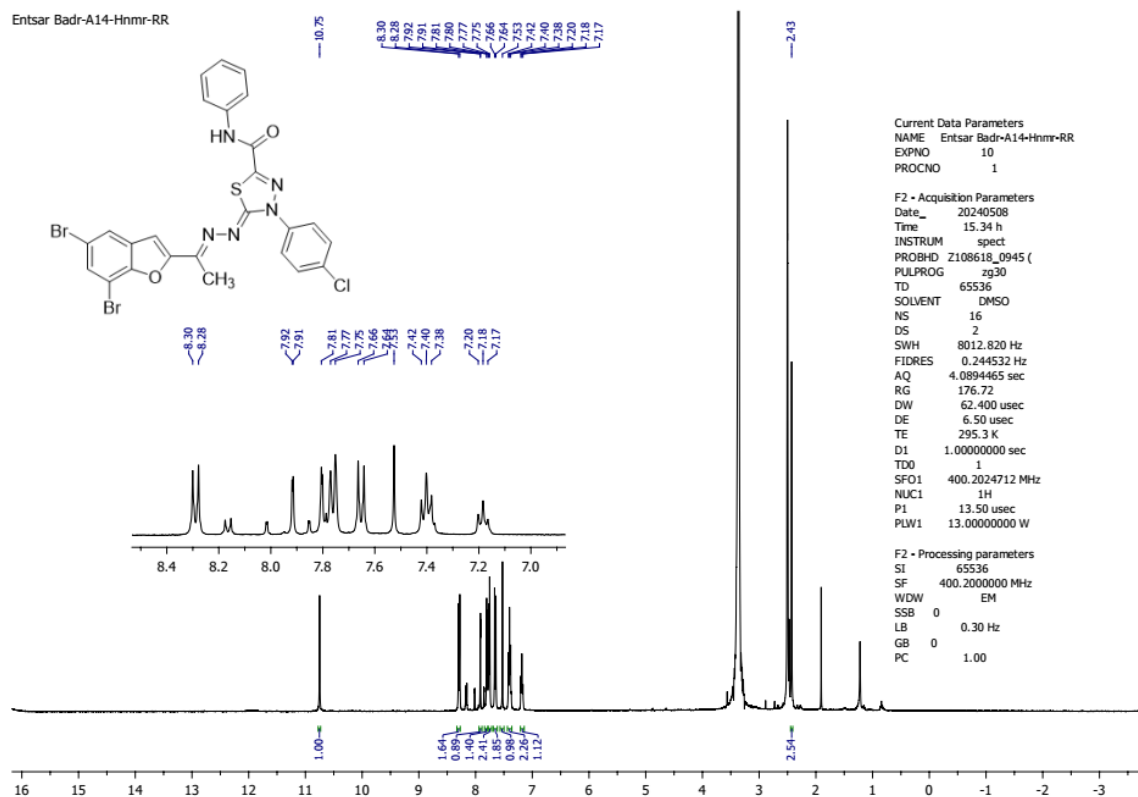


Figure 42: ¹H NMR spectrum of Compound 11b

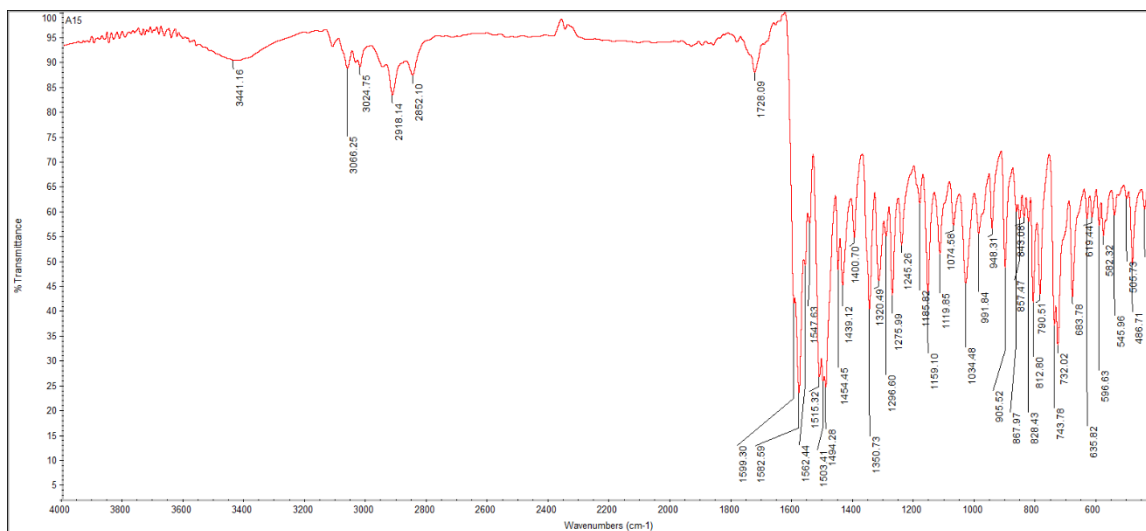


Figure 43: IR spectrum of Compound 11c

A15 #236 RT: 3.97 P: + SB: 9 4.22-4.33 , 4.30 NL: 5.06E2
T: {0,0} + c EI Full ms [40.00-1000.00]

