

Supplementary Material

One-pot synthesis of 2-thioxothiazolidin-4-one, thiazolidine-2,4-dione, 2-iminothiazolidin-4-one based spiro-thiolane and bicyclic chromene-thiolane hybrids *via* Knoevenagel, 1,4-sulfa-Michael and aldol Reactions

Satyanarayana Neeli, Nagaraju Sakkani, Shirisha Thangellapally, and Kashinath Dhurke*

Department of Chemistry, National Institute of Technology, Warangal-506 004, India

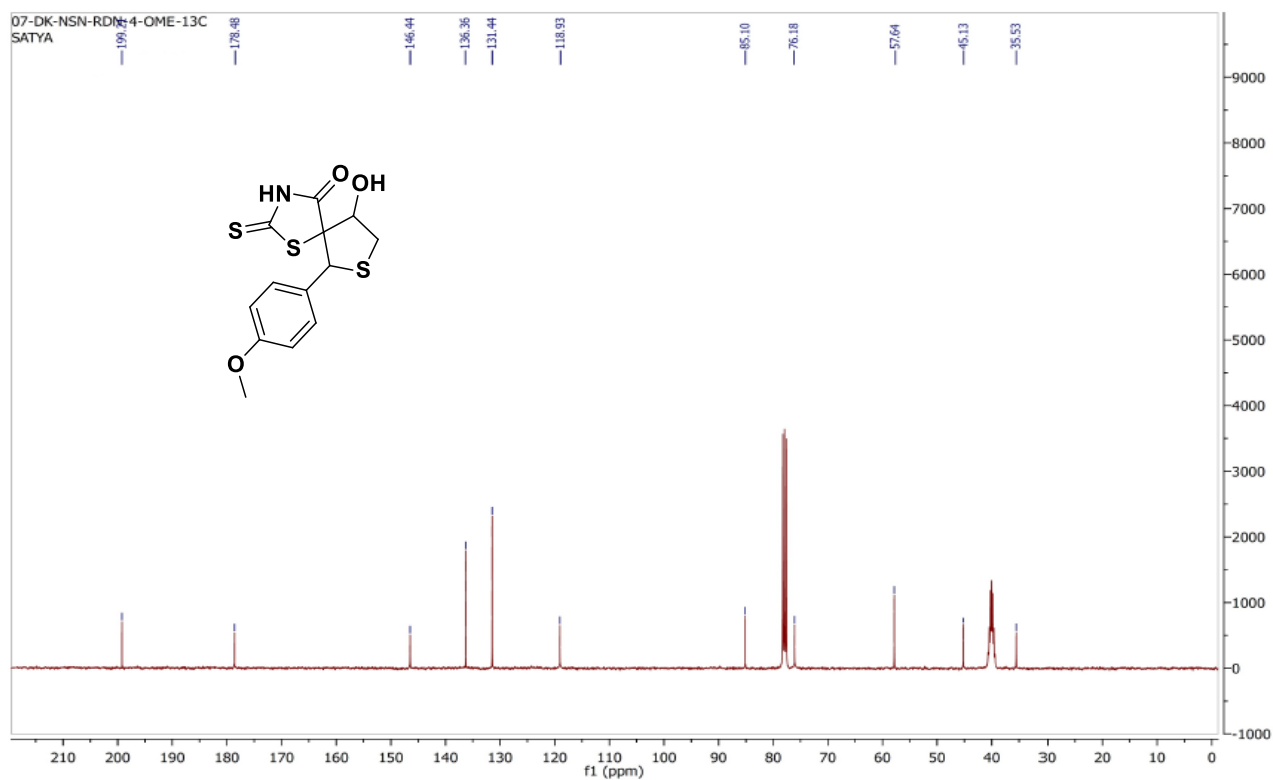
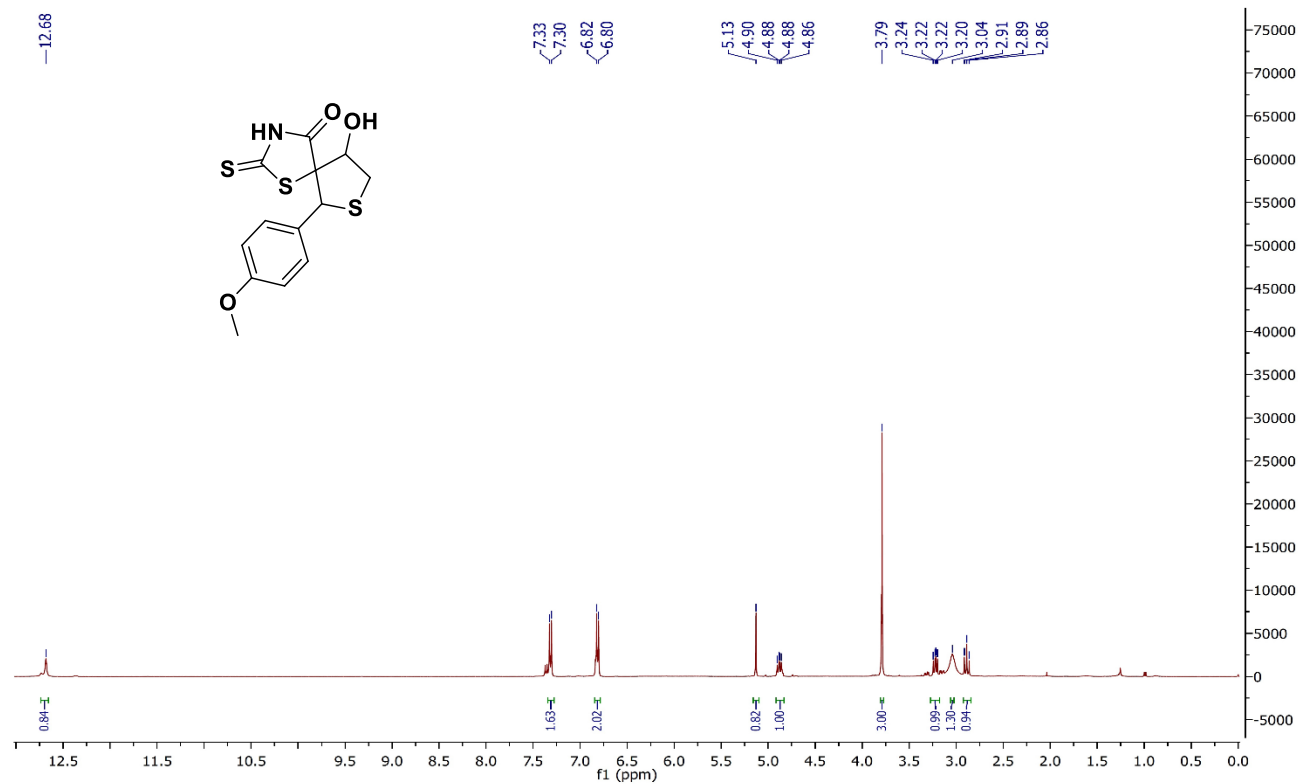
Email: kashinath@nitw.ac.in; kashinath.dhurke@gmail.com

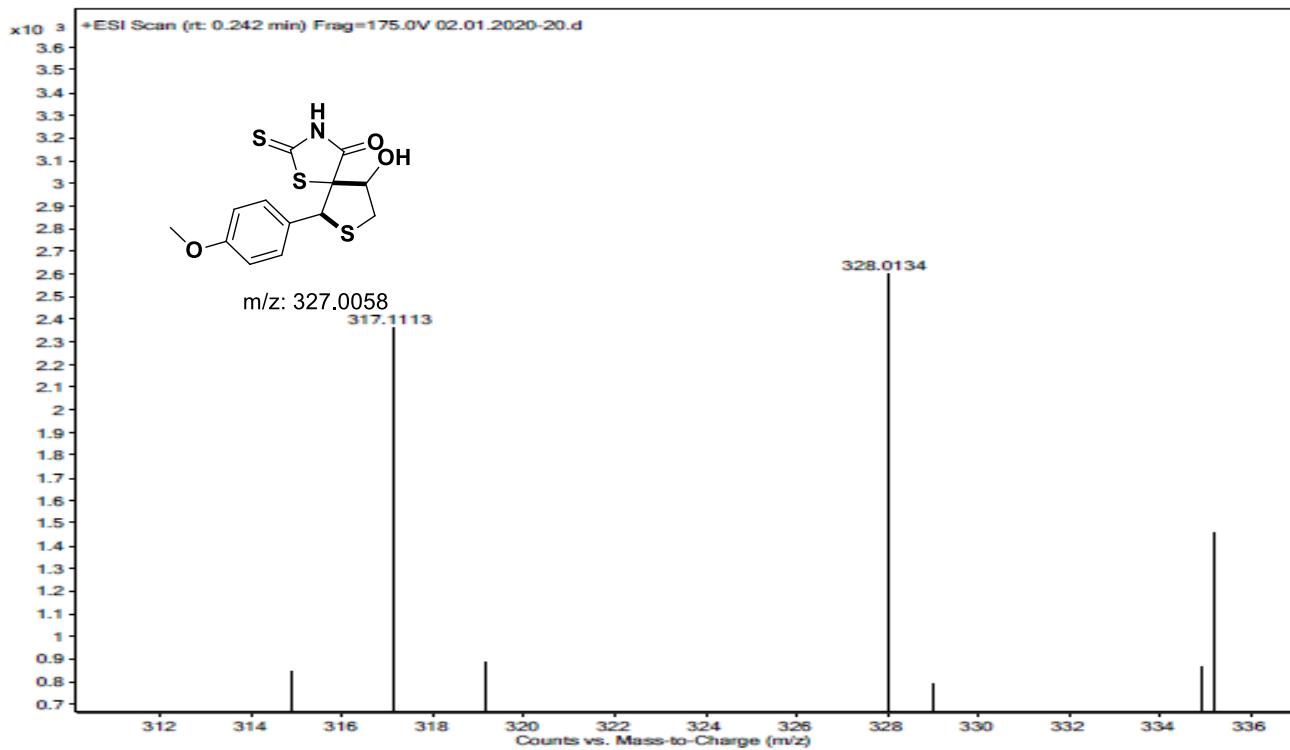
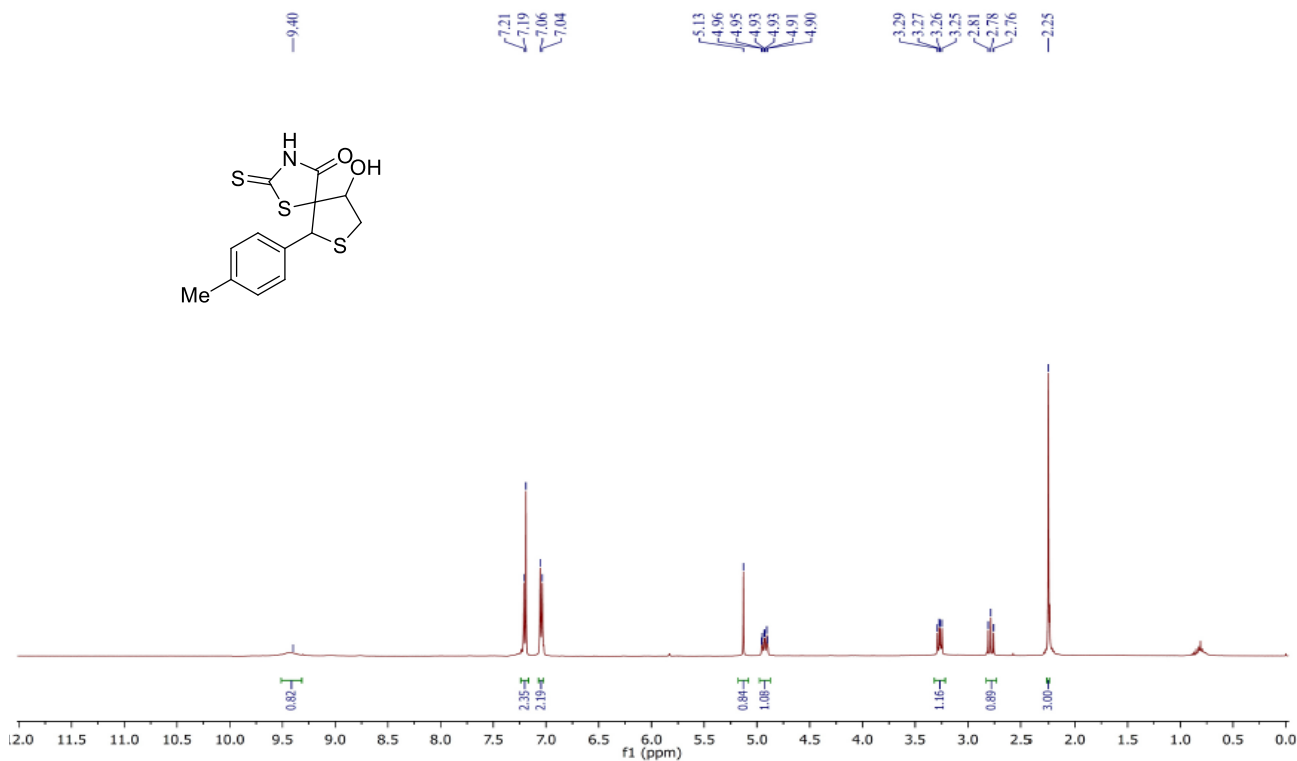
Table of Contents

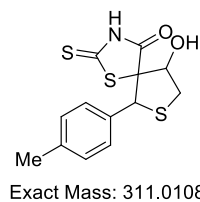
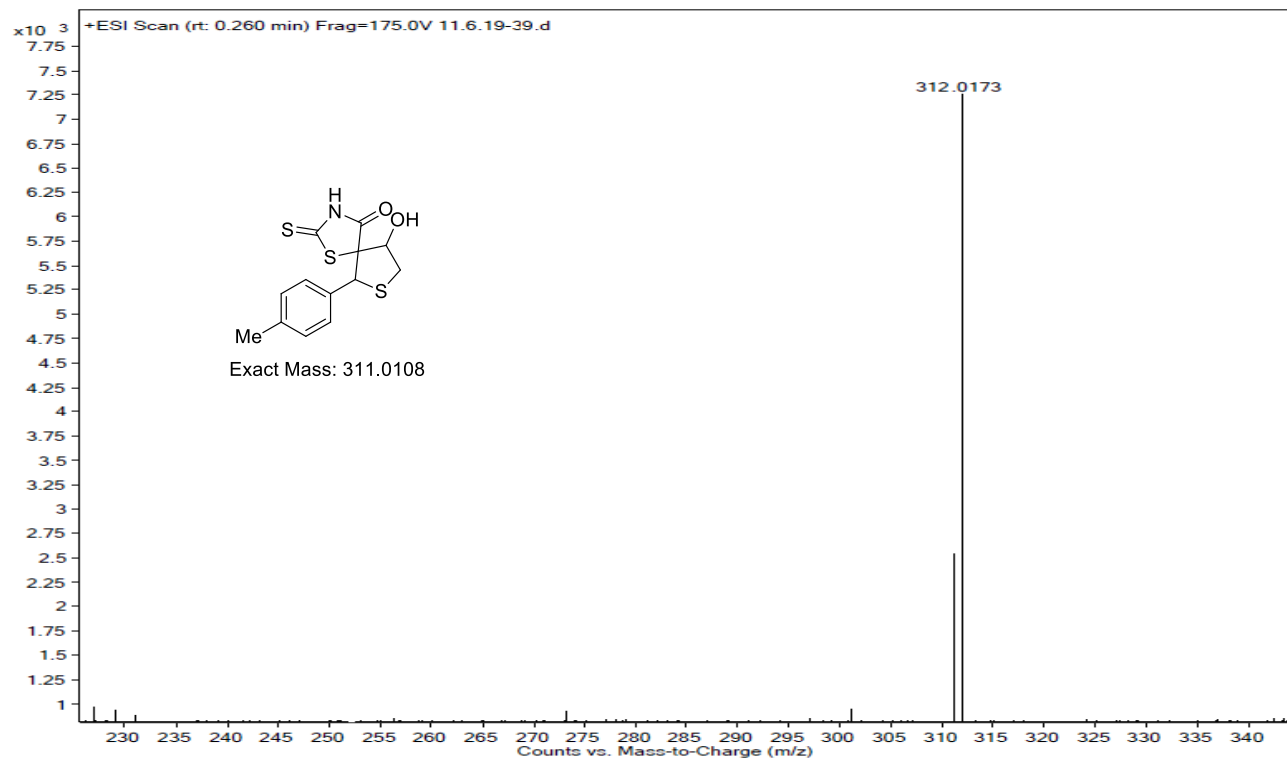
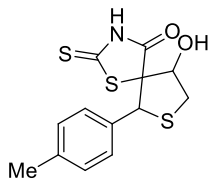
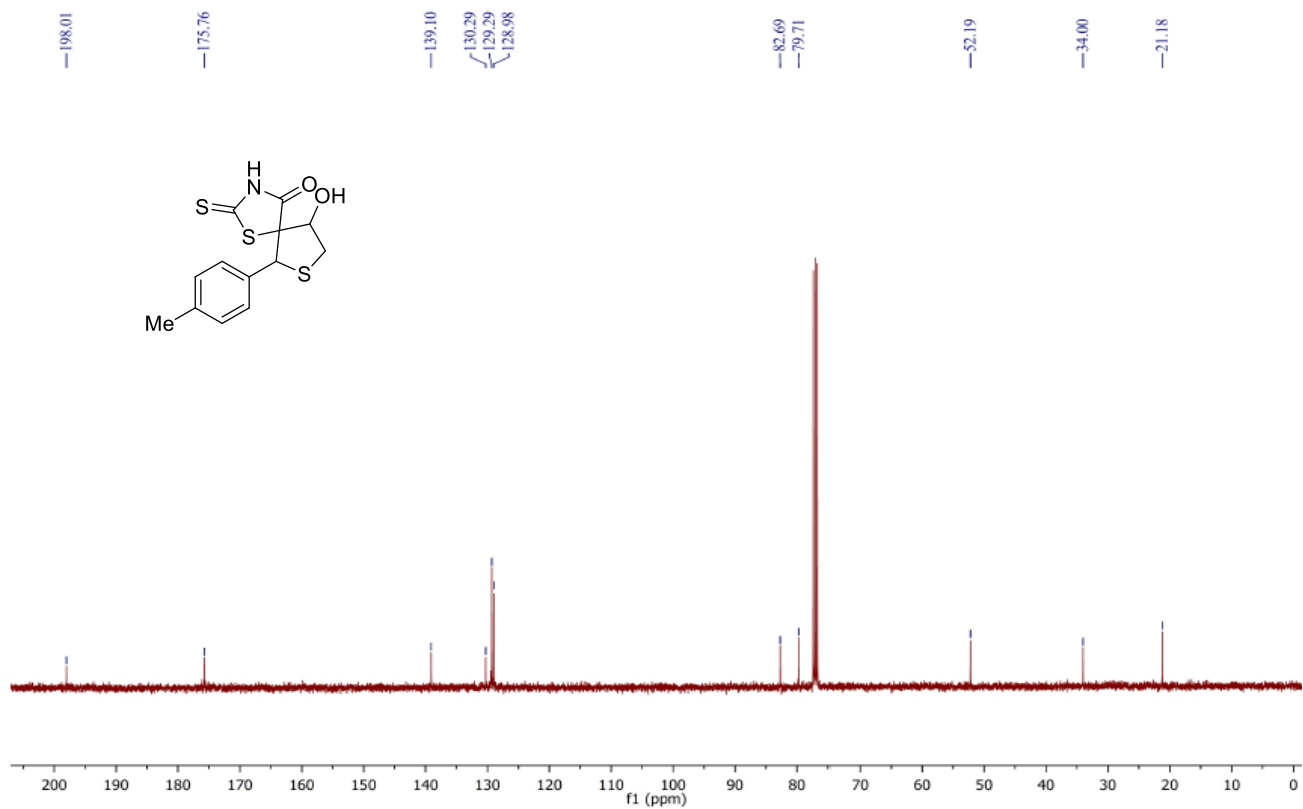
¹ H NMR and ¹³ C NMR spectra of products	S2
--	----

^1H NMR and ^{13}C NMR spectra of products:

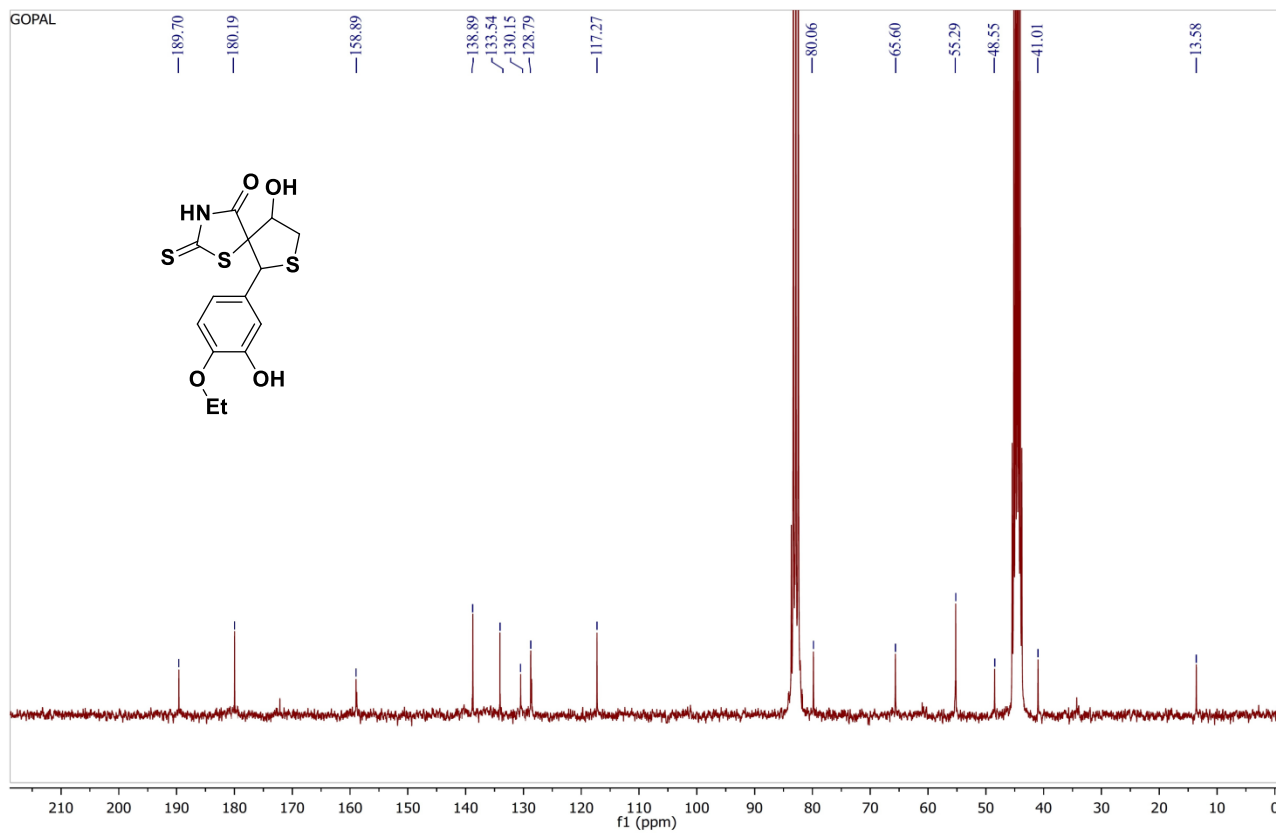
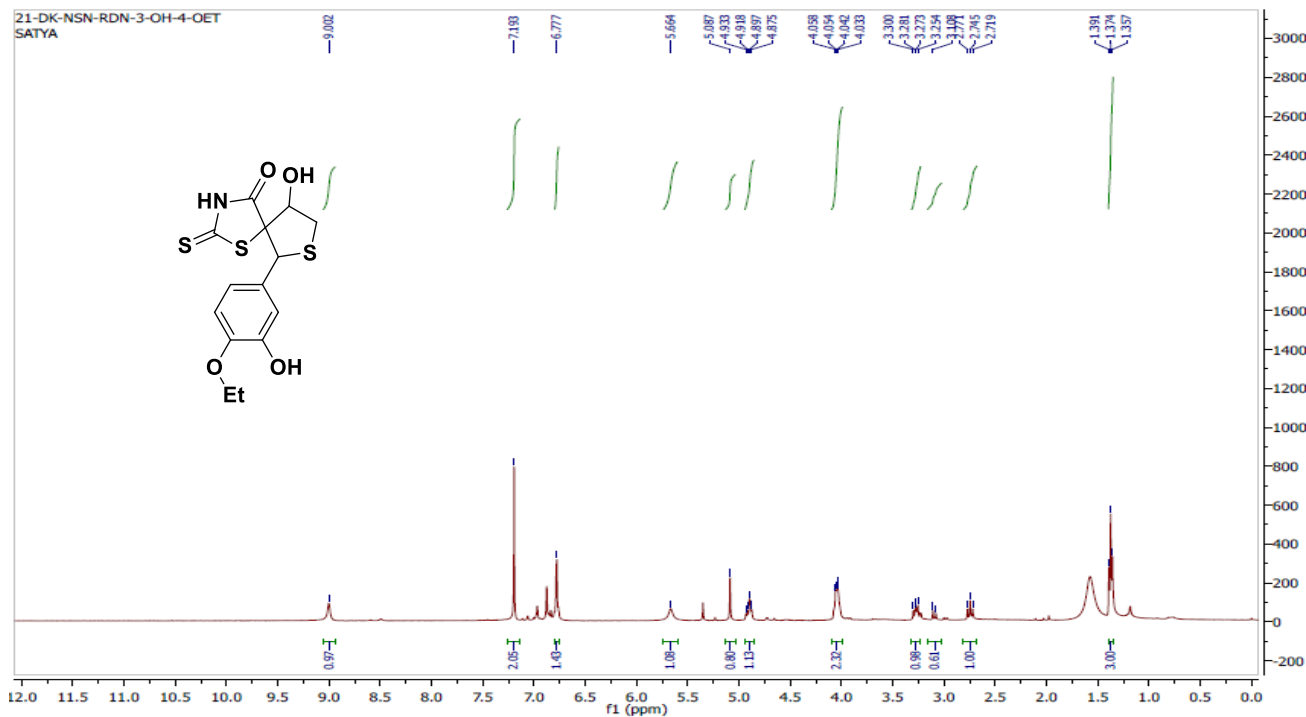
9-hydroxy-6-(4-methoxyphenyl)-2-thioxo-1,7-dithia-3-azaspiro[4.4]nonan-4-one (7a):

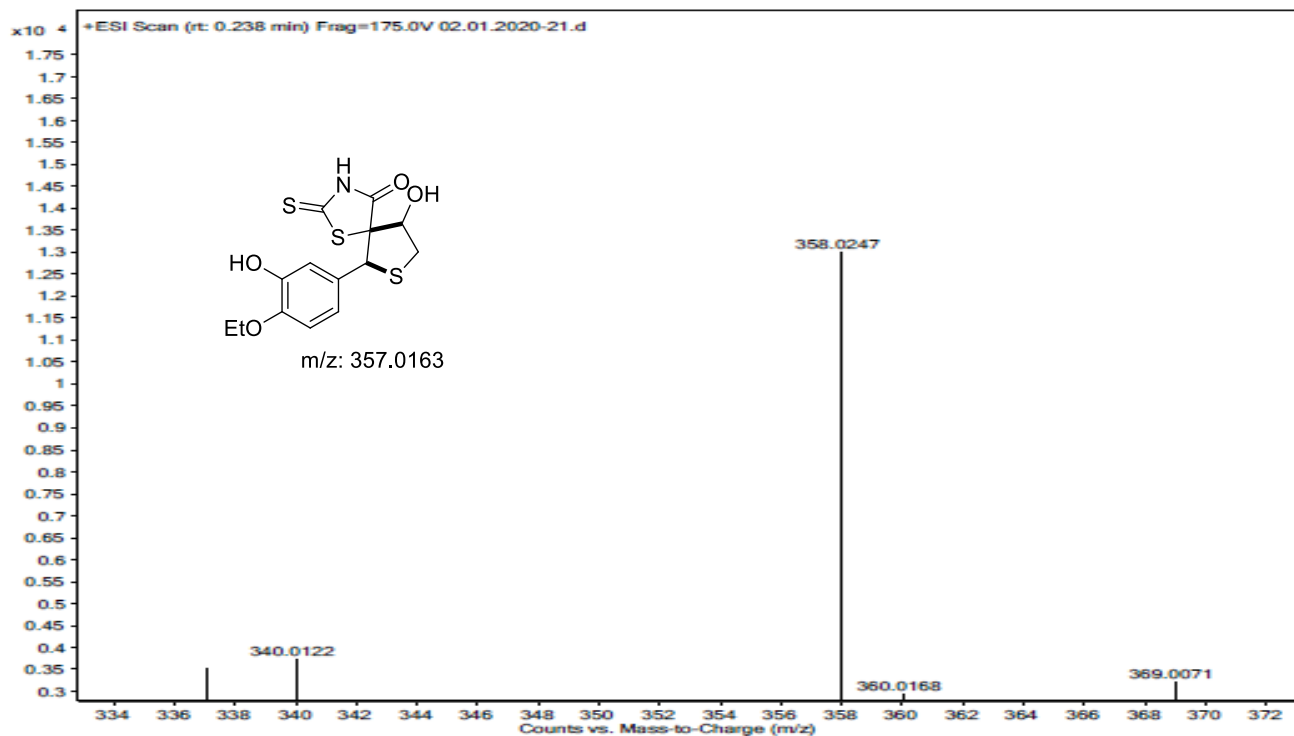
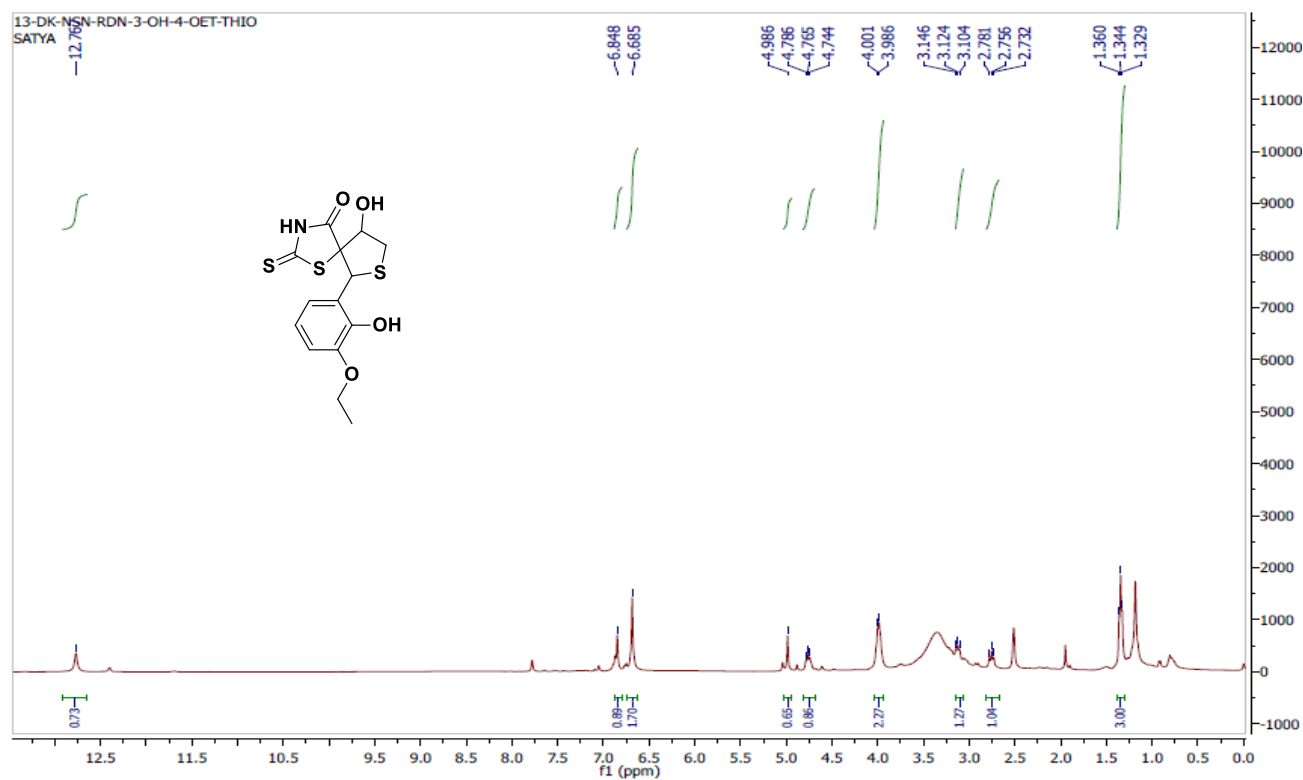


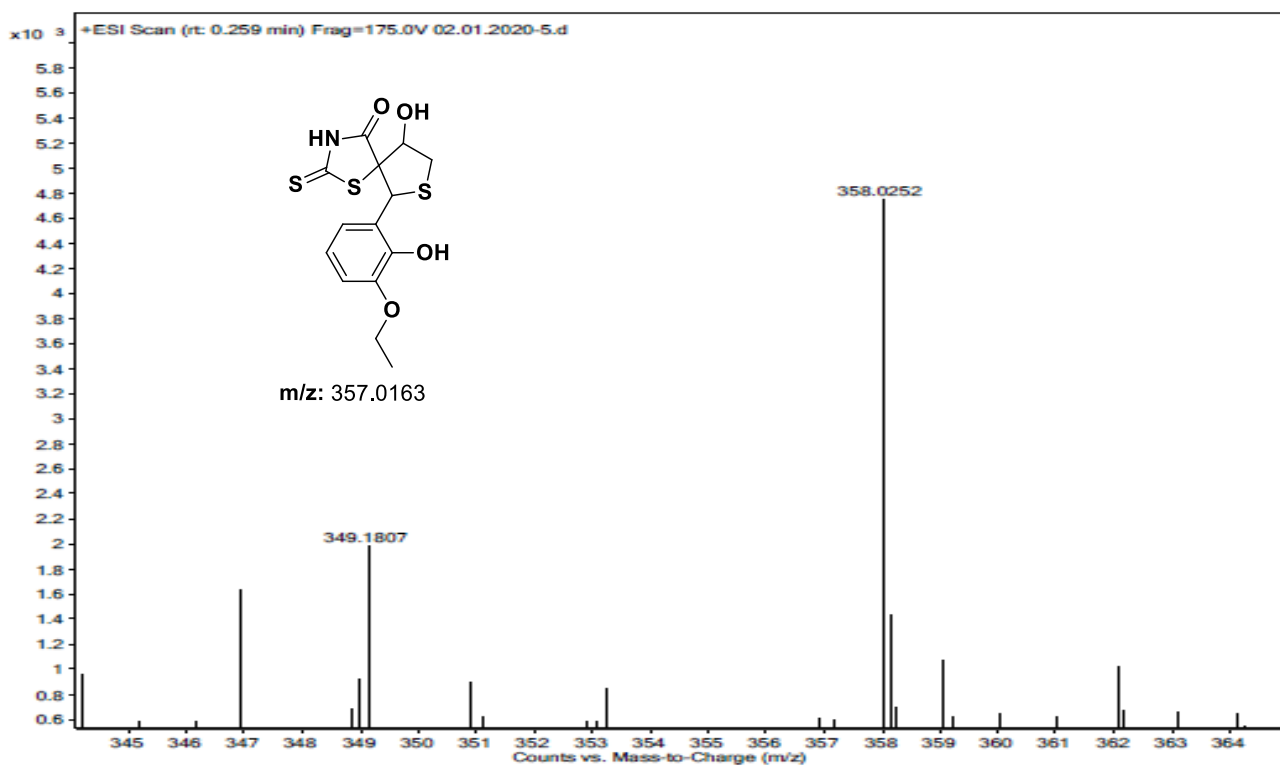
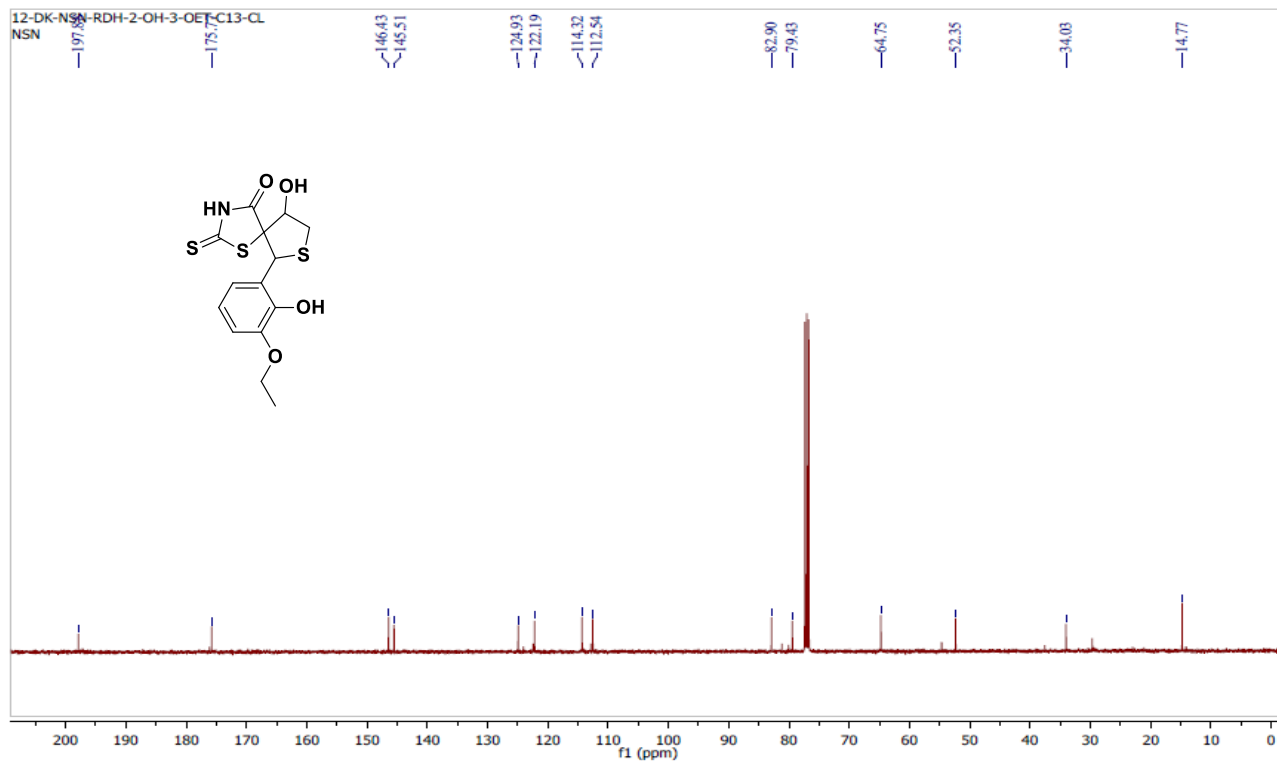
**9-hydroxy-2-thioxo-6-(p-tolyl)-1,7-dithia-3-azaspiro[4.4]nonan-4-one (7b):**

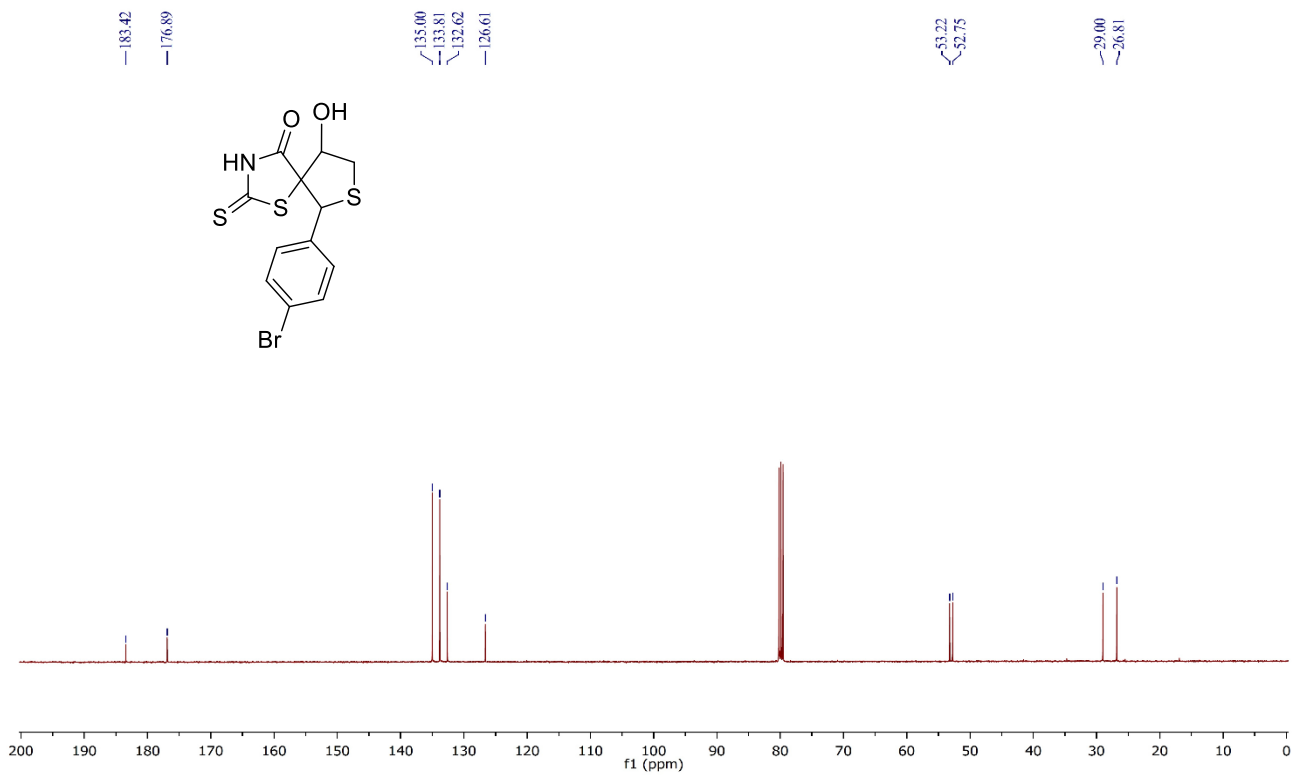
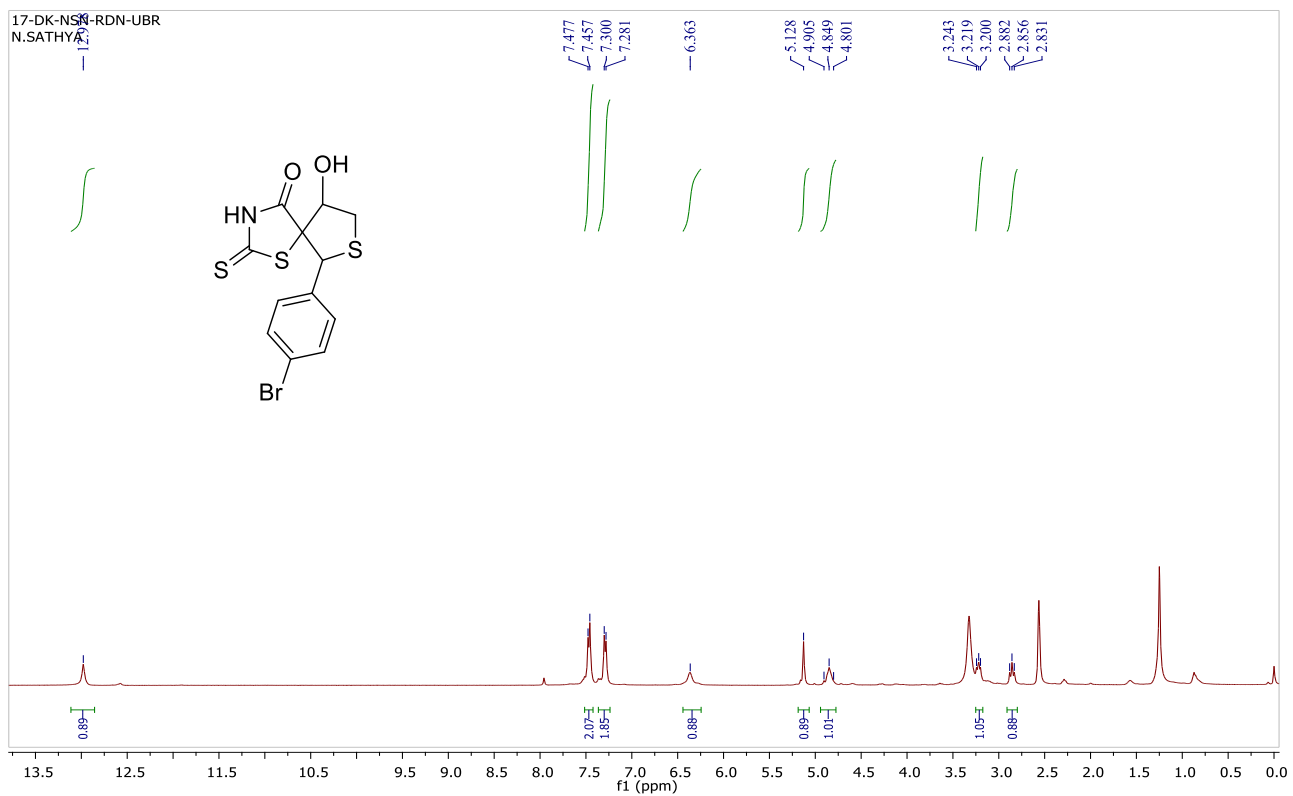