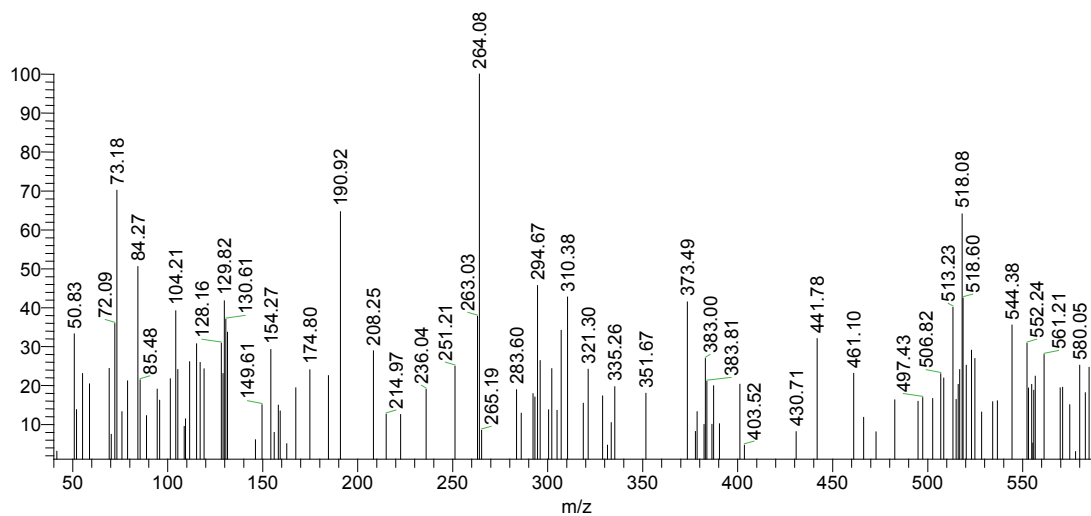


Figure 44: Mass spectrum of Compound 11c

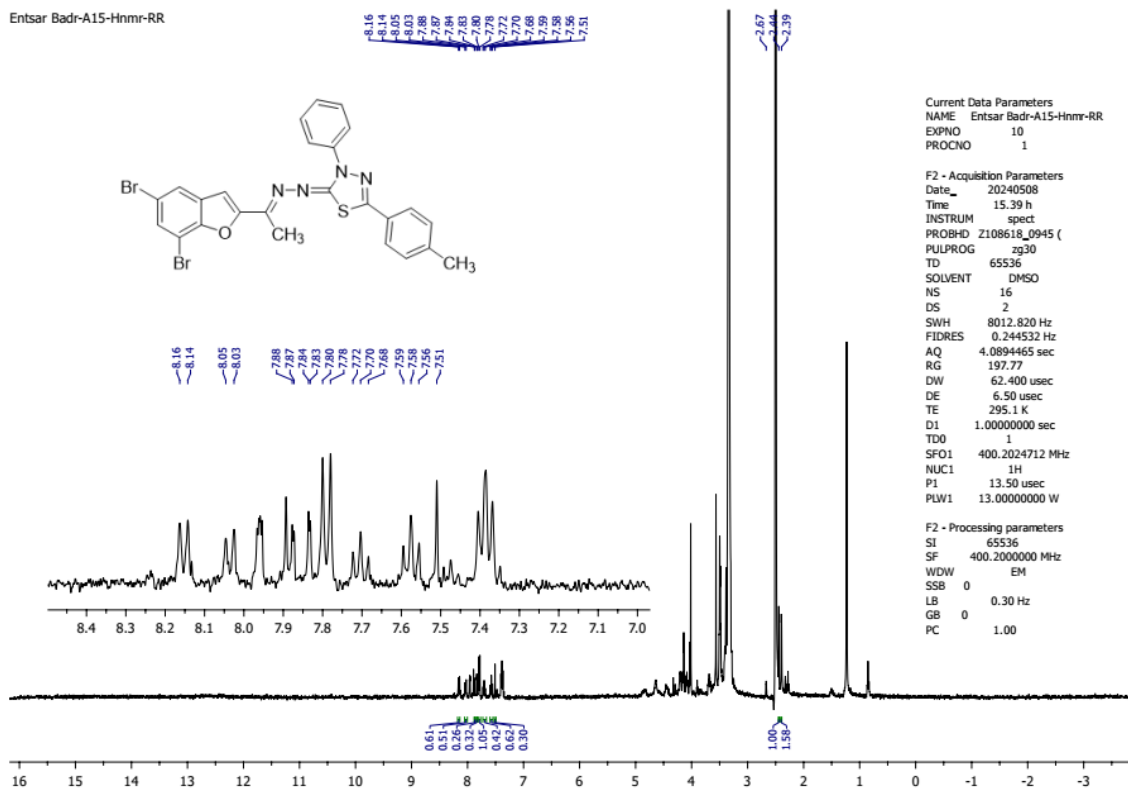


Figure 45: ^1H NMR spectrum of Compound 11c

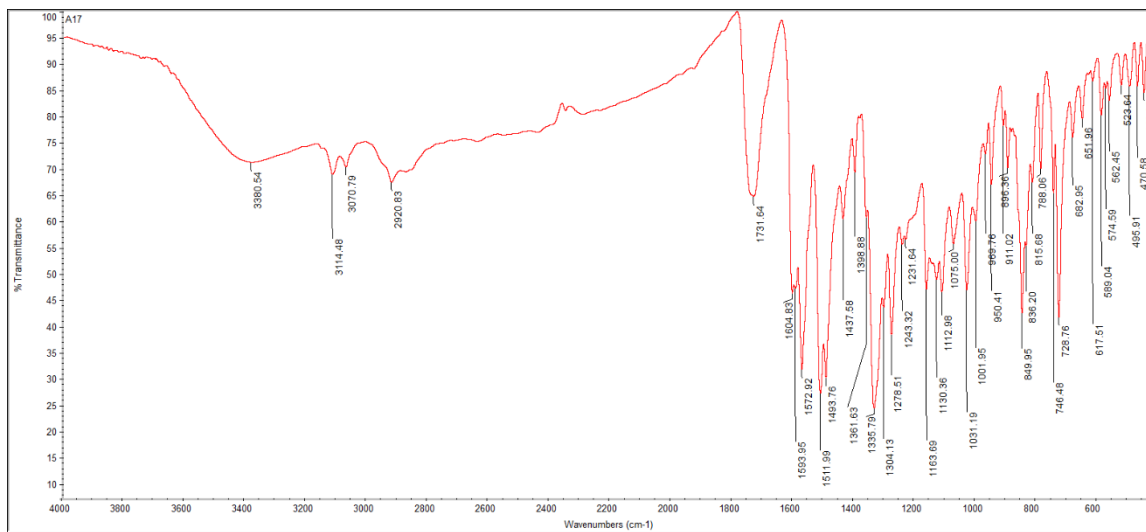


Figure 46: IR spectrum of Compound 11d

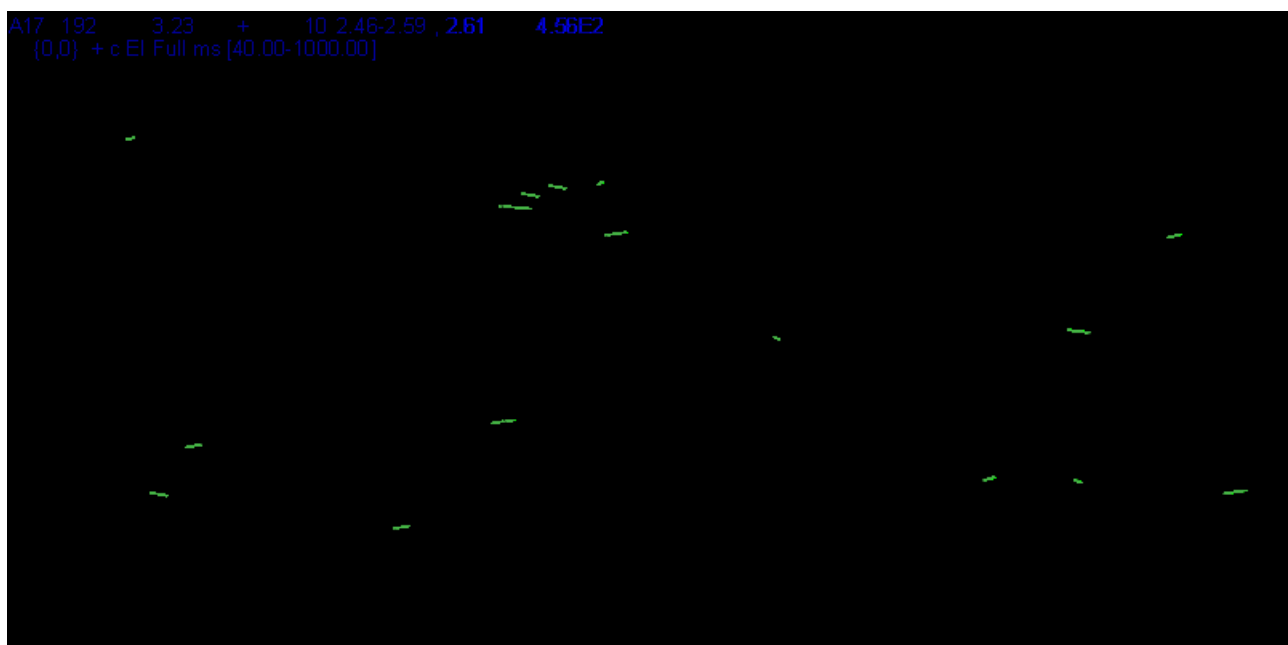


Figure 47: Mass spectrum of Compound 11d

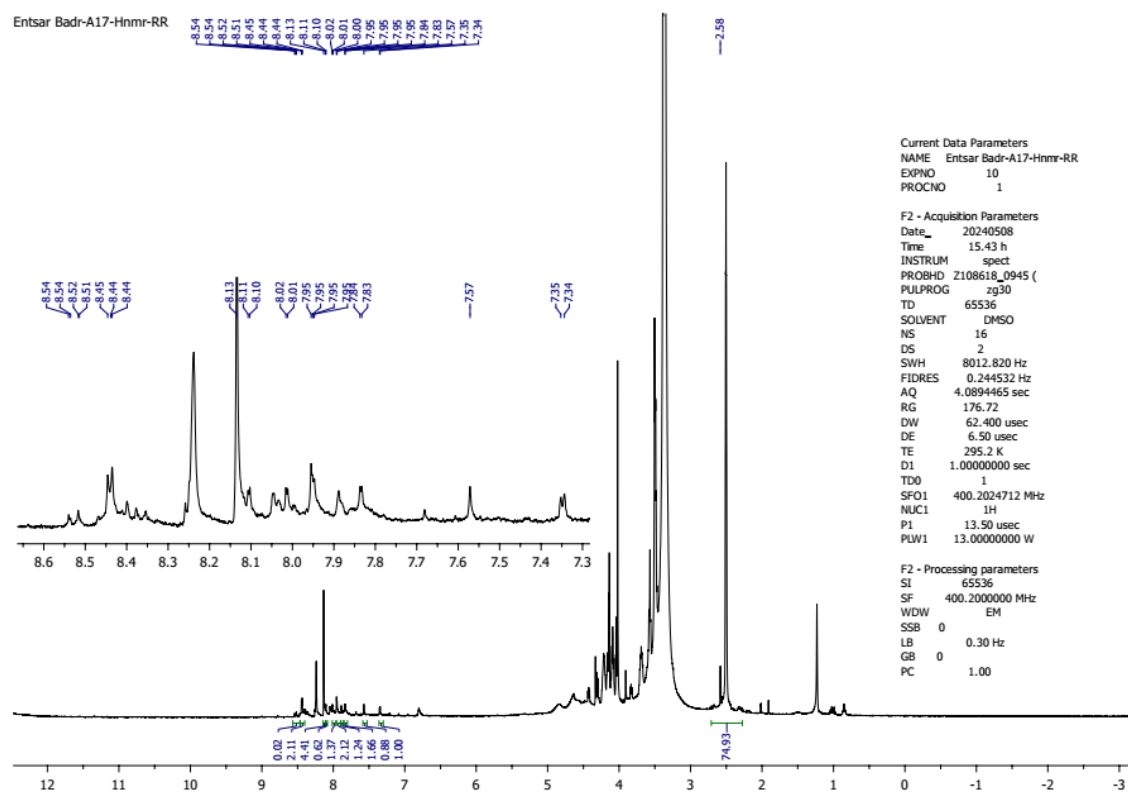