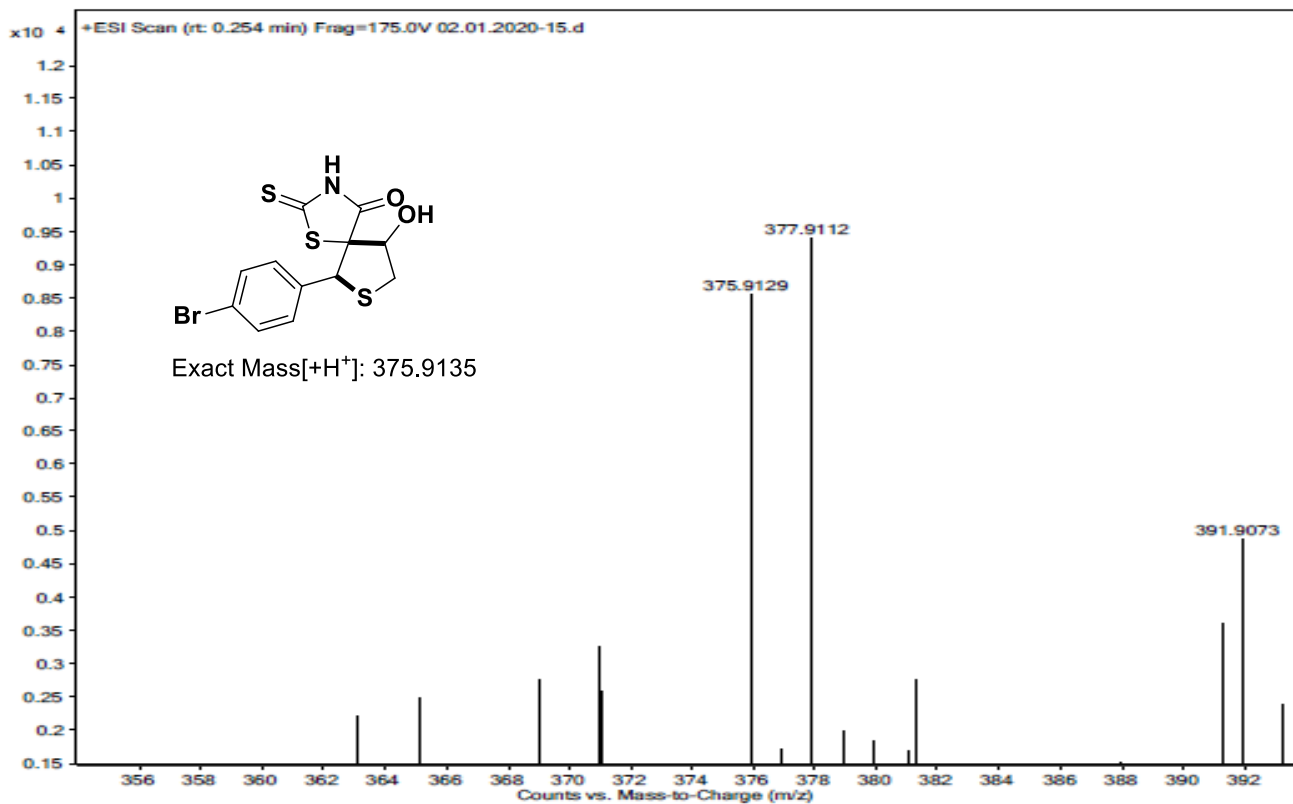
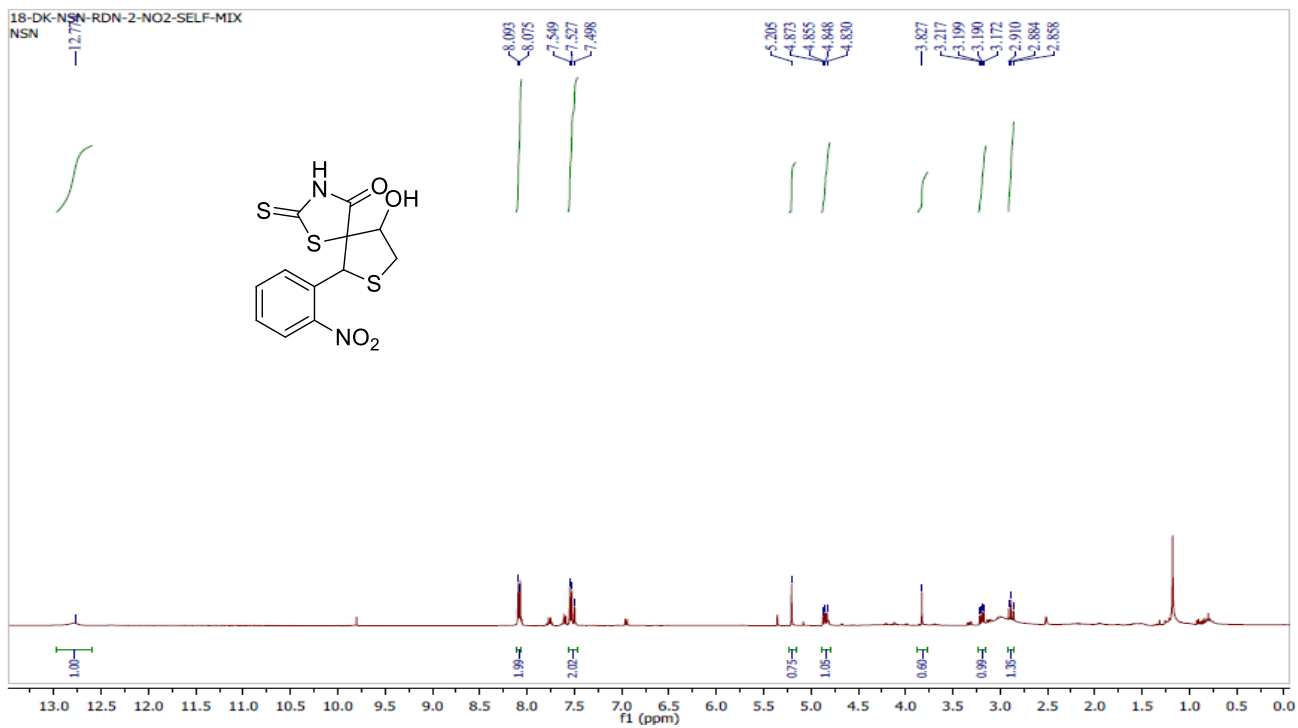
6-(4-ethoxy-3-hydroxyphenyl)-9-hydroxy-2-thioxo-1,7-dithia-3-azaspiro[4.4]nonan-4-one (7c):

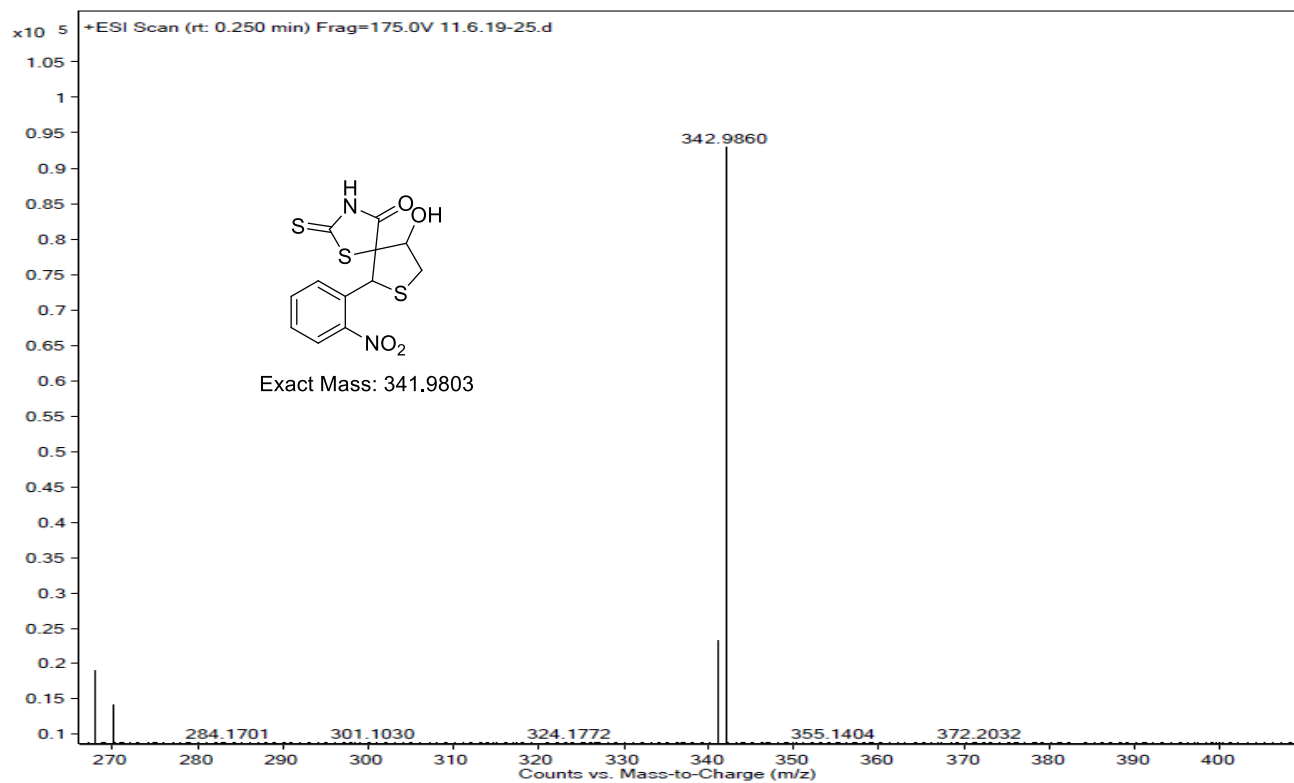
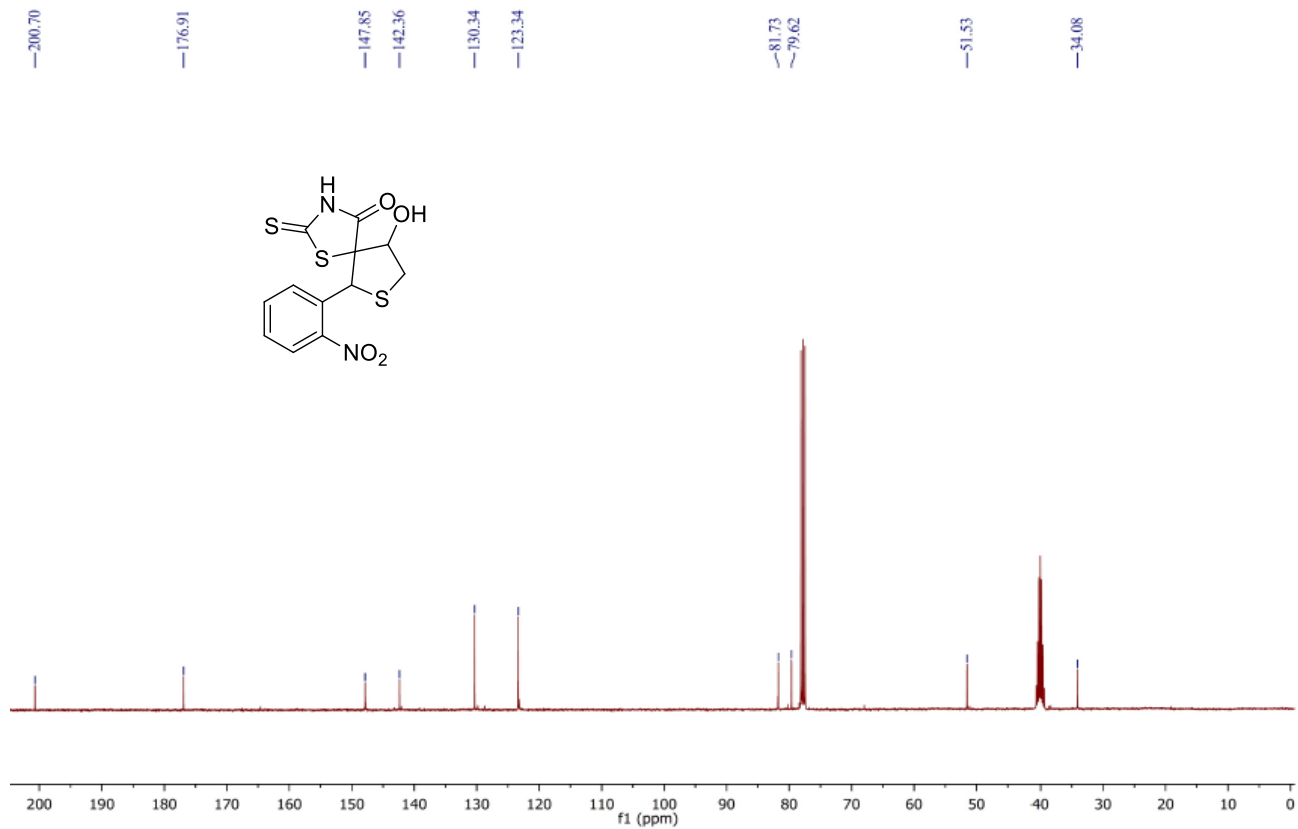


**6-(3-ethoxy-2-hydroxyphenyl)-9-hydroxy-2-thioxo-1,7-dithia-3-azaspiro[4.4]nonan-4-one (7d):**

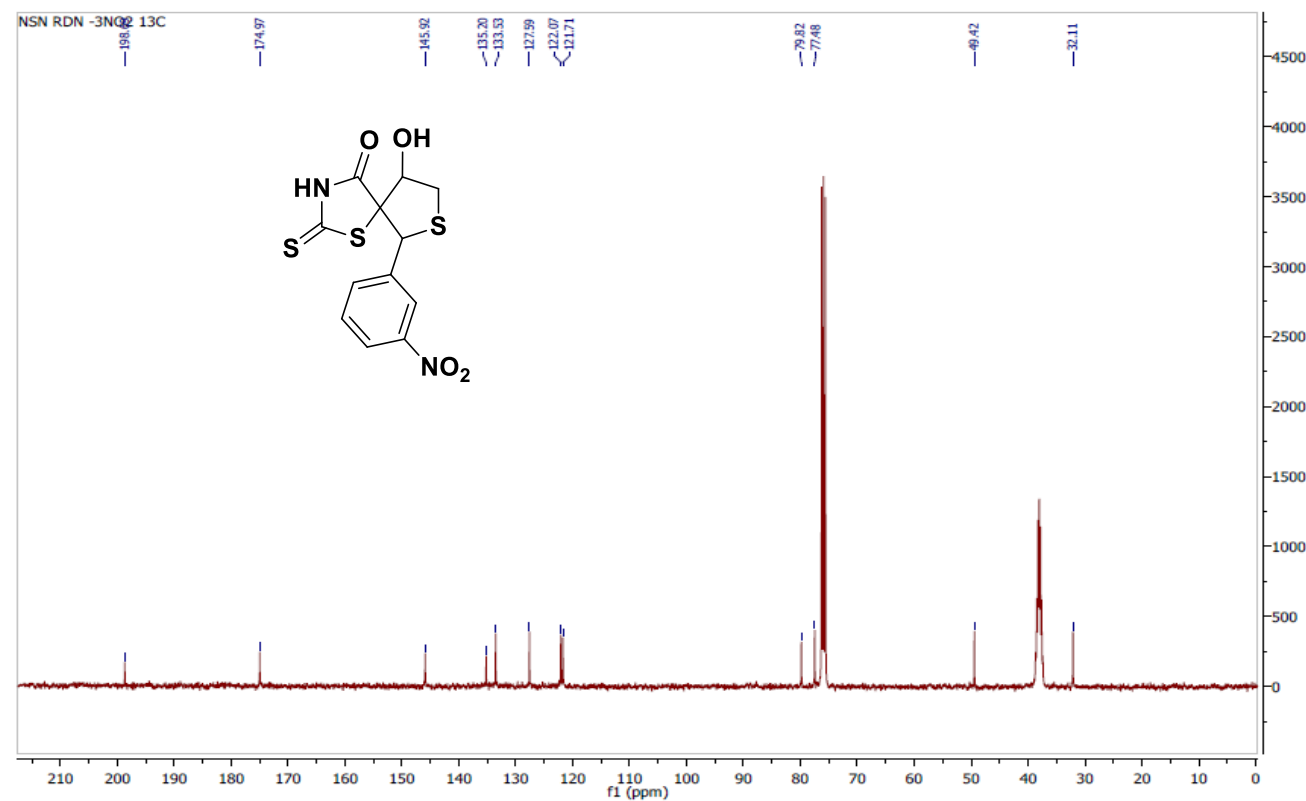
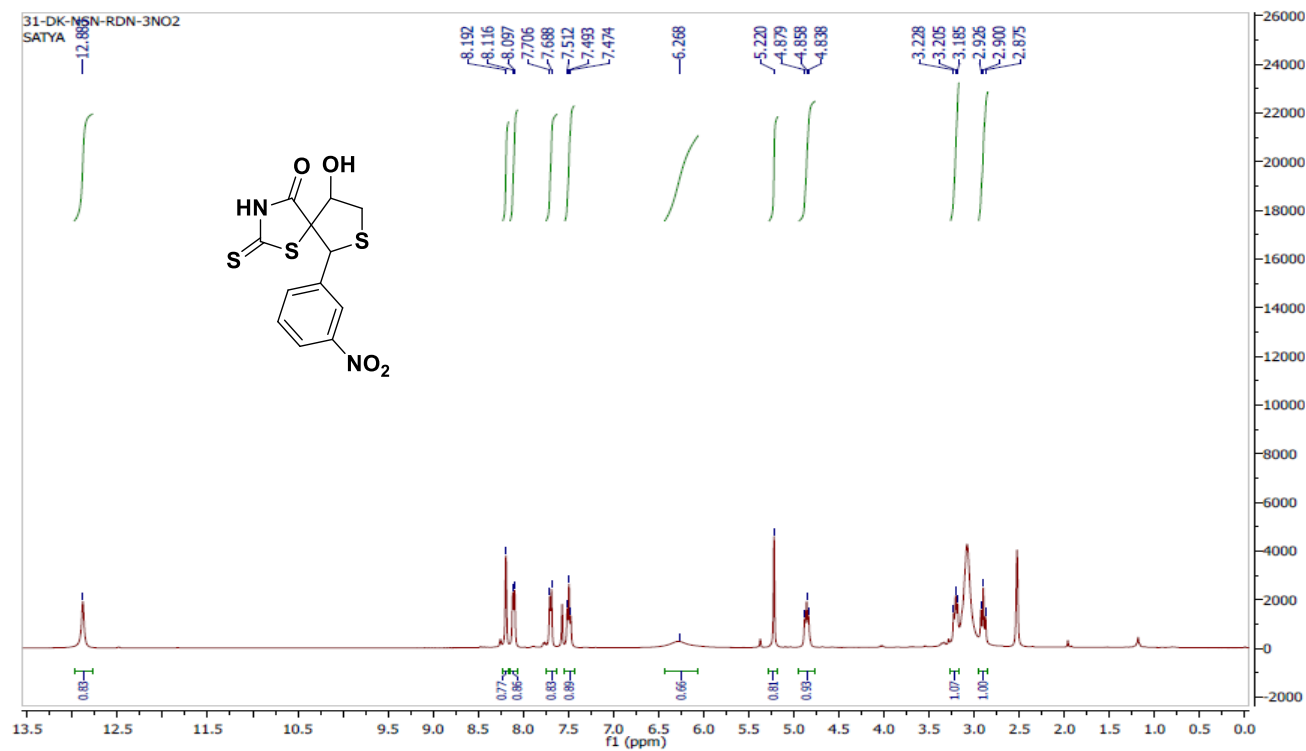


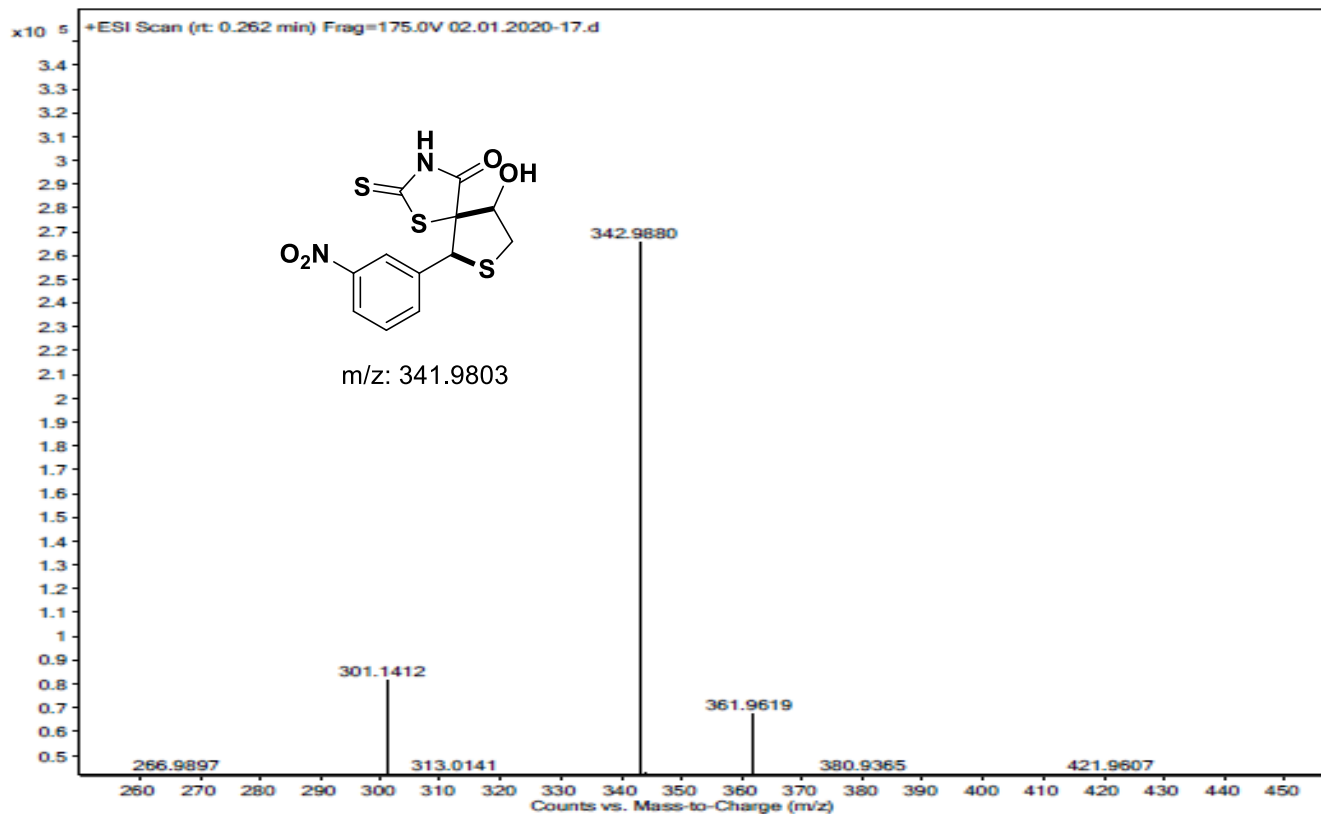
6-(4-bromophenyl)-9-hydroxy-2-thioxo-1,7-dithia-3-azaspiro[4.4]nonan-4-one (7e):

**9-hydroxy-6-(2-nitrophenyl)-2-thioxo-1,7-dithia-3-azaspiro[4.4]nonan-4-one (7f):**

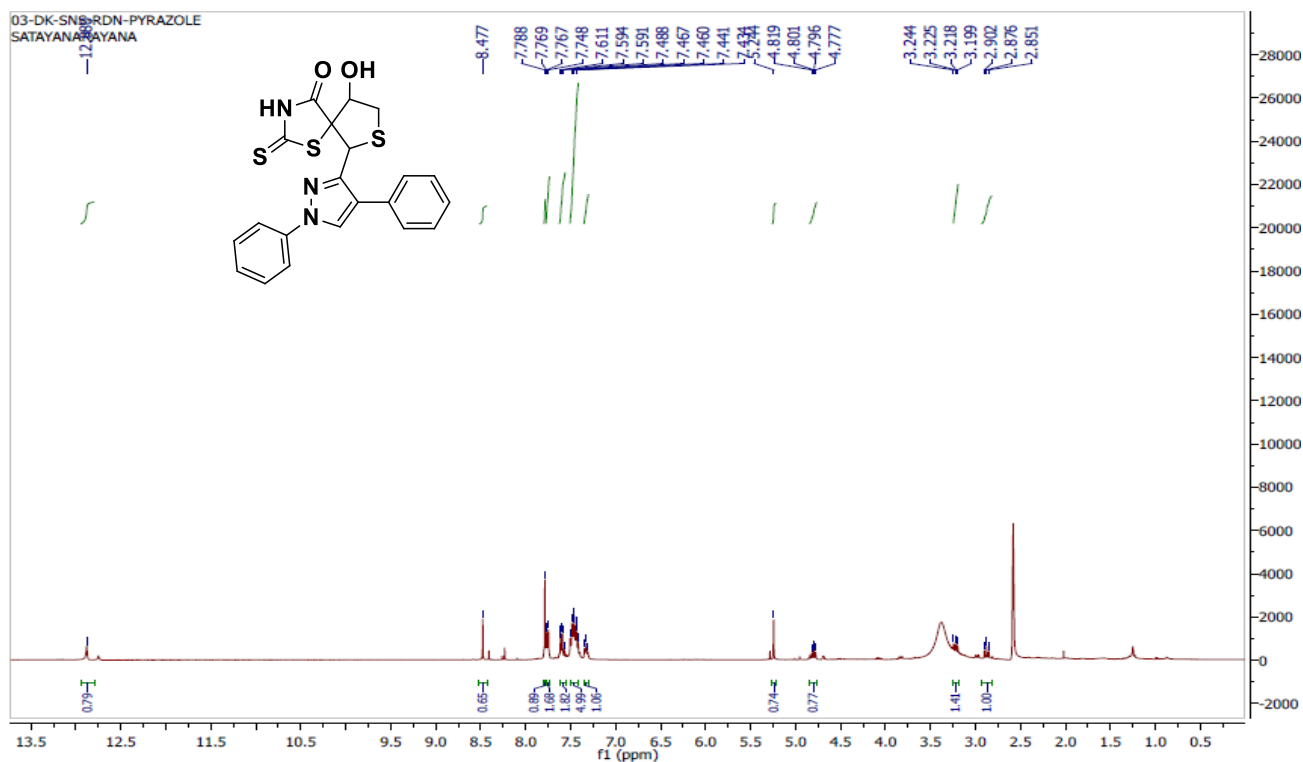


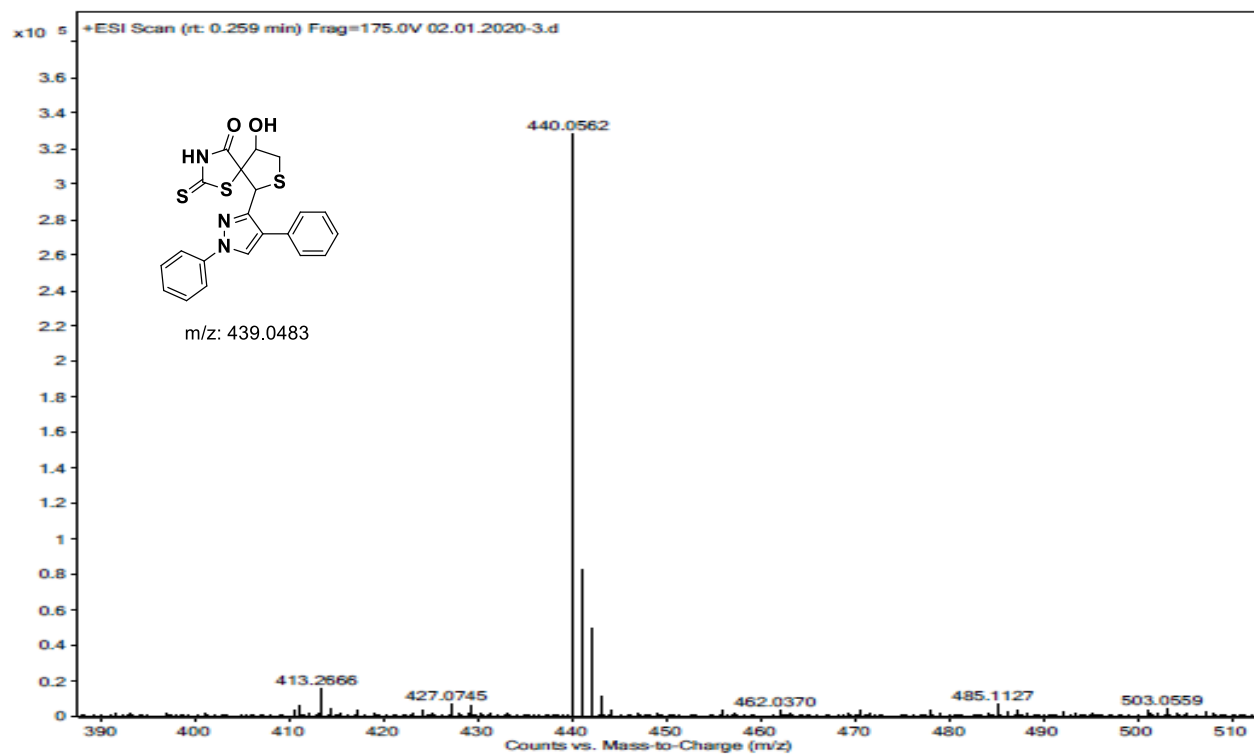
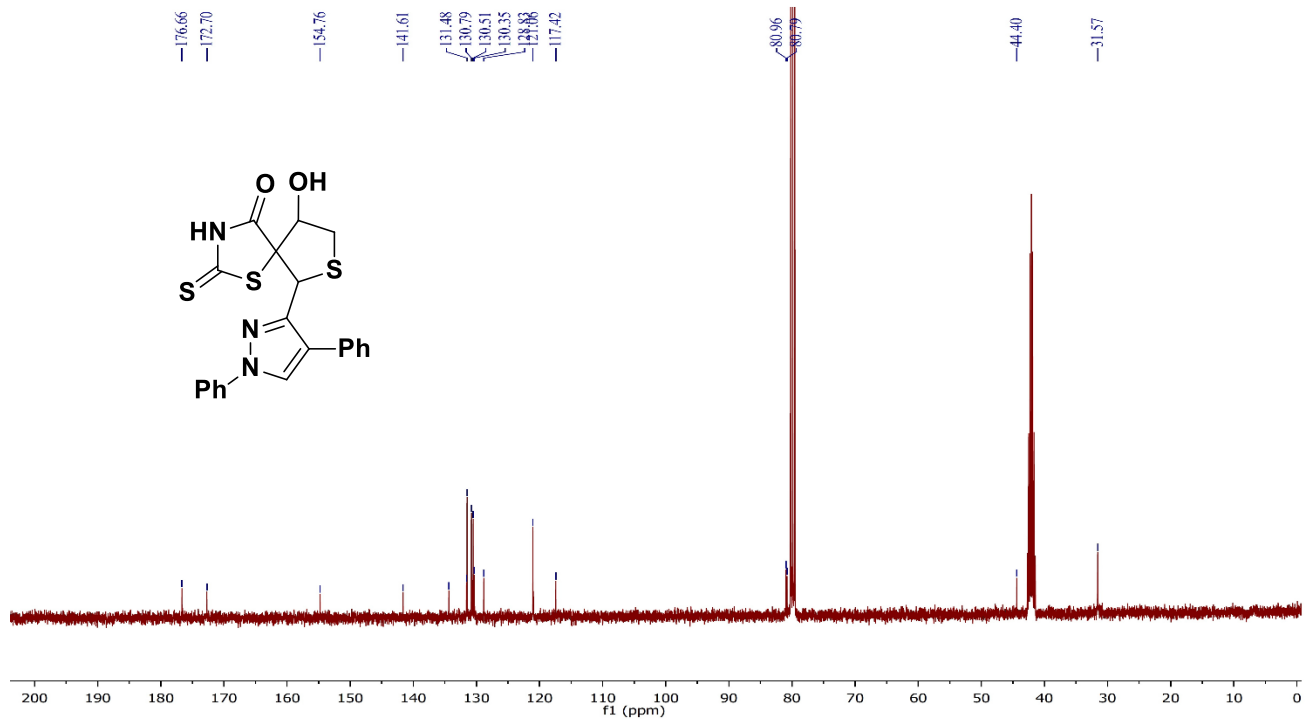
9-hydroxy-6-(3-nitrophenyl)-2-thioxo-1,7-dithia-3-azaspiro[4.4]nonan-4-one (7g):

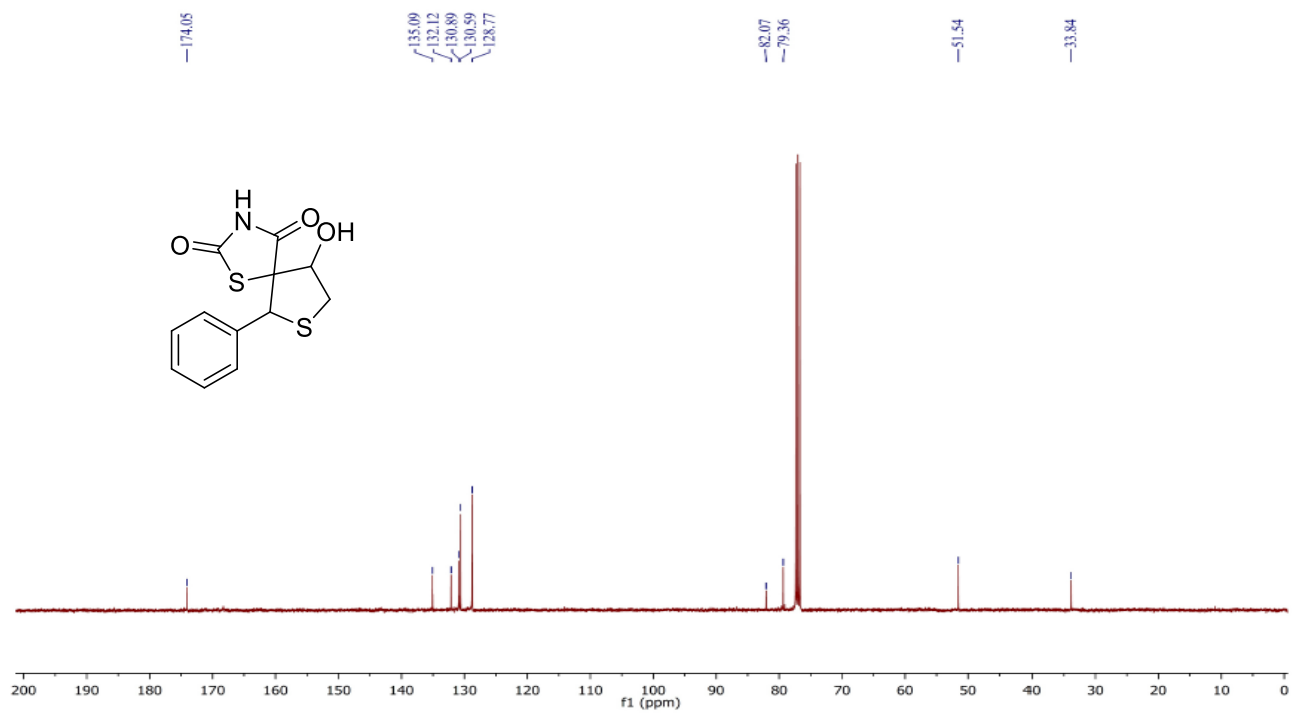
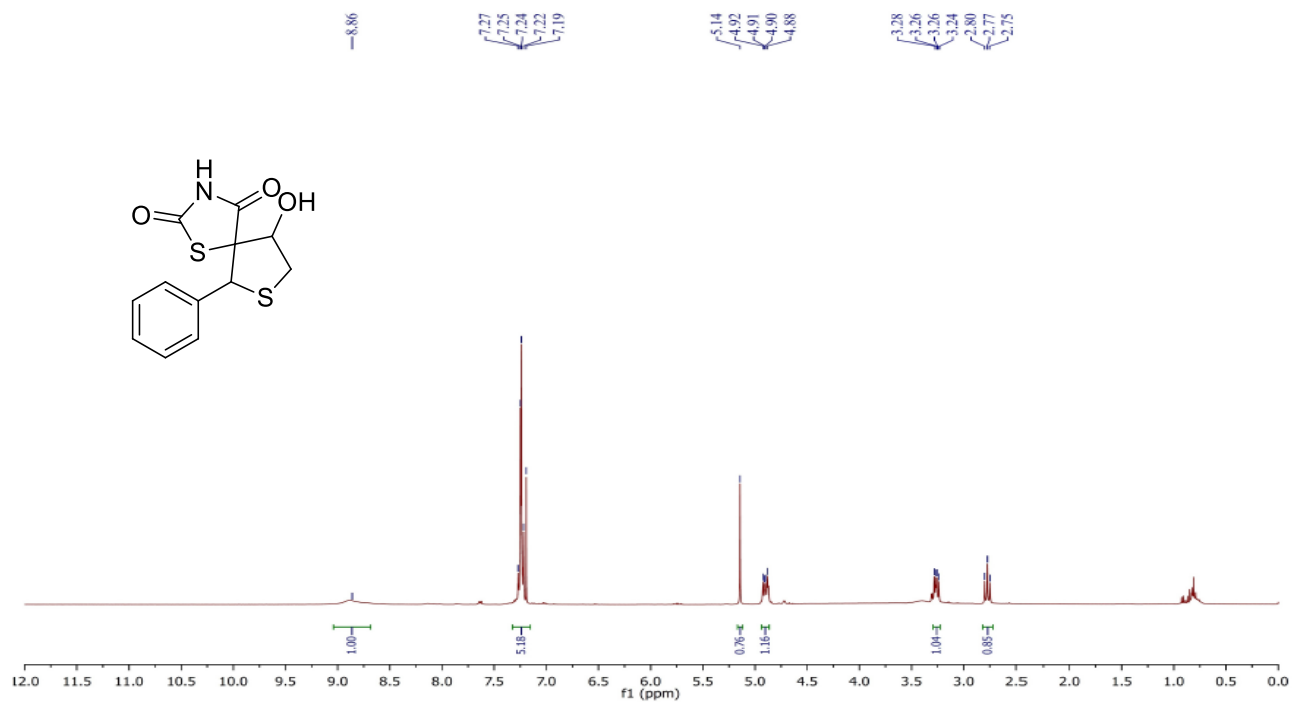


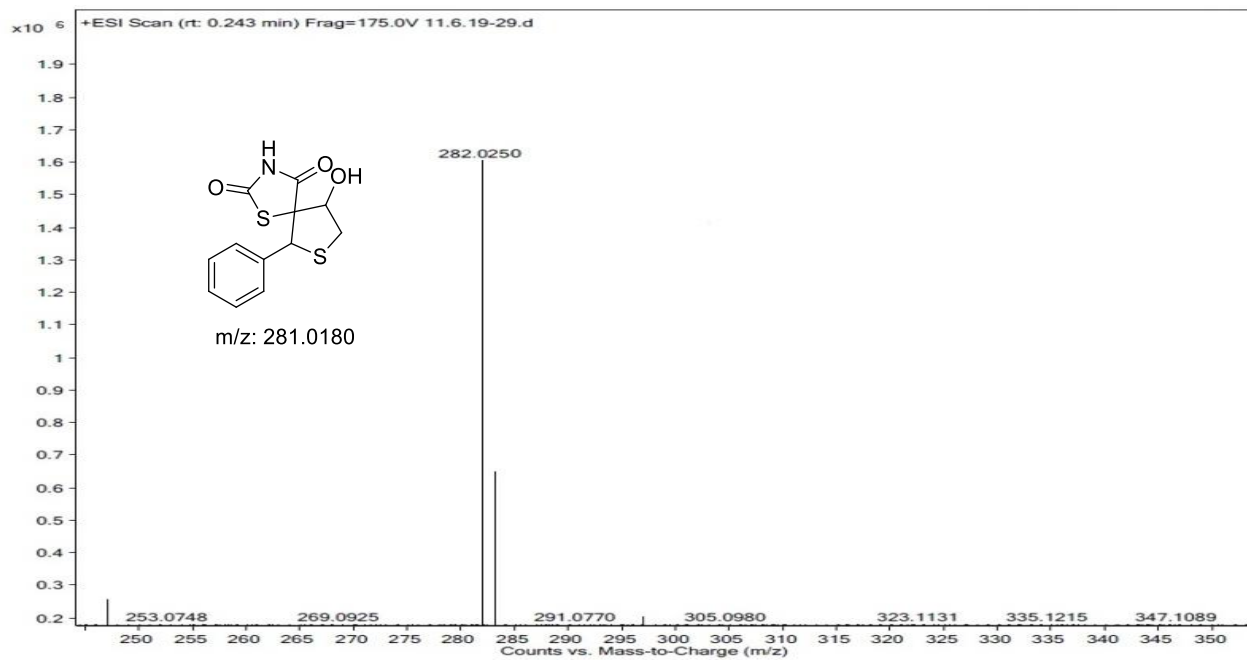
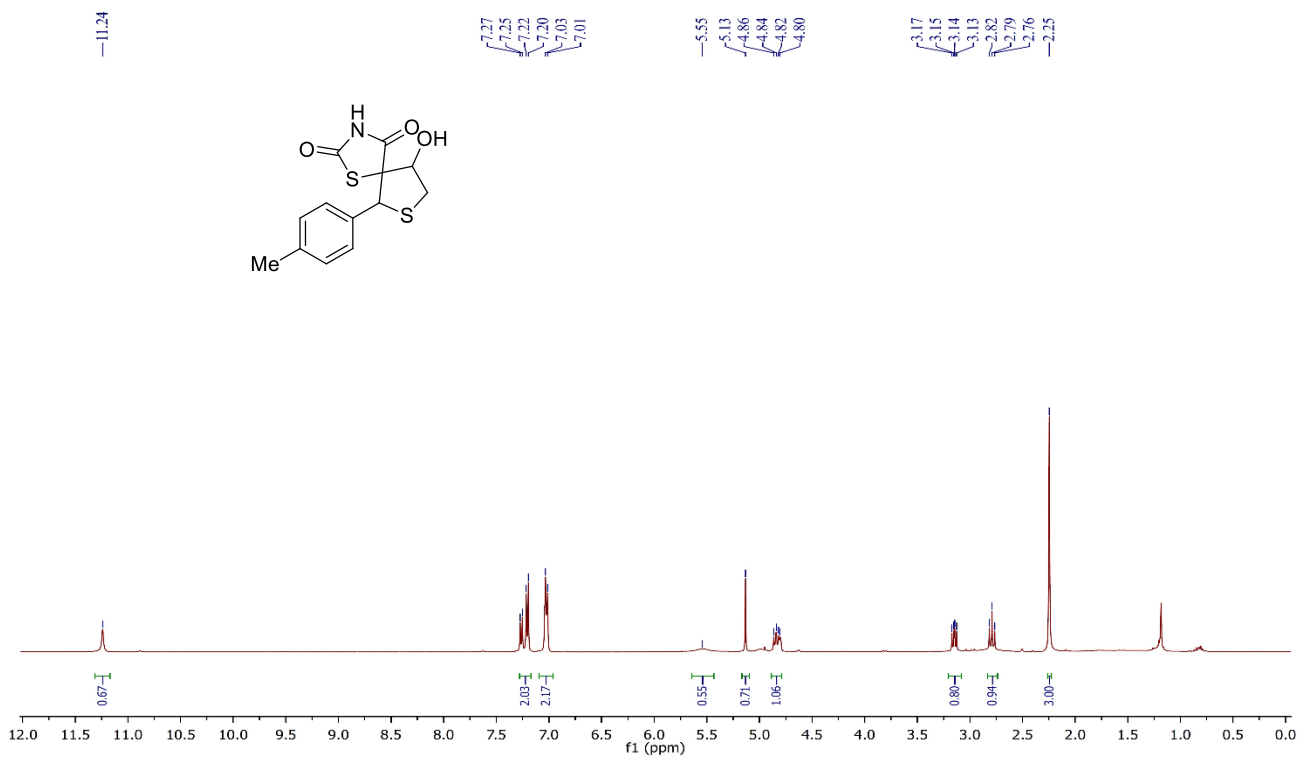