Figure 48: ^1H NMR spectrum of Compound 11d

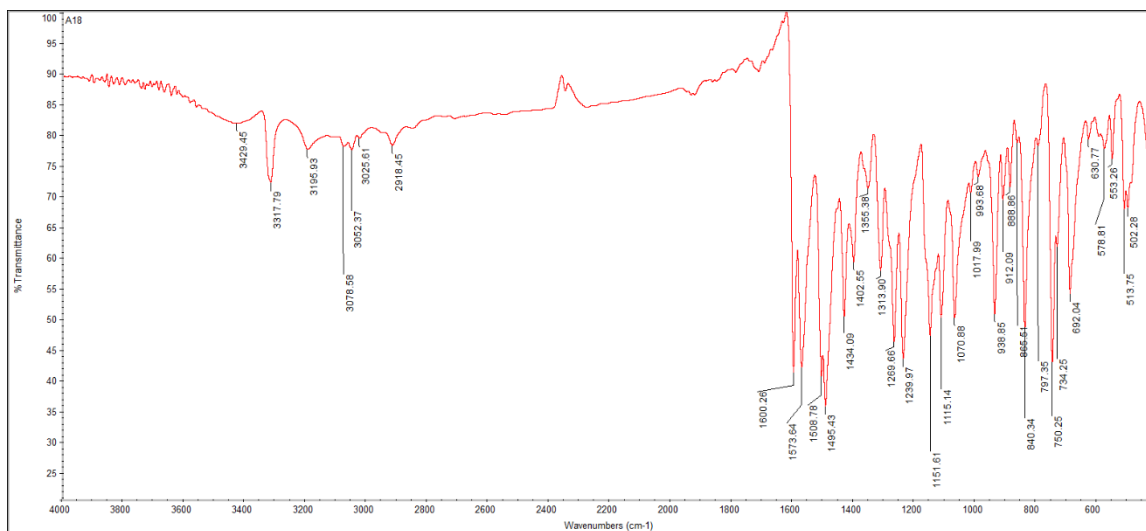


Figure 49: IR spectrum of Compound 11e

A18 #231 RT: 3.88 P: + SB: 9 5.15, 5.09-5.20 NL: 1.09E3
T: {0,0} + c EI Full ms [40.00-1000.00]