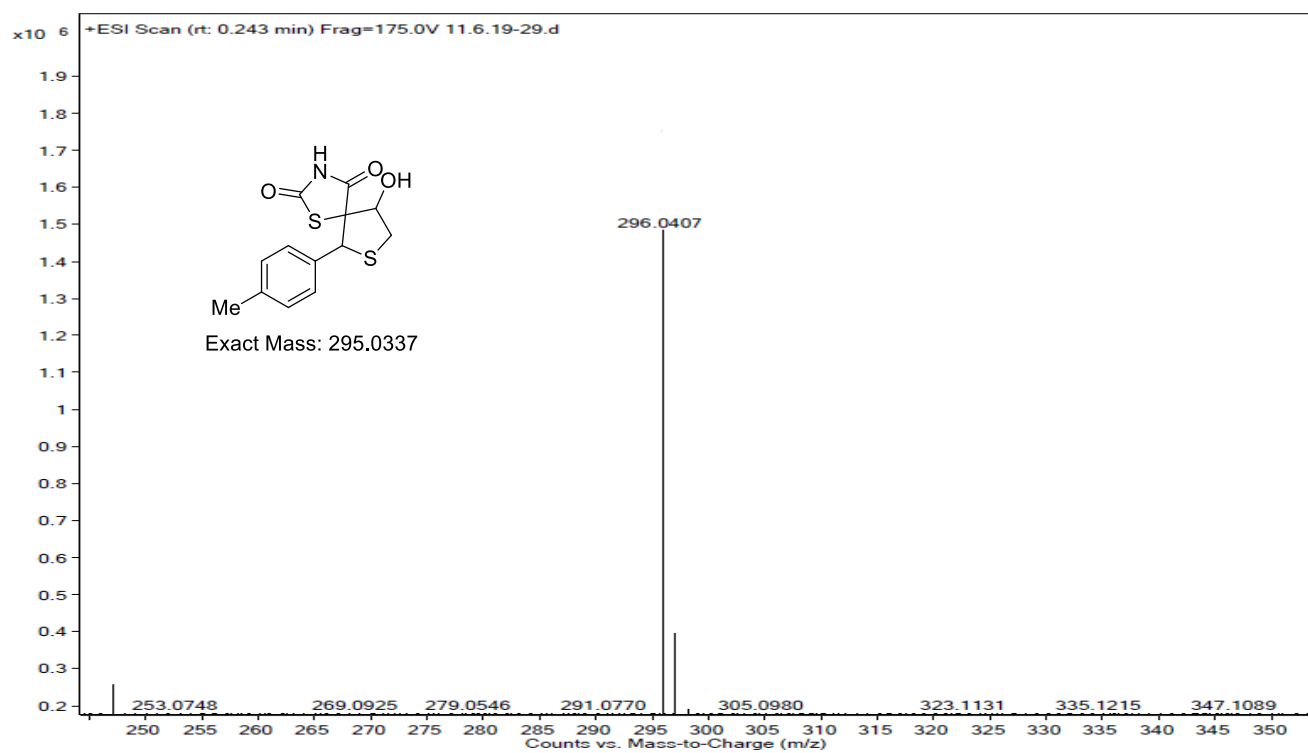
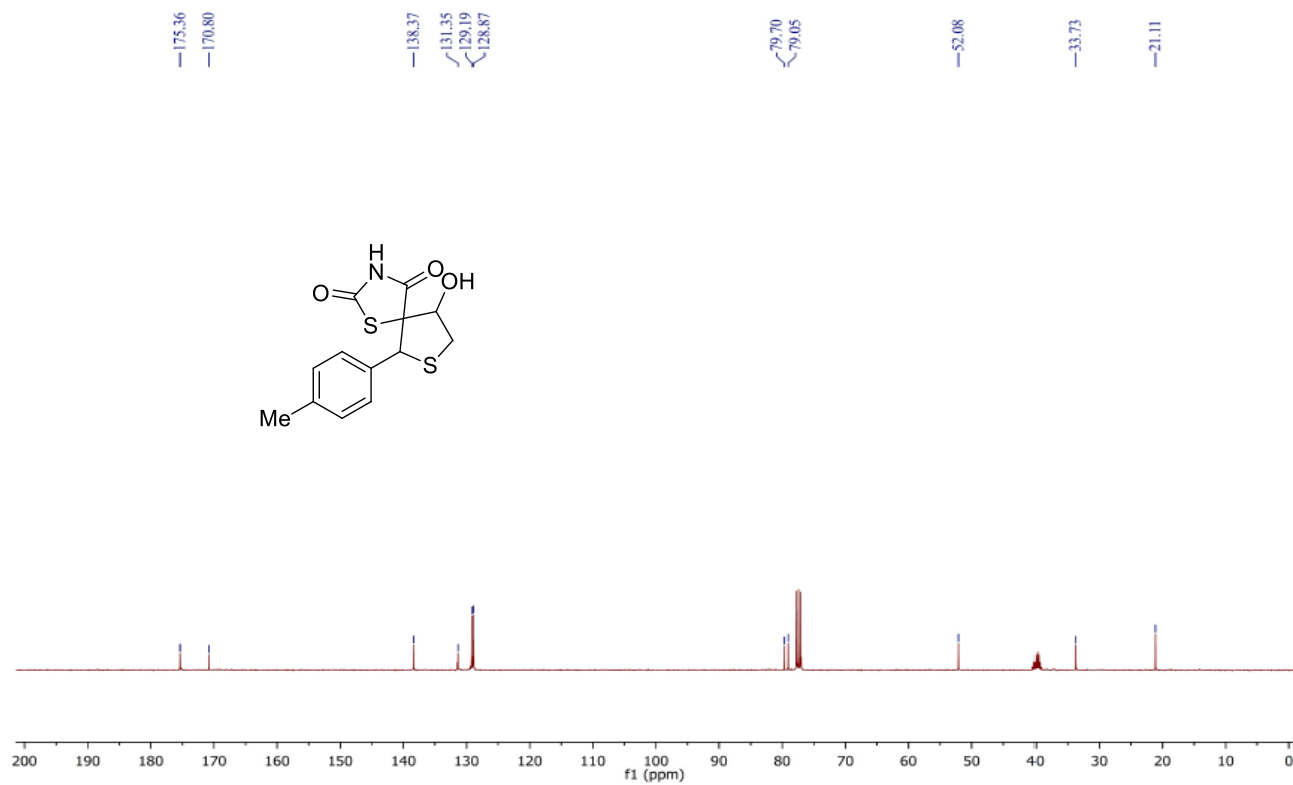
6-(1,4-diphenyl-1H-pyrazol-3-yl)-9-hydroxy-2-thioxo-1,7-dithia-3-azaspiro[4.4]nonan-4-one (7h)

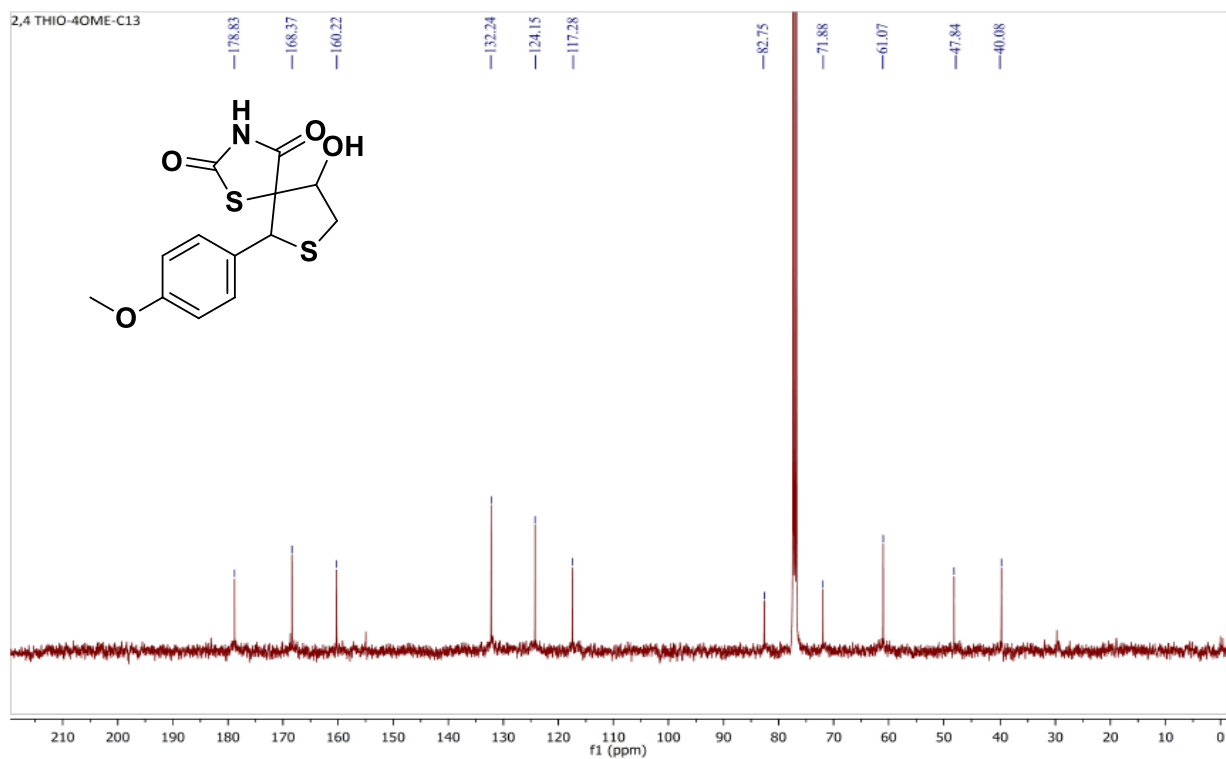
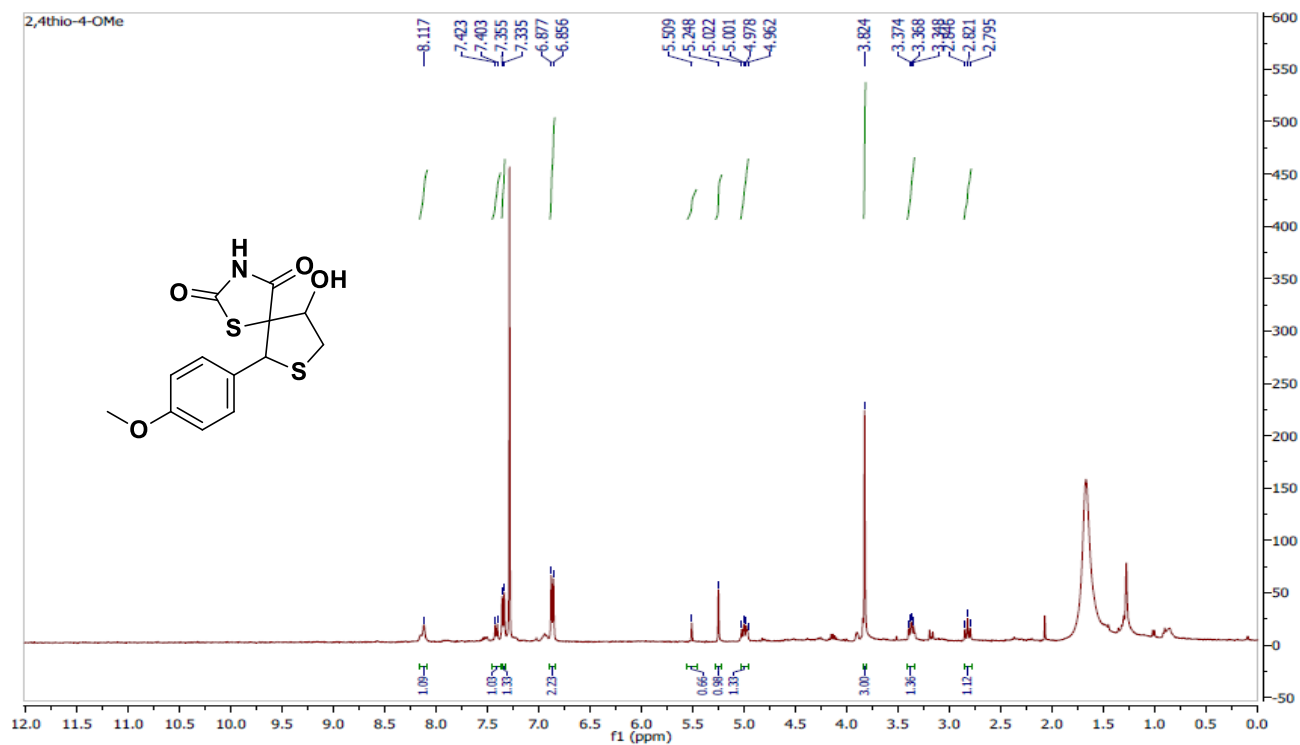


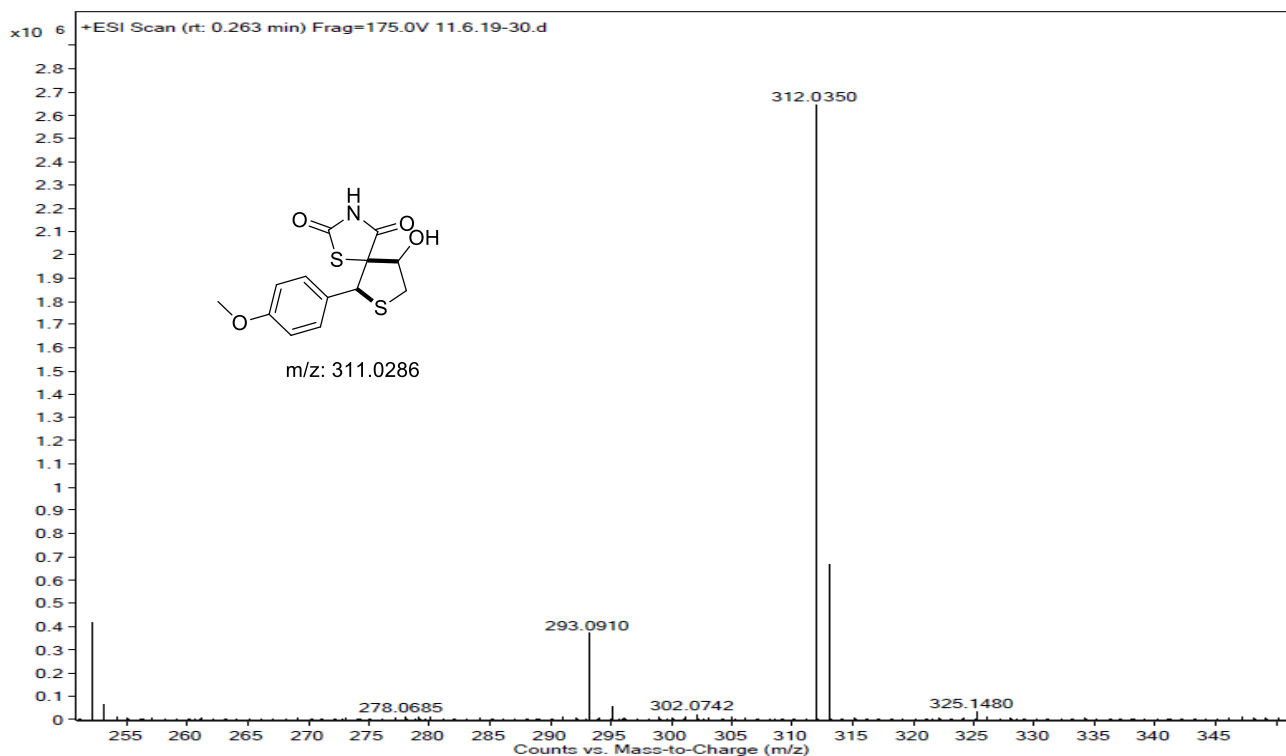
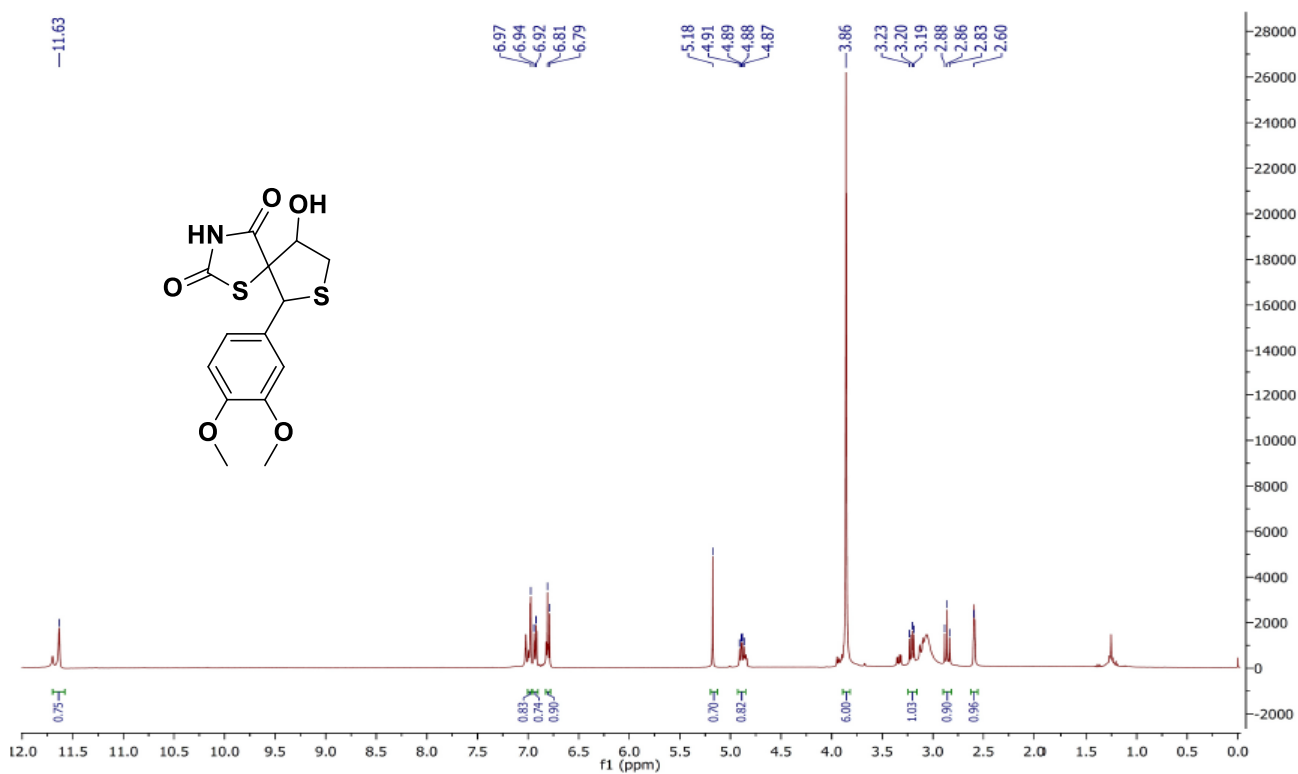


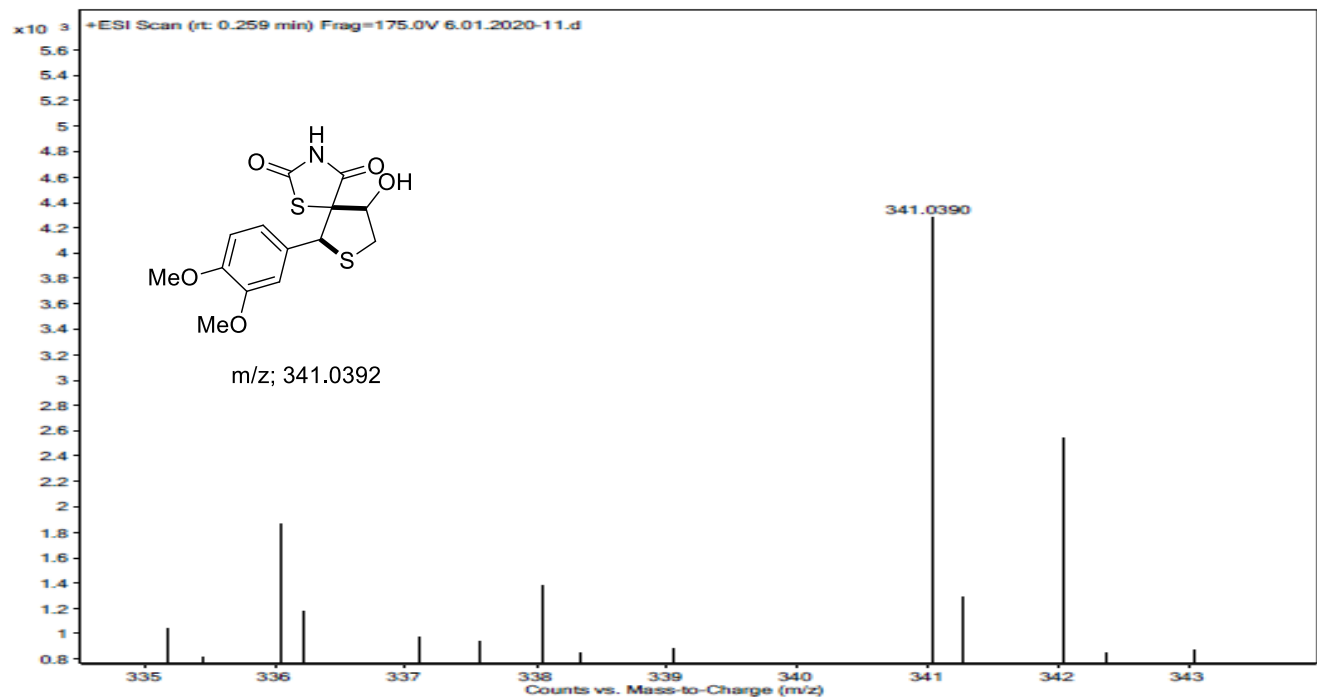
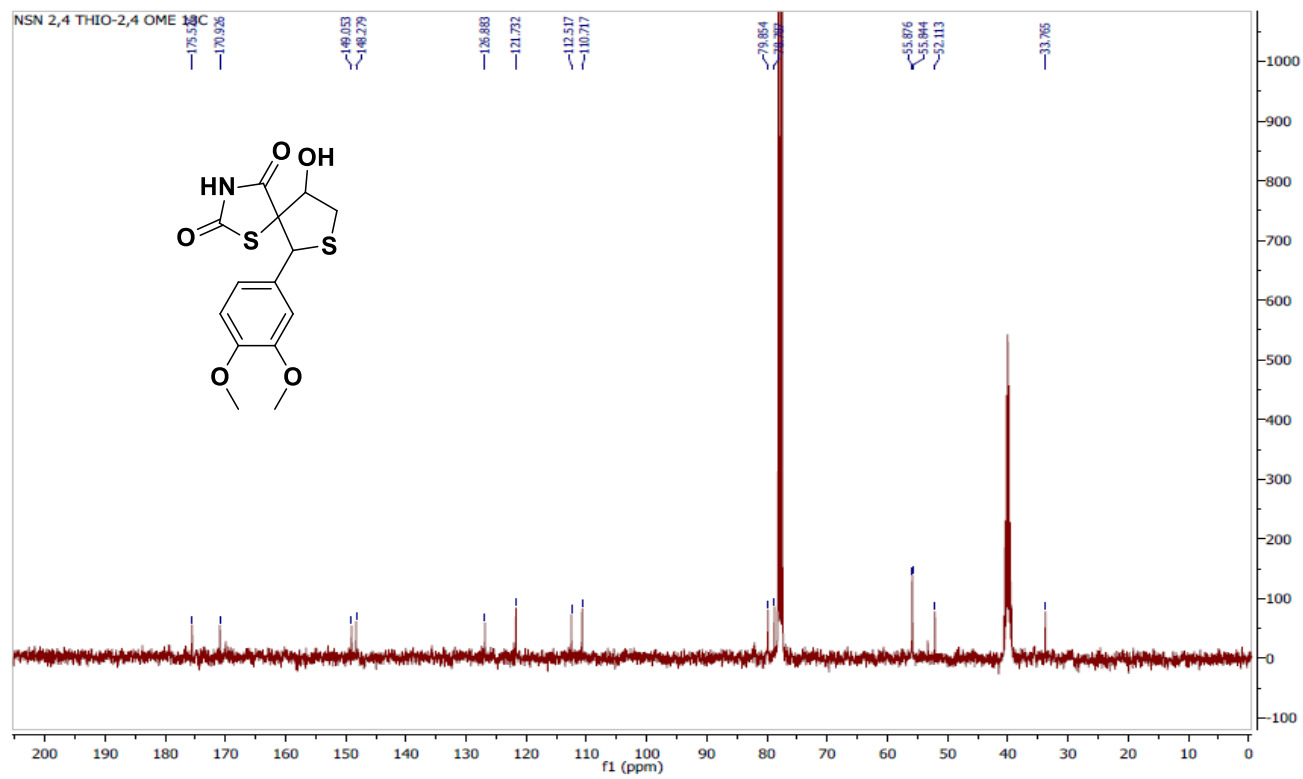
9-hydroxy-6-phenyl-1,7-dithia-3-azaspiro[4.4]nonane-2,4-dione (8a):