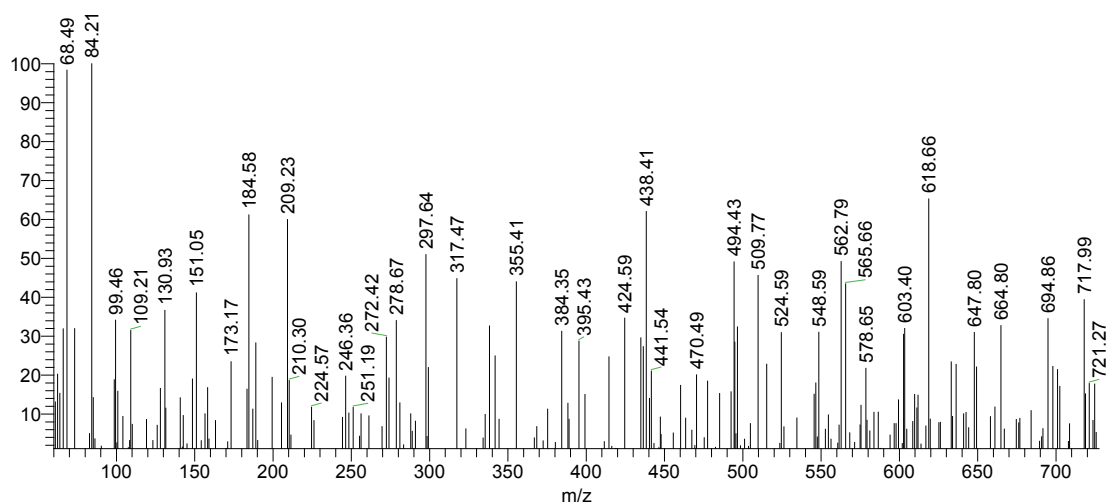


Figure 50: Mass spectrum of Compound 11e

Entsar Badr-A18-Hnmr-RR

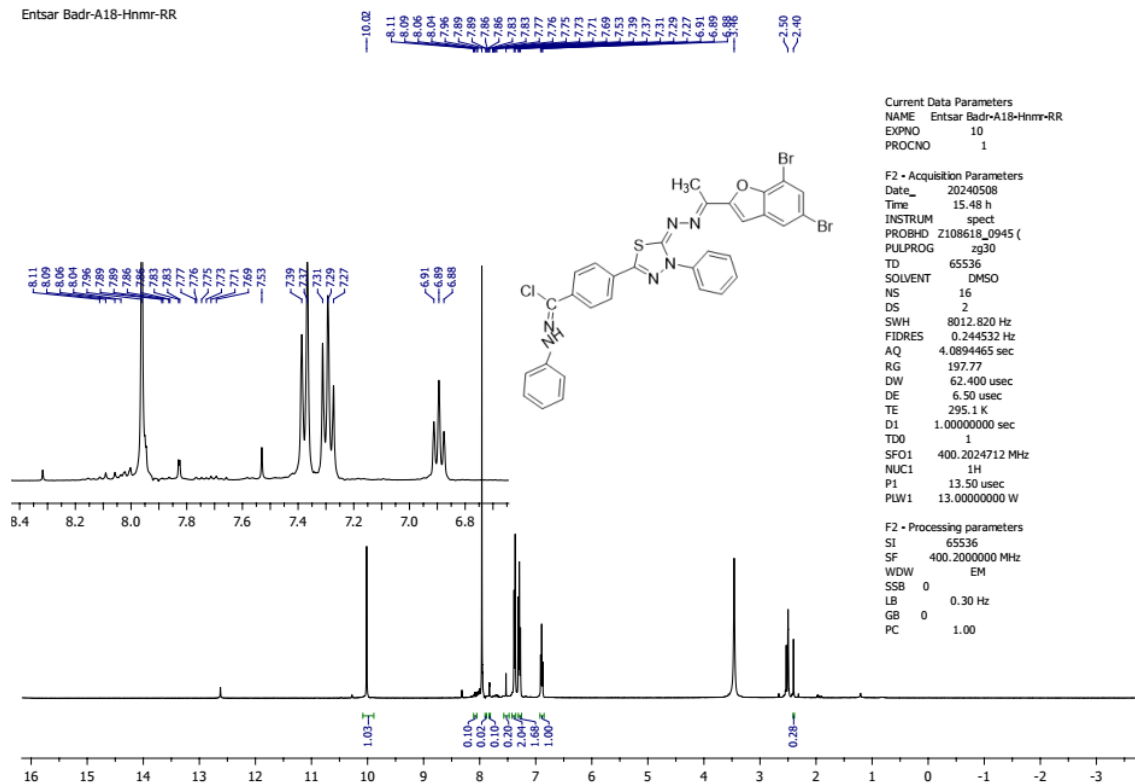


Figure 51: ¹H NMR spectrum of Compound 11e

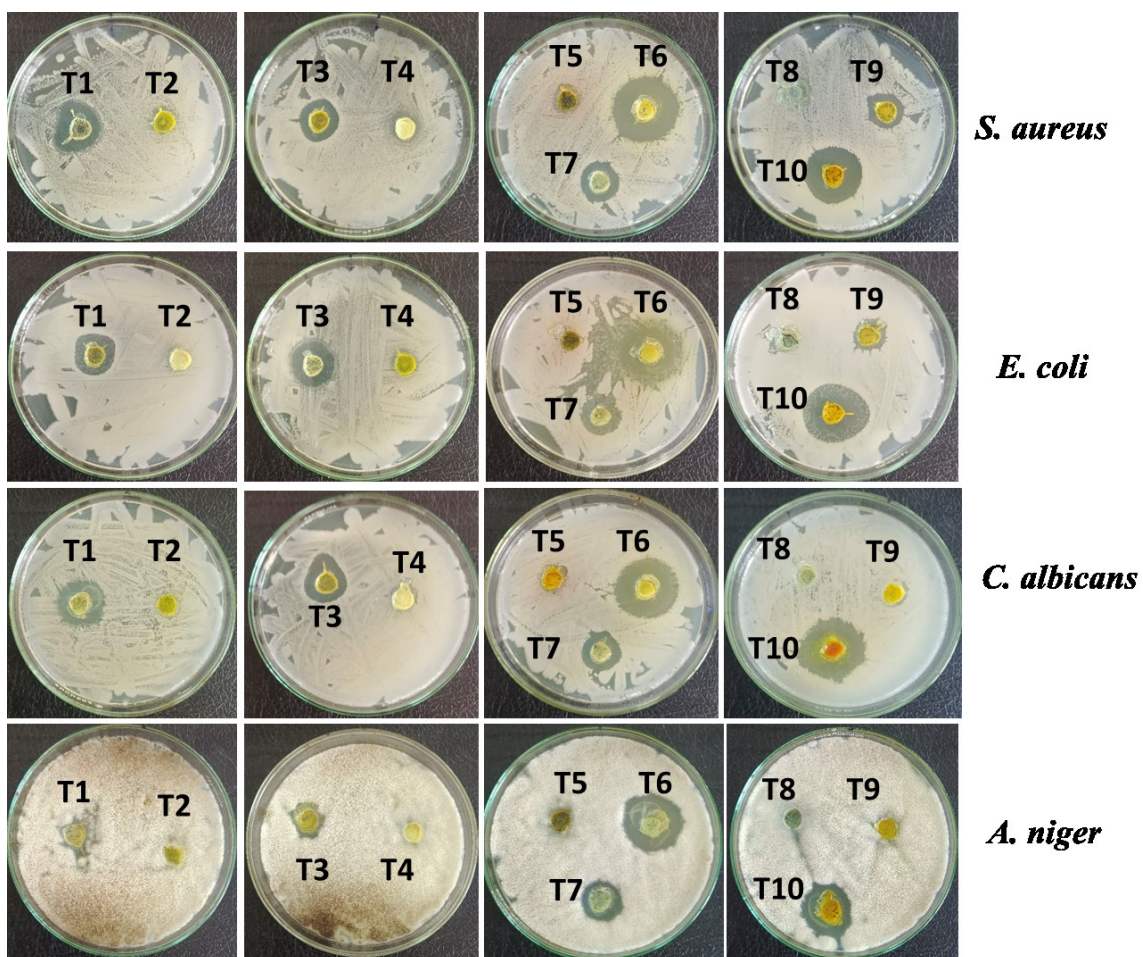


Figure 52:Antimicrobial Activity of compounds 10a(T1), 10b(T2), 10c(T9), 10d(T5), 10e(T6), 10f(T7), 10g(T8) and 10h(T3)

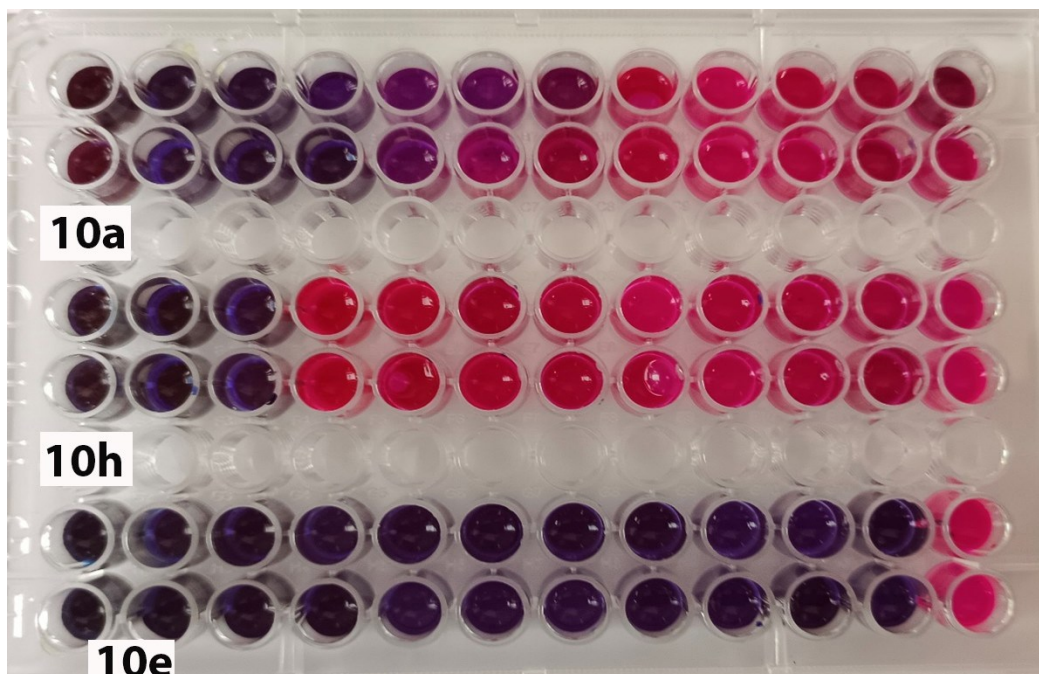


Figure 53: MIC and MBC of compounds: 10a, 10h and 10e with *Staphylococcus aureus* ATCC 6538-P