**9-hydroxy-6-(p-tolyl)-1,7-dithia-3-azaspiro[4.4]nonane-2,4-dione (8b):**

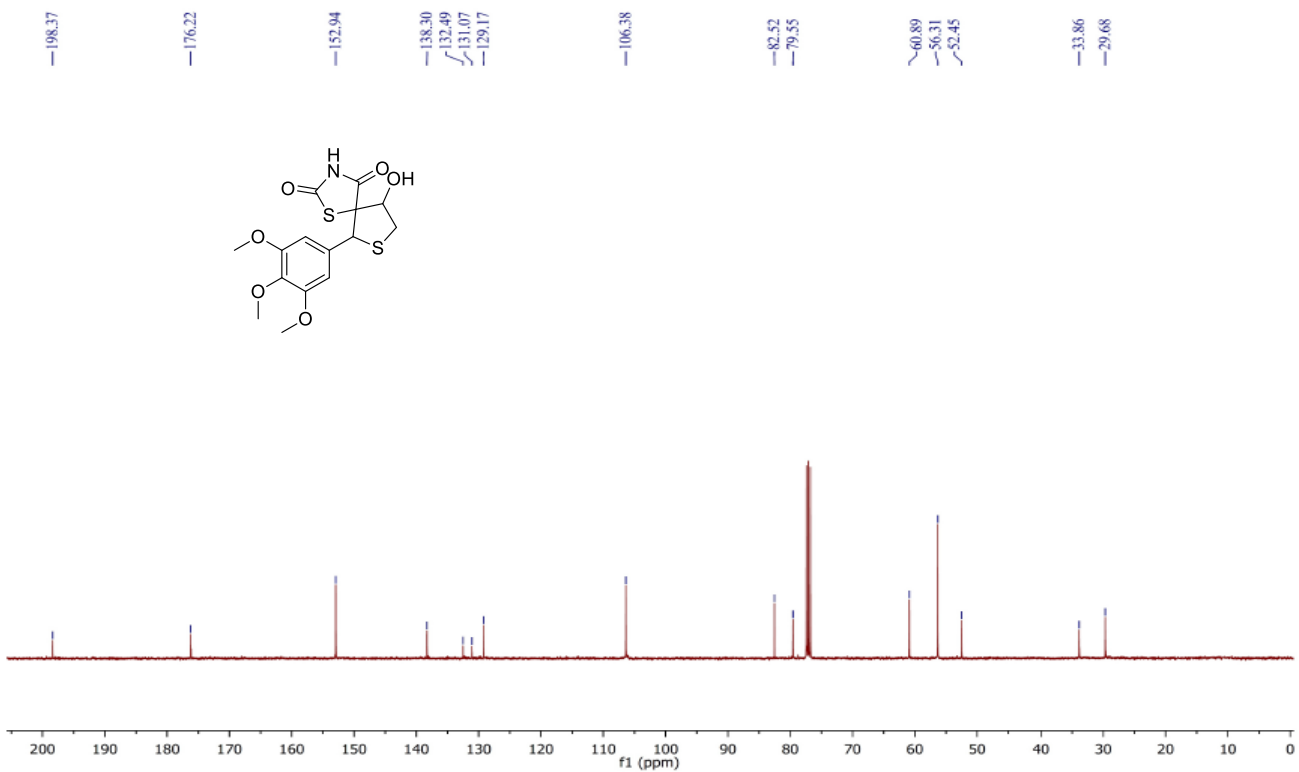
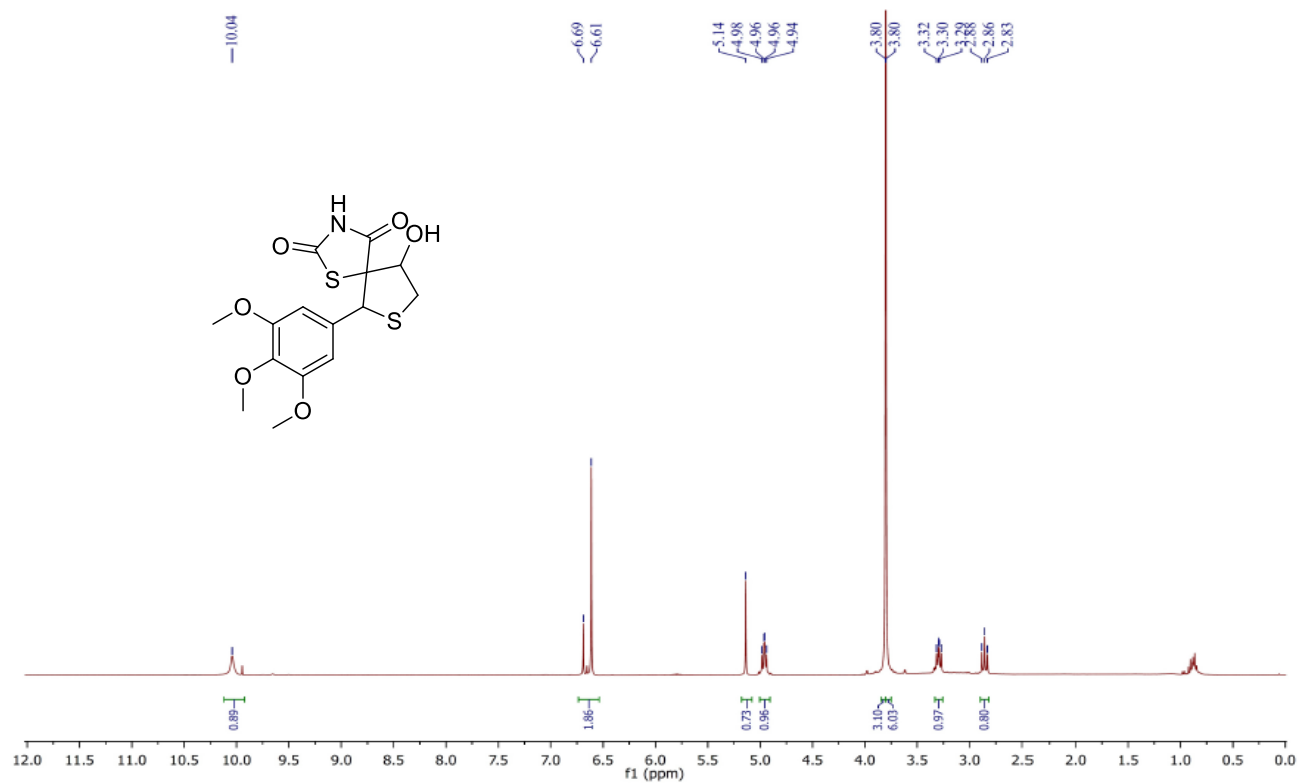


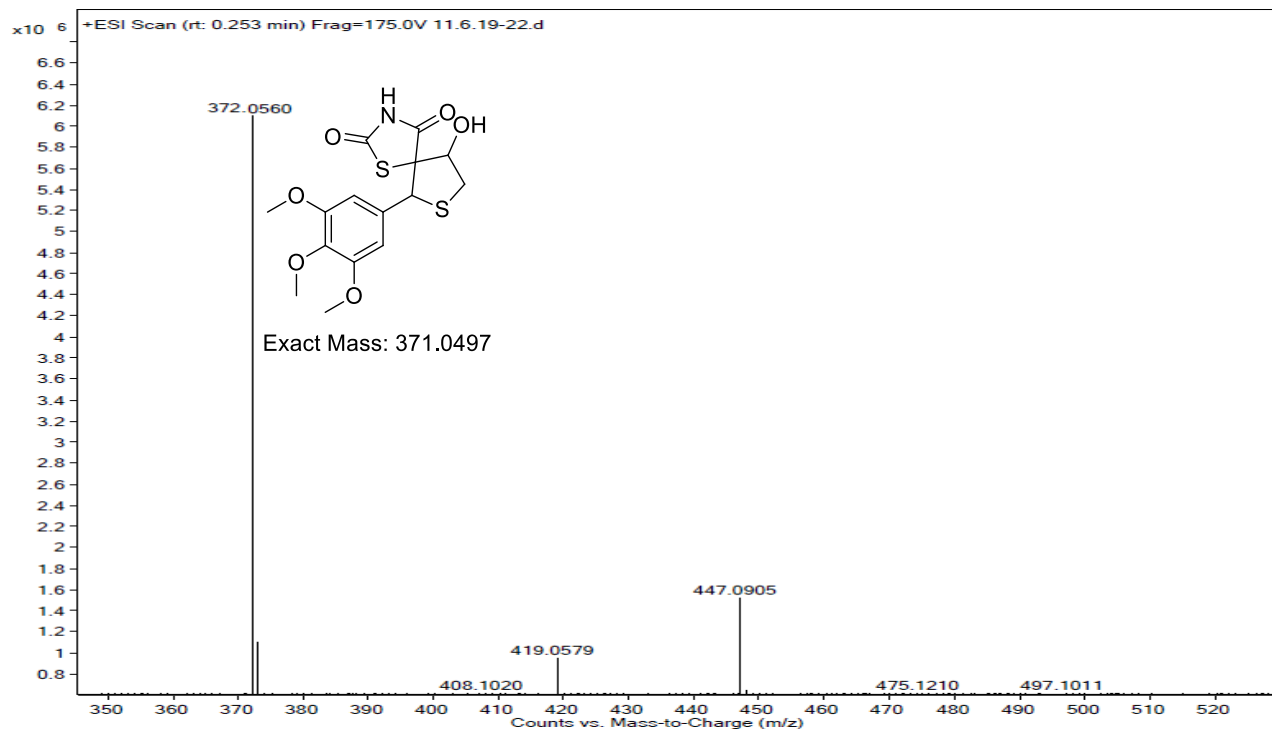
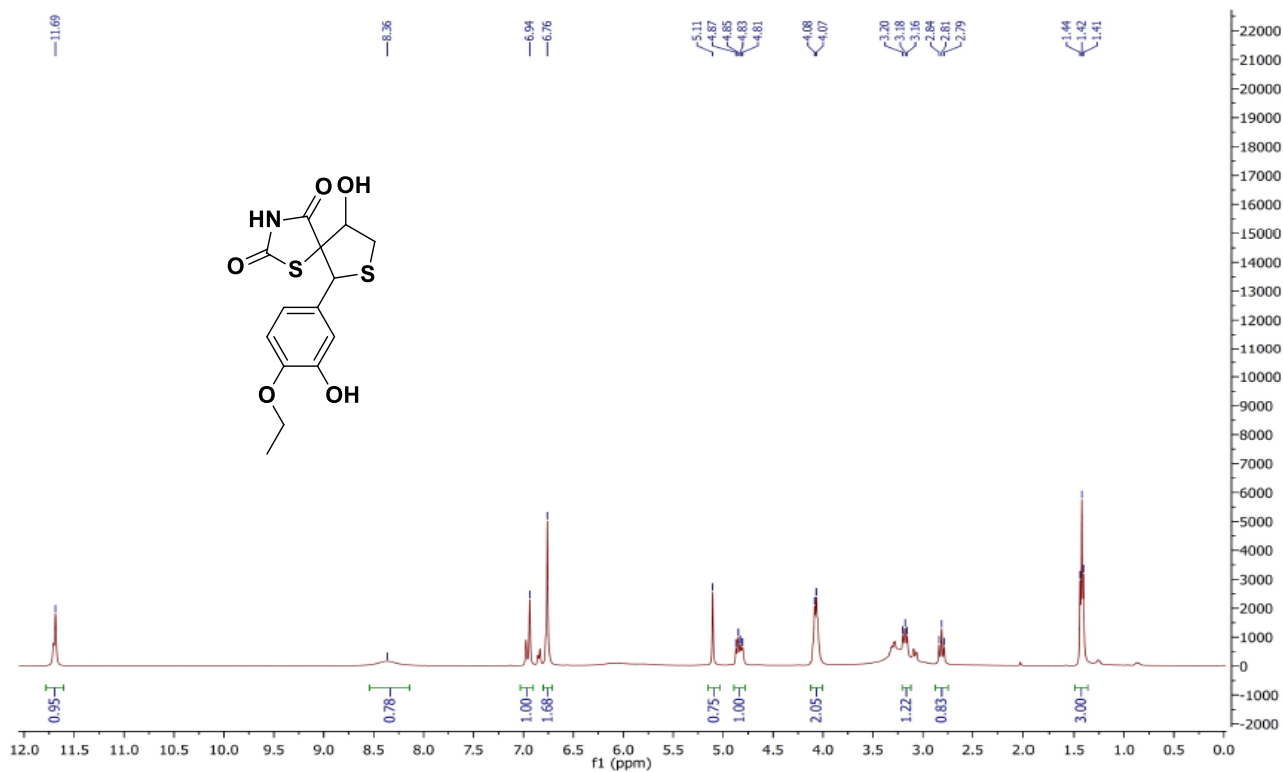
9-hydroxy-6-(4-methoxyphenyl)-1,7-dithia-3-azaspiro[4.4]nonane-2,4-dione (8c):

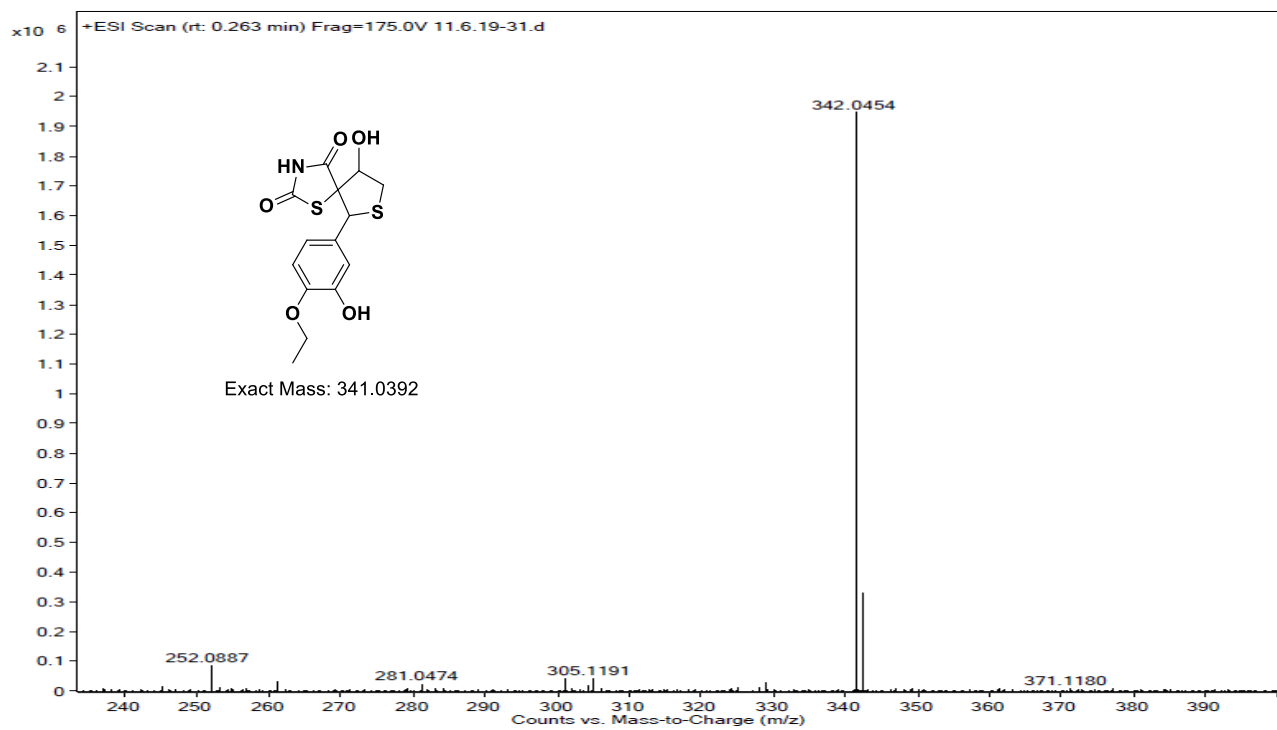
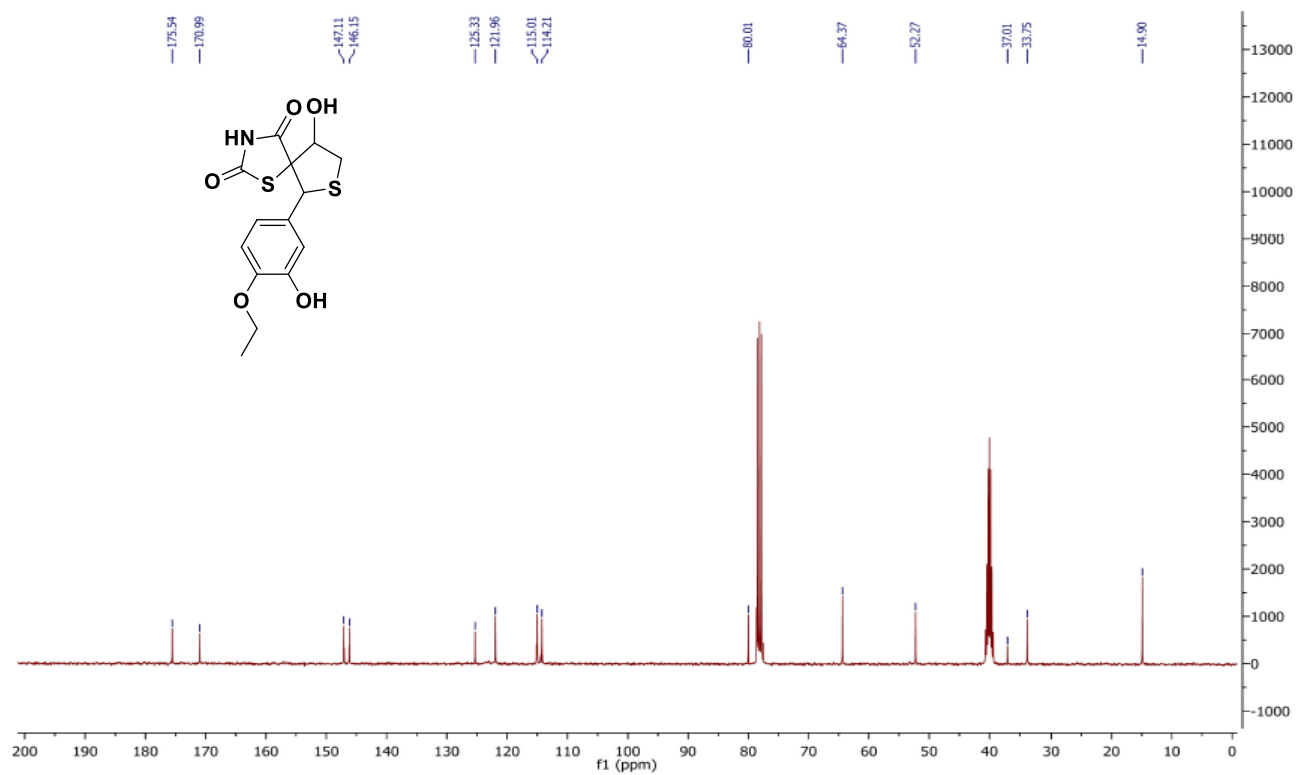
**6-(3,4-dimethoxyphenyl)-9-hydroxy-1,7-dithia-3-azaspiro[4.4]nonane-2,4-dione (8d):**



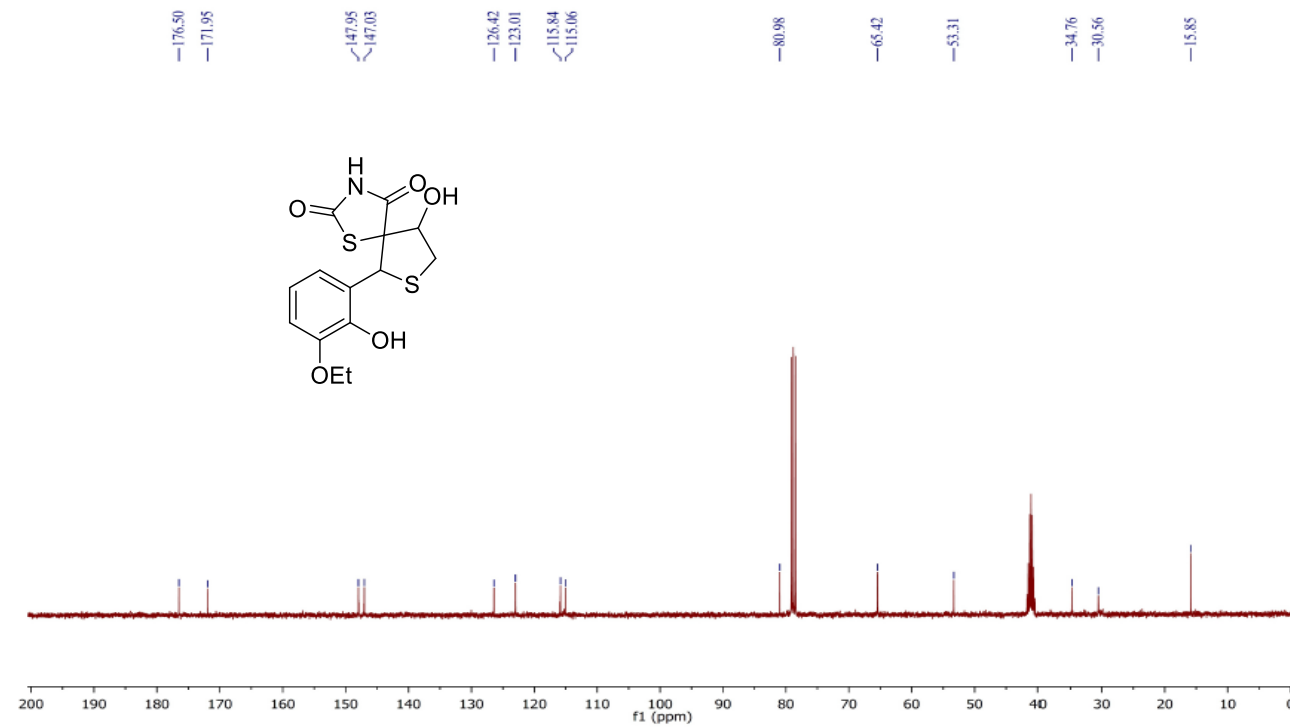
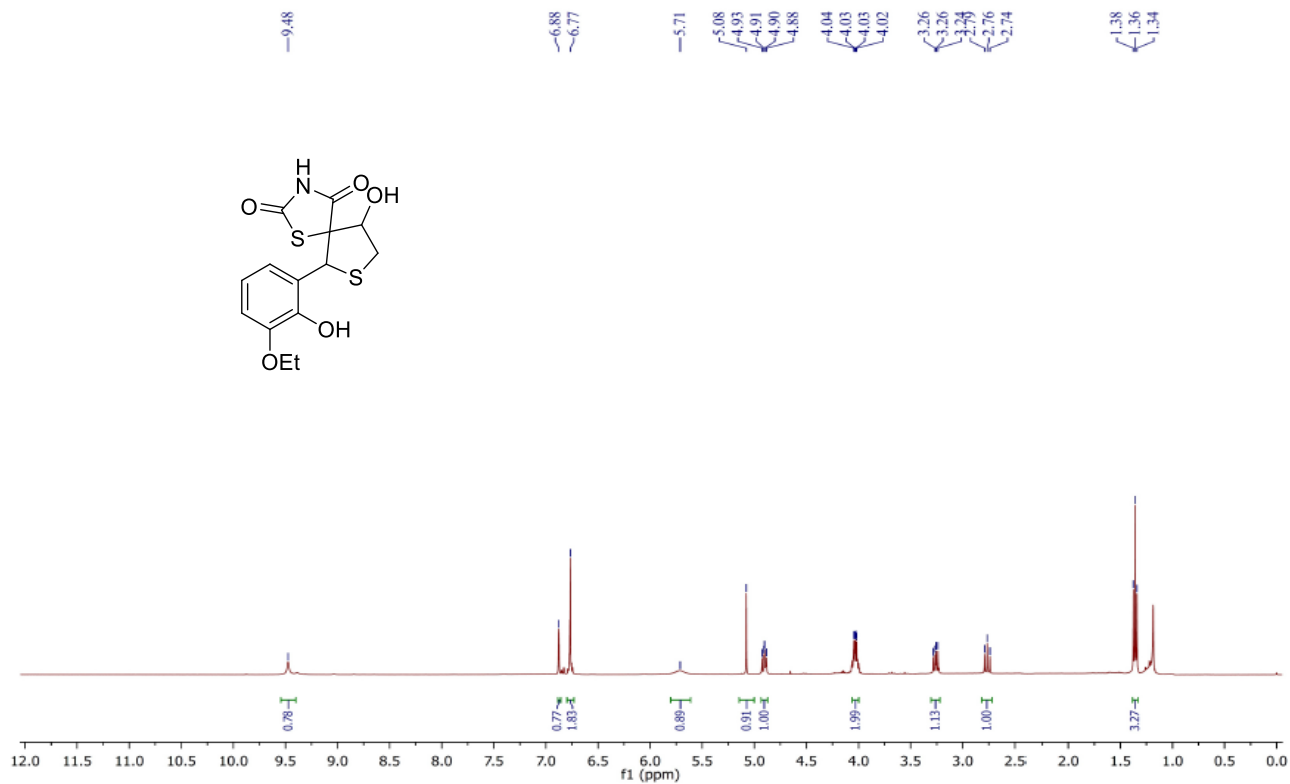
6-(3,4,5-trimethoxyphenyl)-9-hydroxy-1,7-dithia-3-azaspiro[4.4]nonane-2,4-dione (8e):

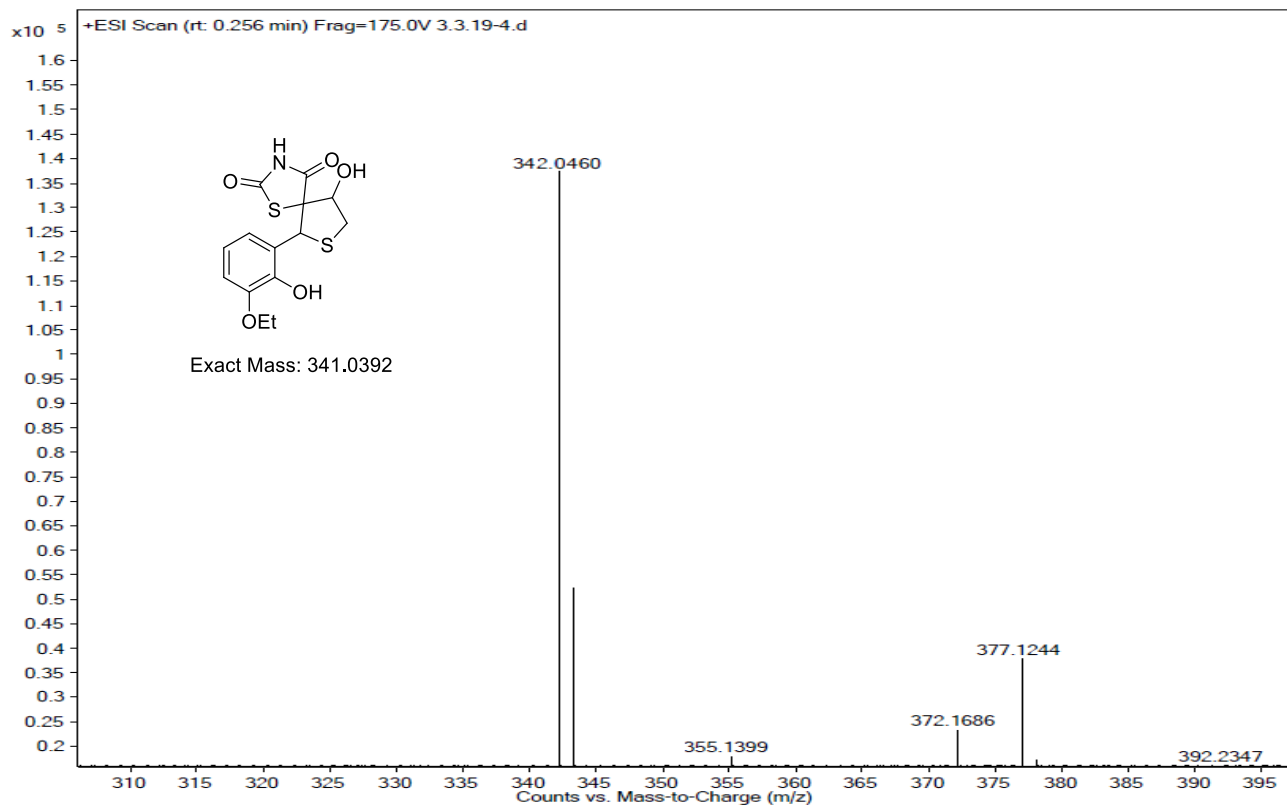
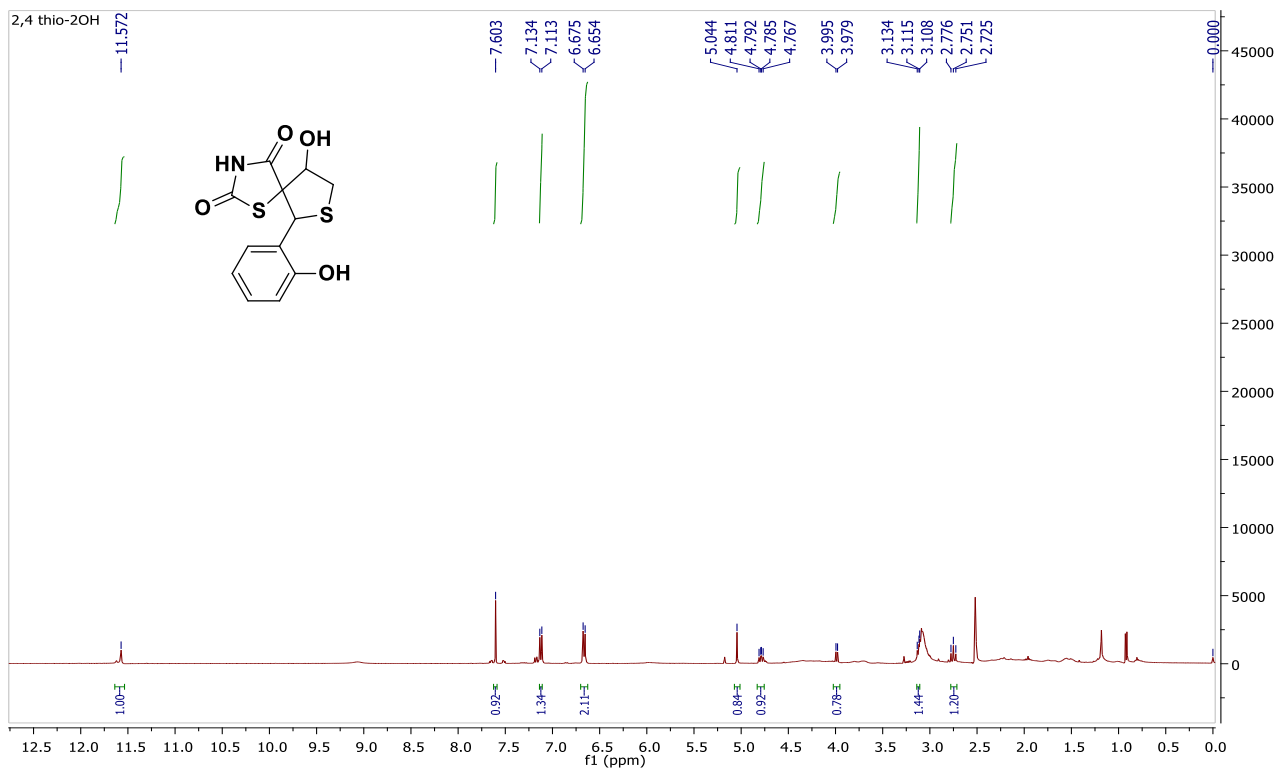


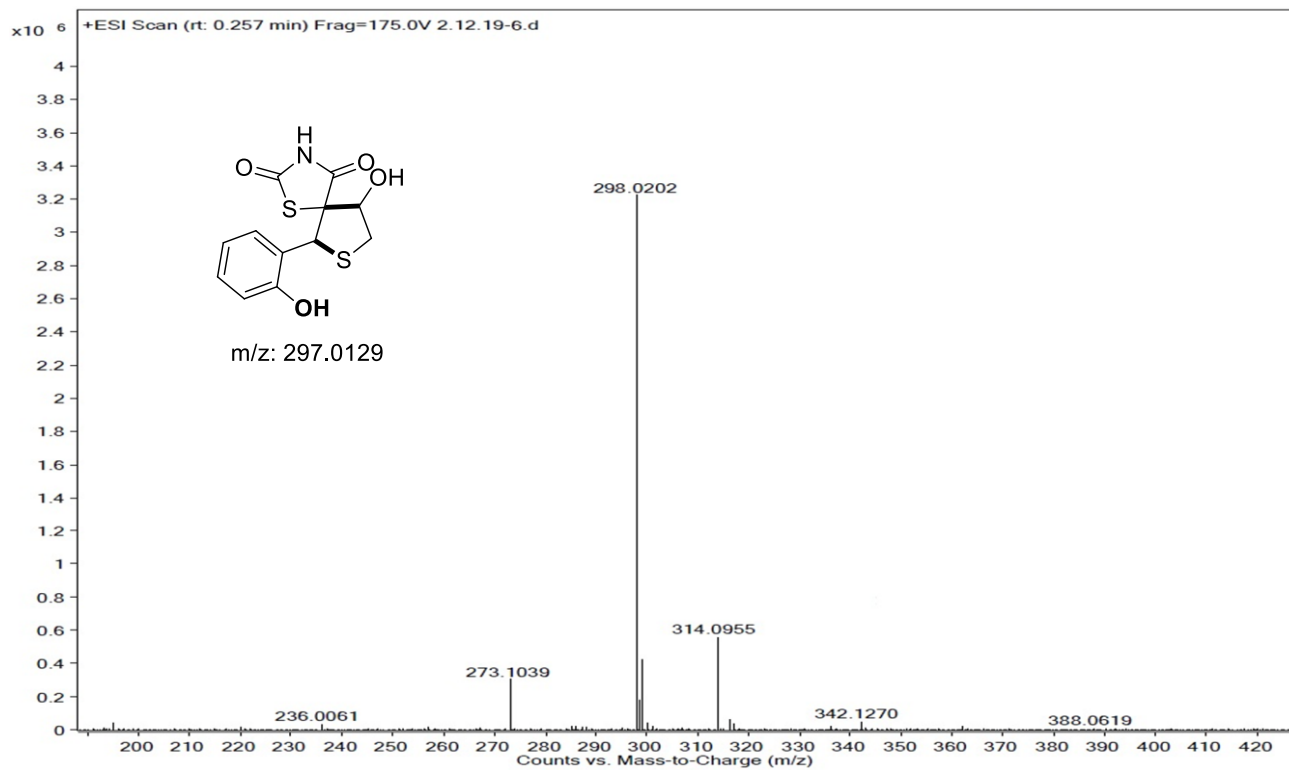
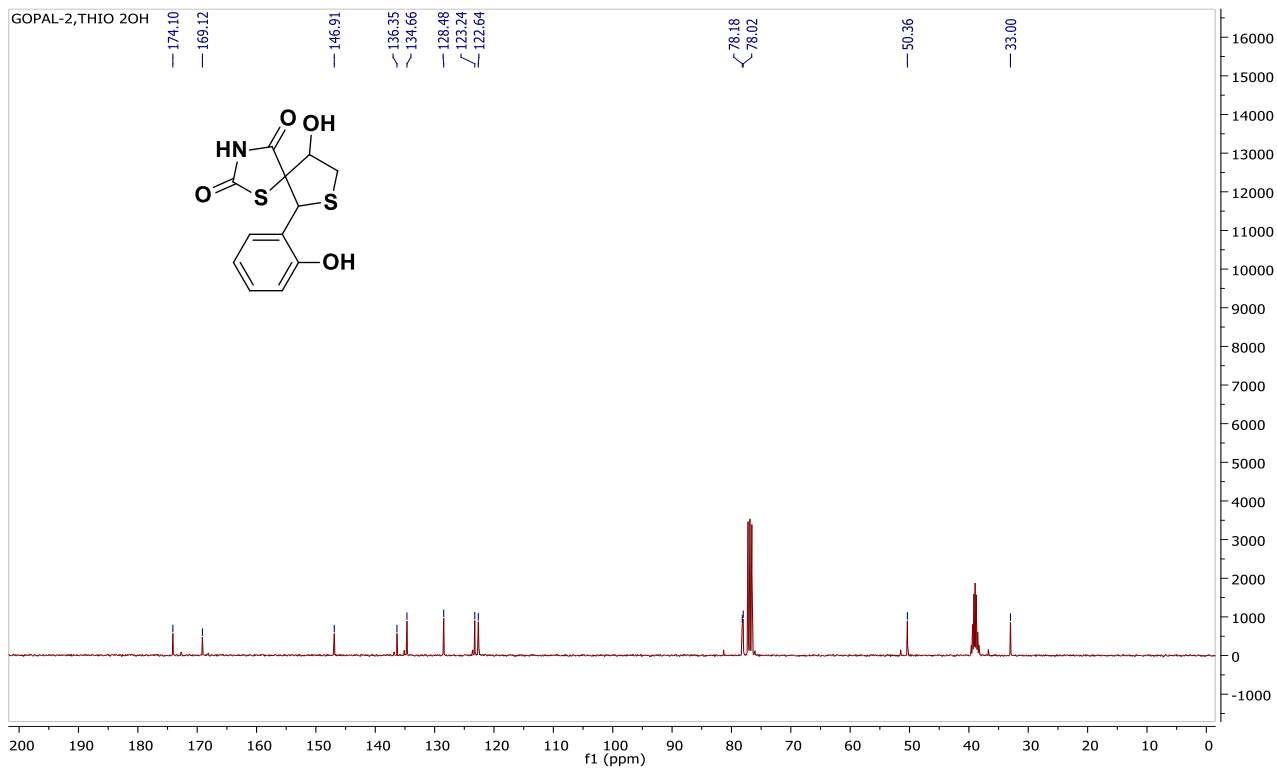
**6-(4-ethoxy-3-hydroxyphenyl)-9-hydroxy-1,7-dithia-3-azaspiro[4.4]nonane-2,4-dione (8f):**



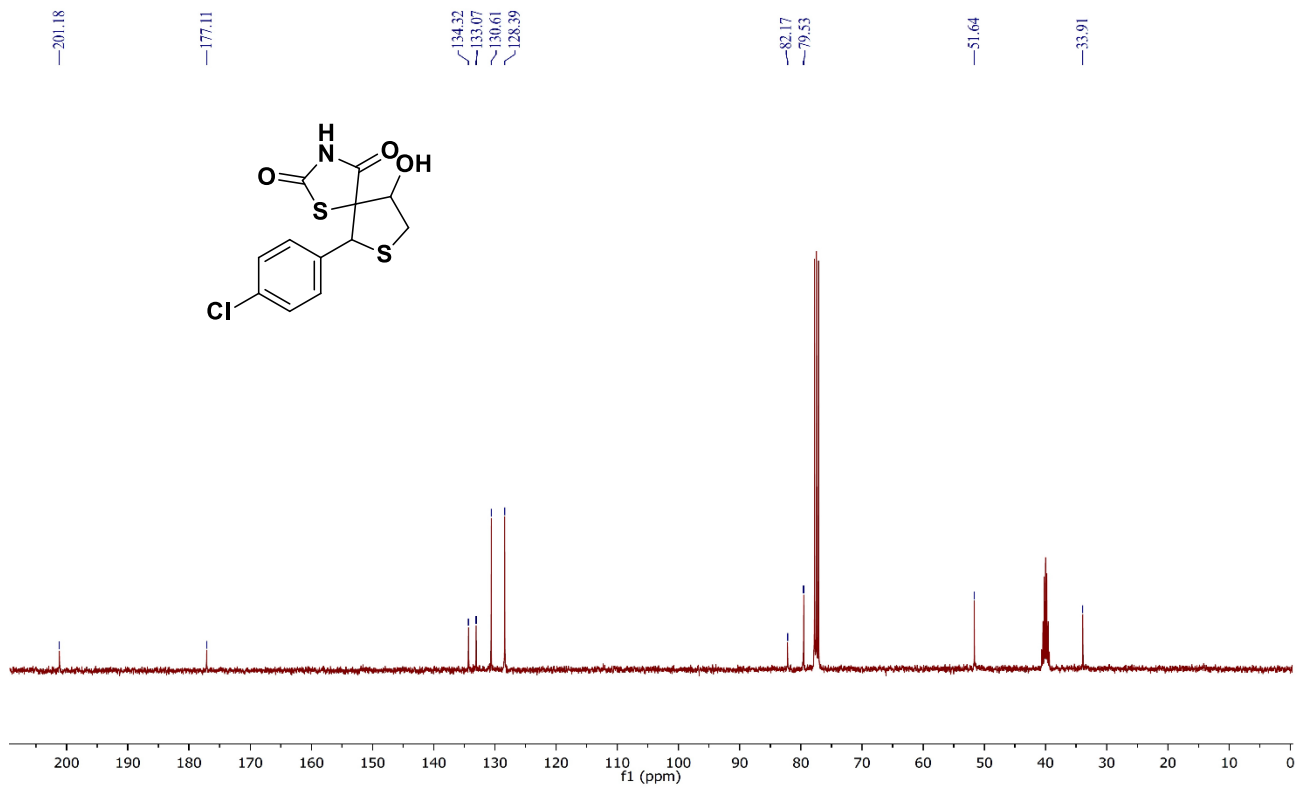
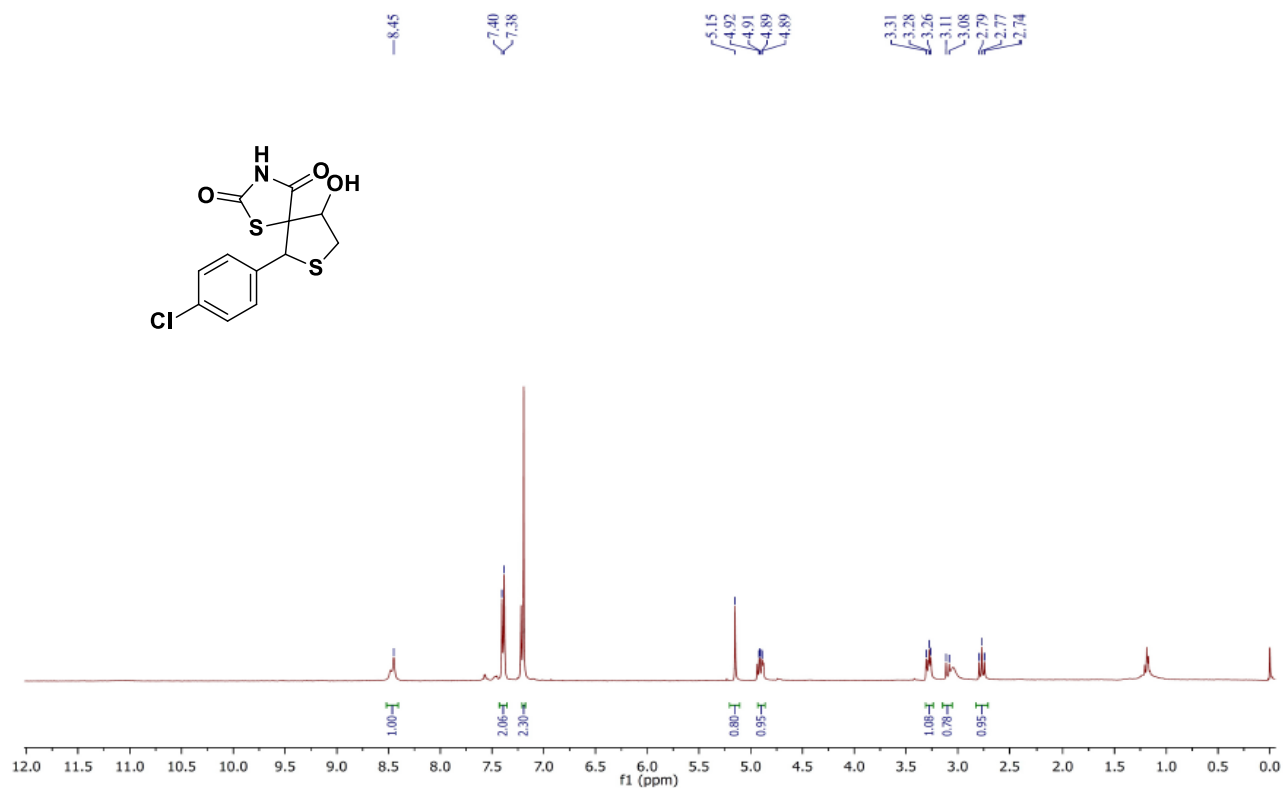
6-(3-ethoxy-2-hydroxyphenyl)-9-hydroxy-1,7-dithia-3-azaspiro[4.4]nonane-2,4-dione (8g):