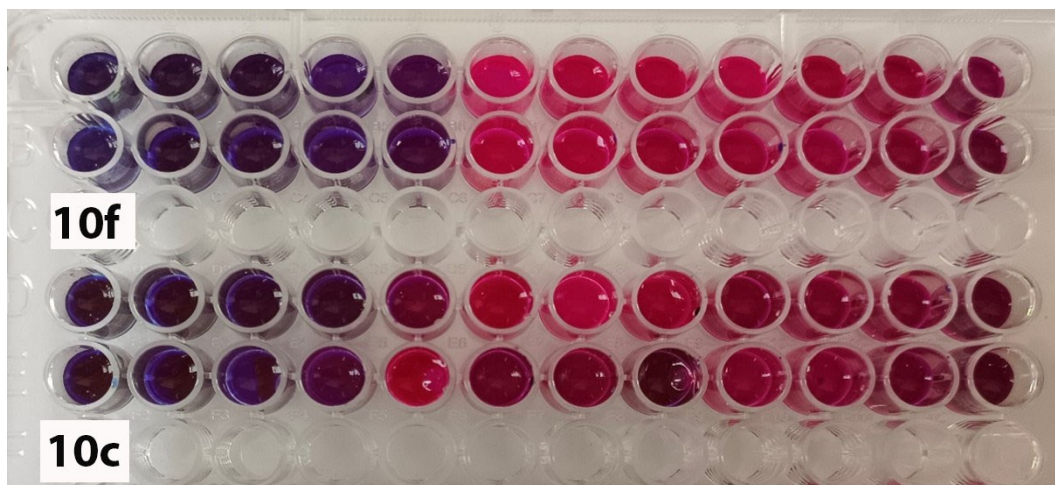


Figure 54: MIC and MBC of compounds: 10f and 10c with *Staphylococcus aureus* ATCC 6538-P

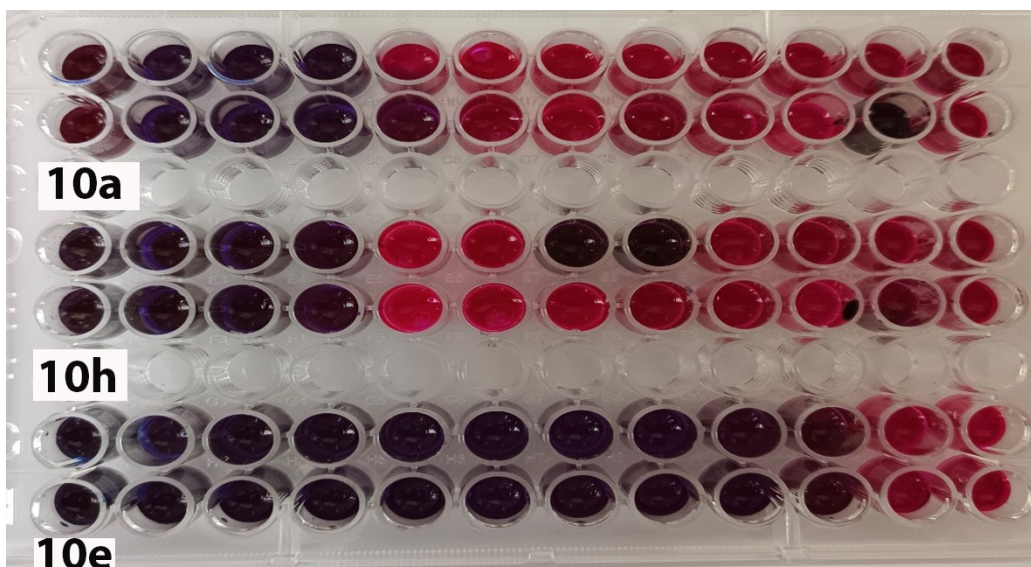


Figure 55: MIC and MBC of compounds: 10a, 10h and 10e with *Escherichia coli* ATCC 25933

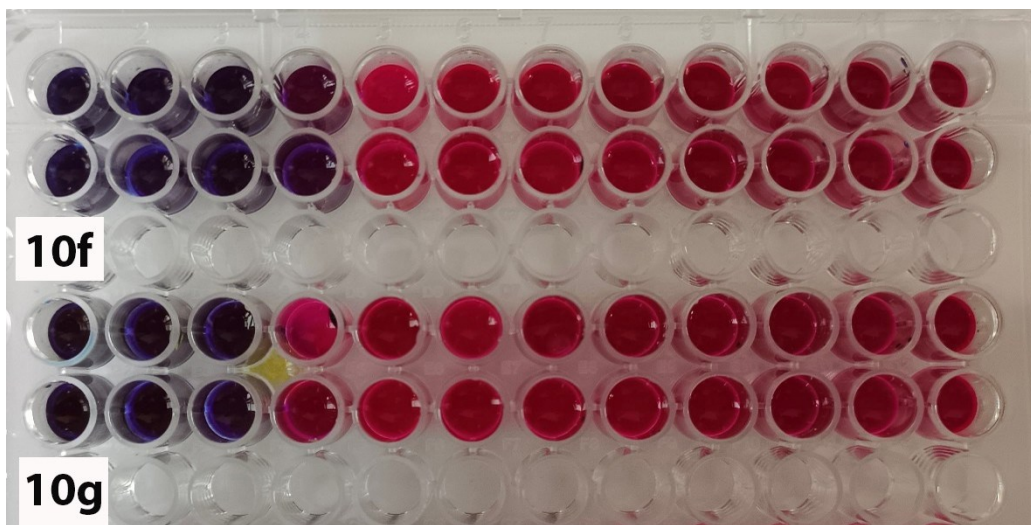


Figure 56: MIC and MBC of compounds: 10f and 10g with *Escherichia coli* ATCC 25933

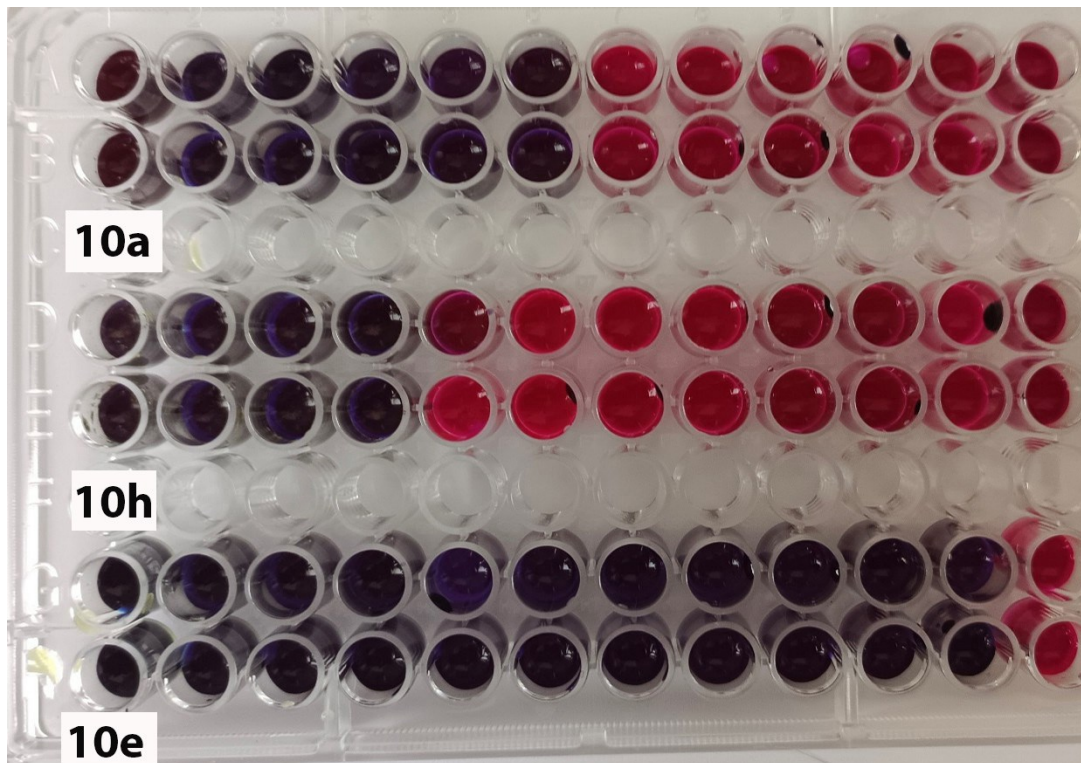


Figure 57: MIC and MFC of compounds: 10a, 10h and 10e with *Candida albicans* ATCC 10231

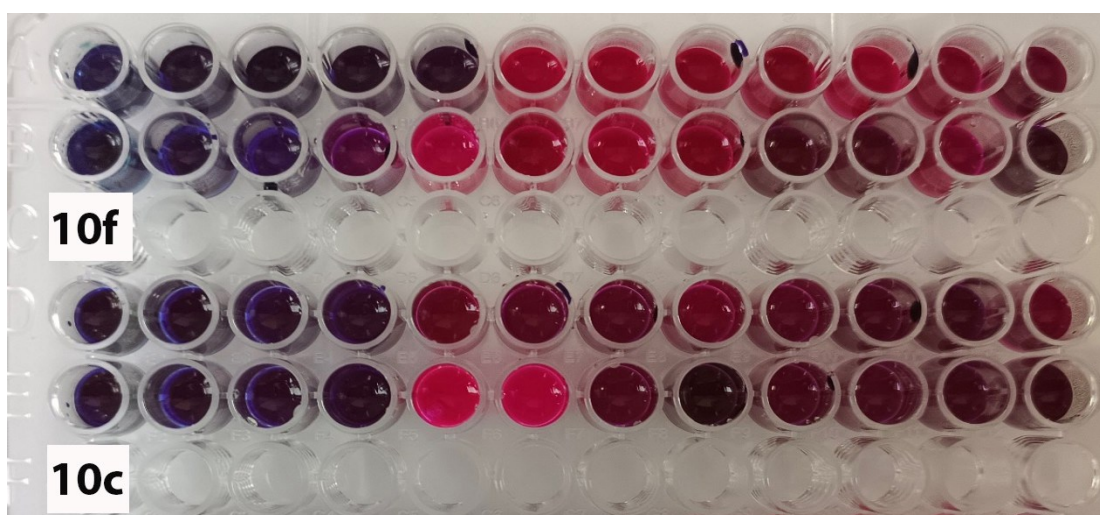


Figure 58: MIC and MFC of compounds: 10f and 10c with *Candida albicans* ATCC 10231