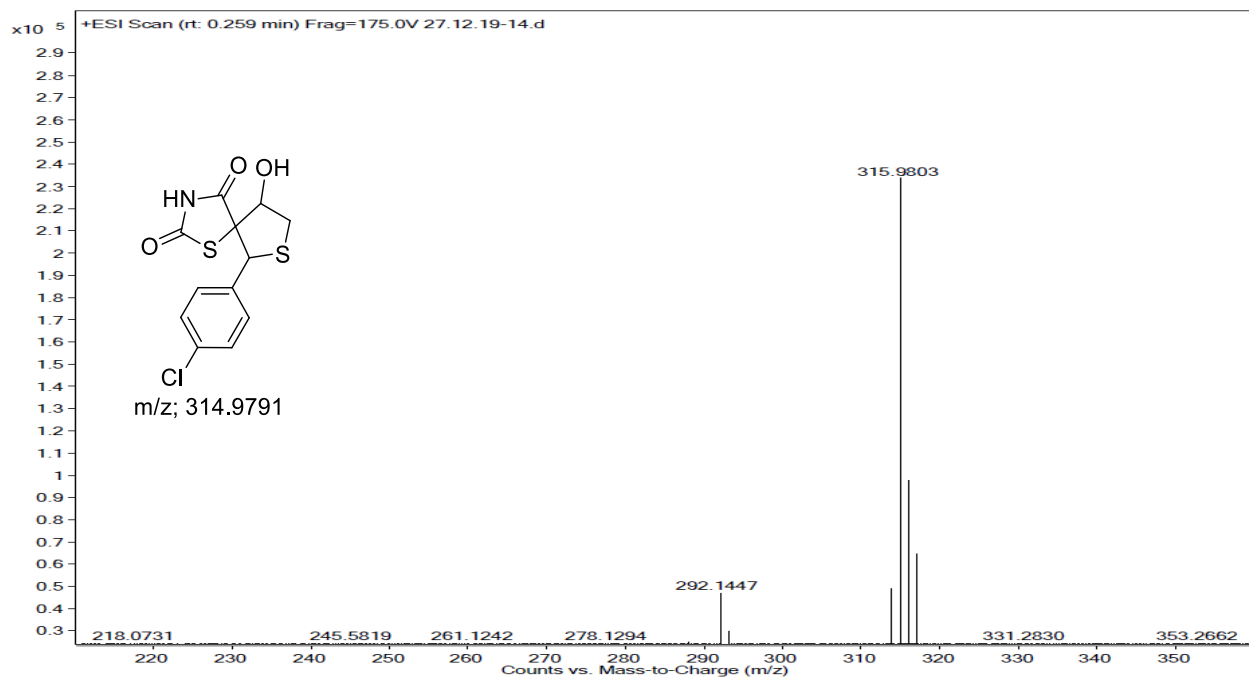
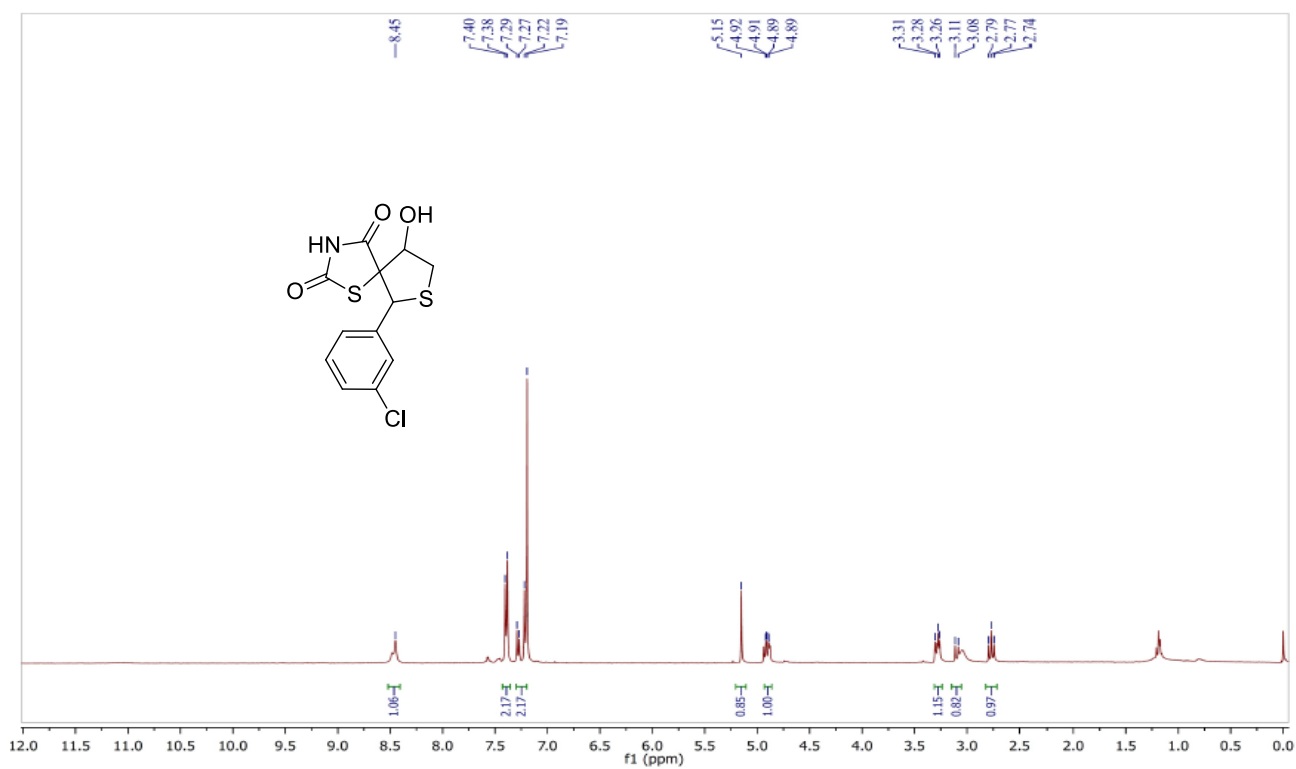


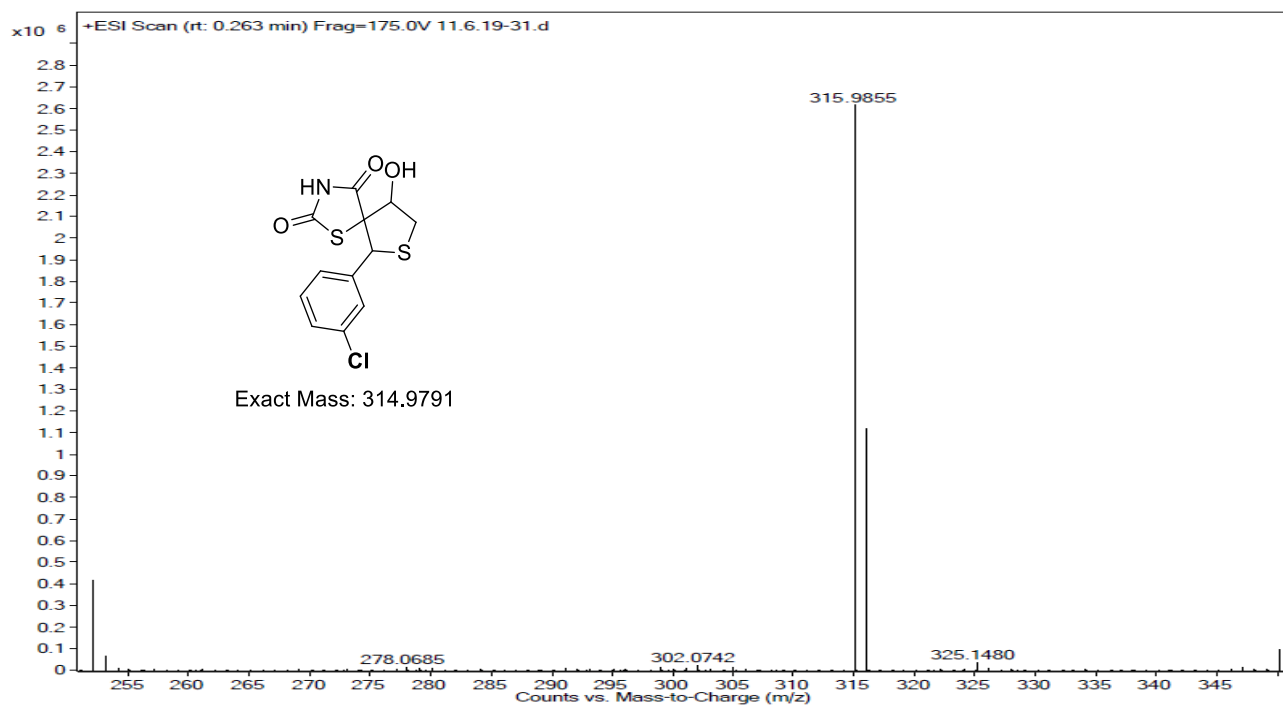
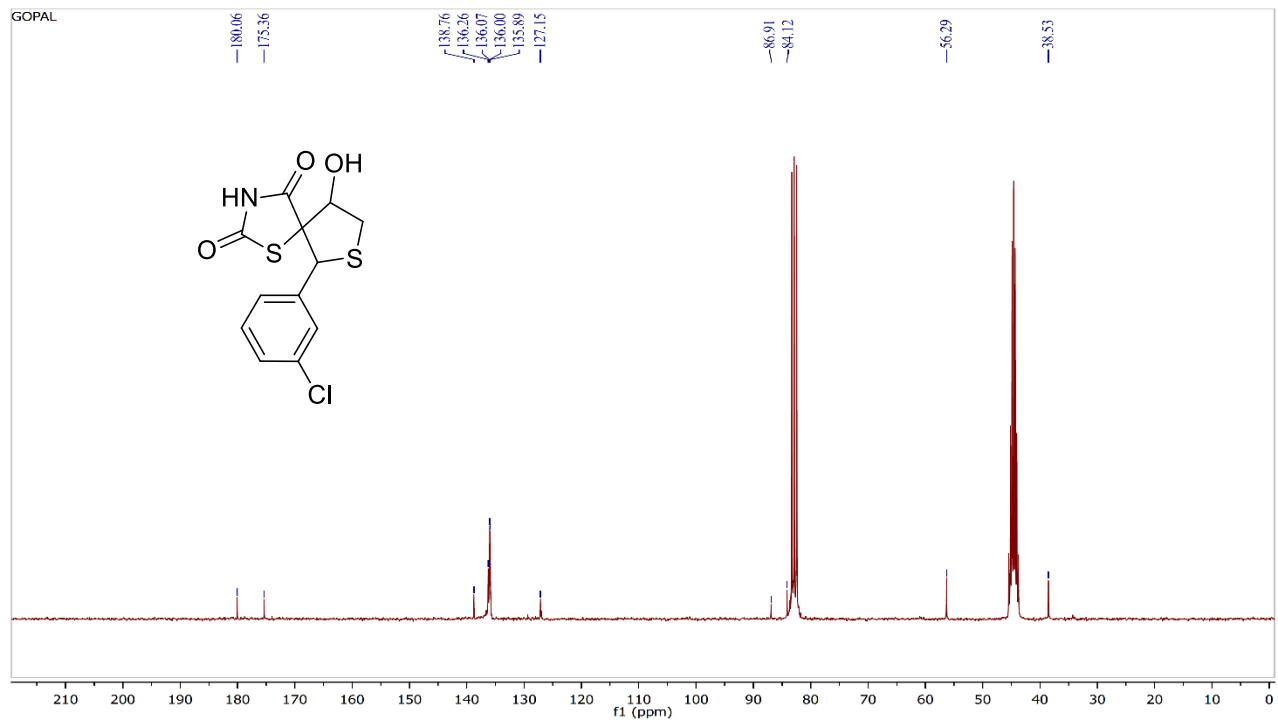
**9-hydroxy-6-(2-hydroxyphenyl)-1,7-dithia-3-azaspiro[4.4]nonane-2,4-dione (8h):**

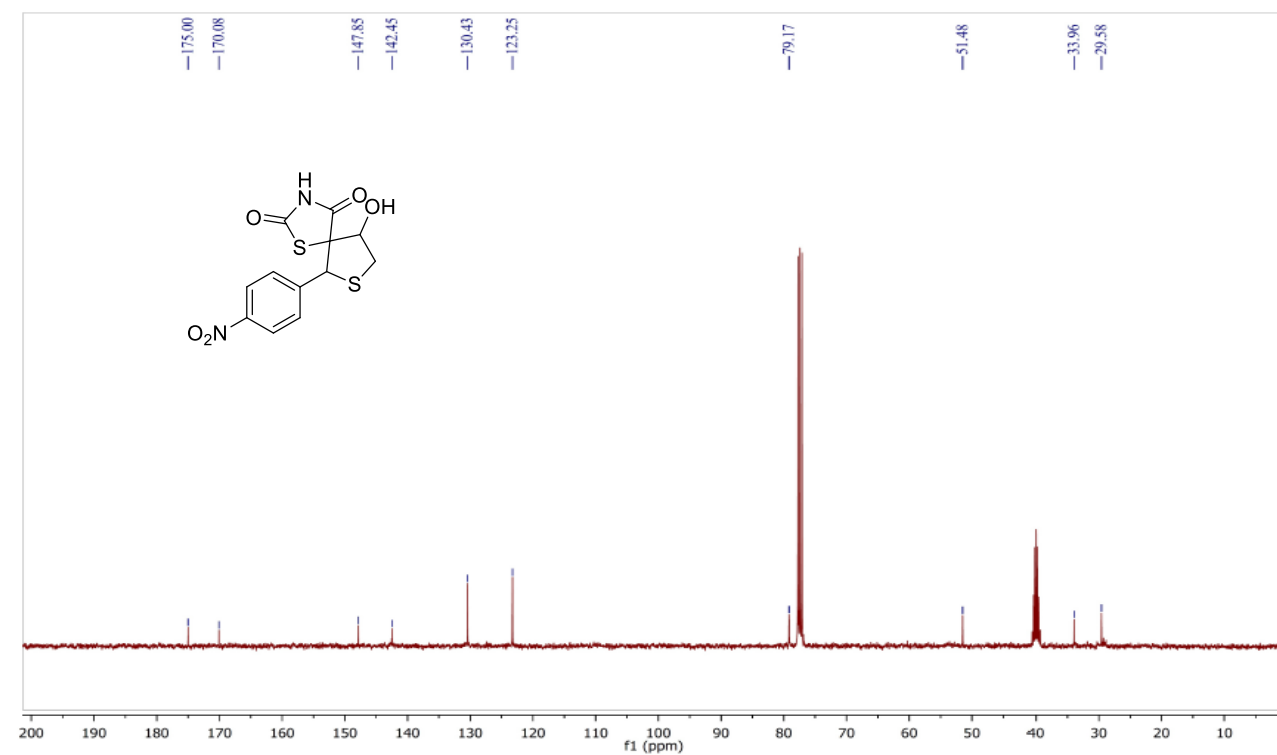
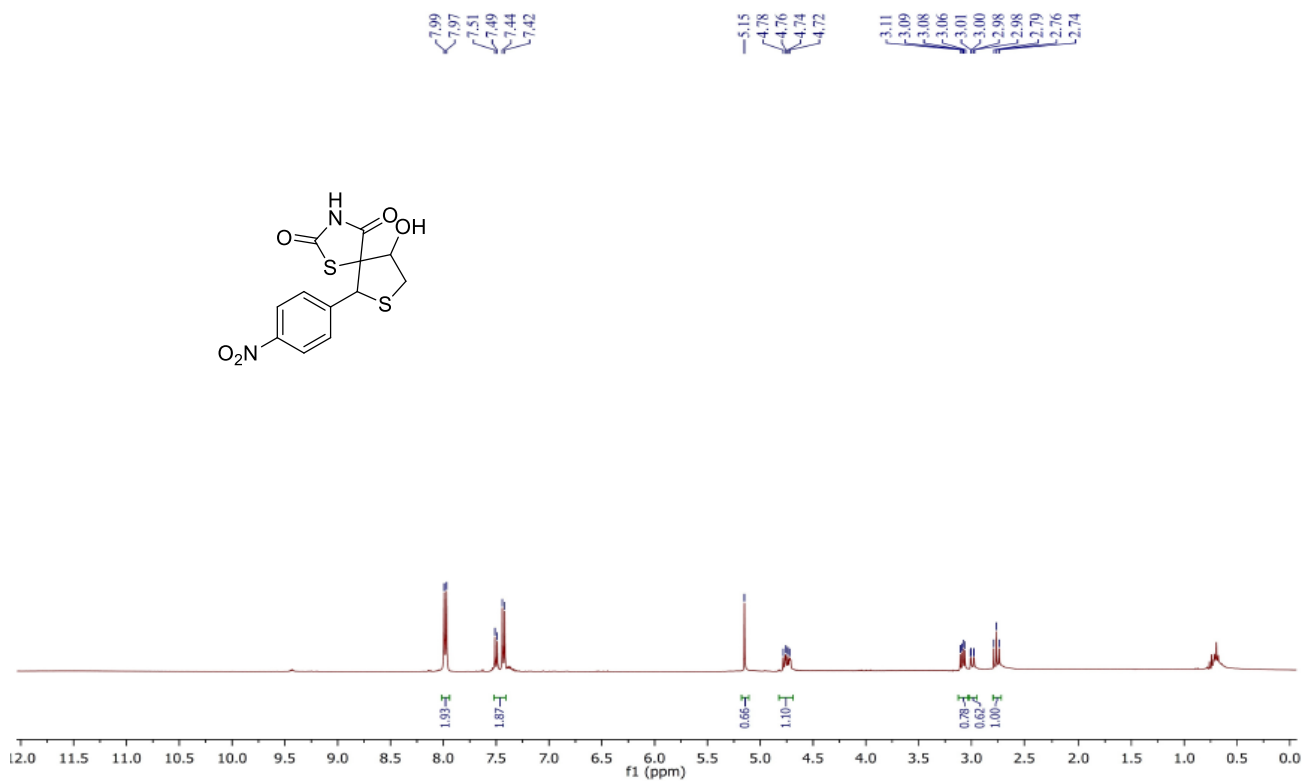


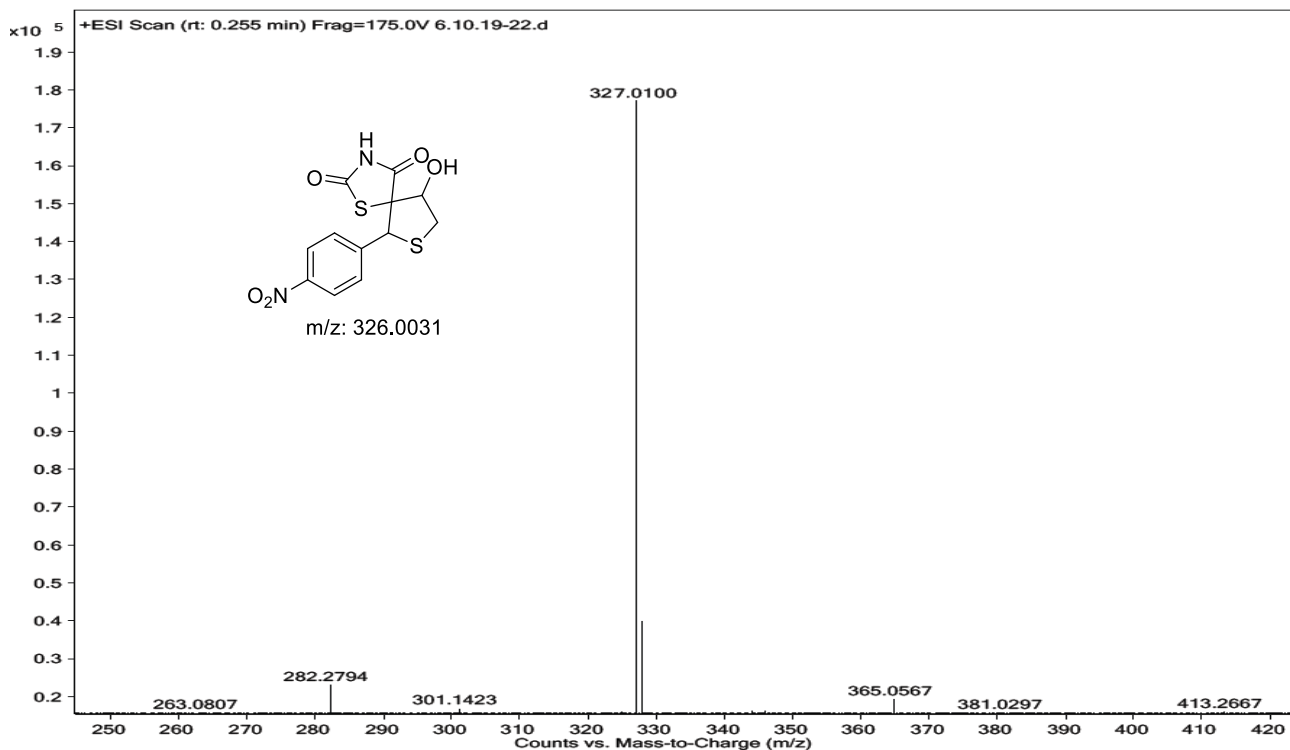
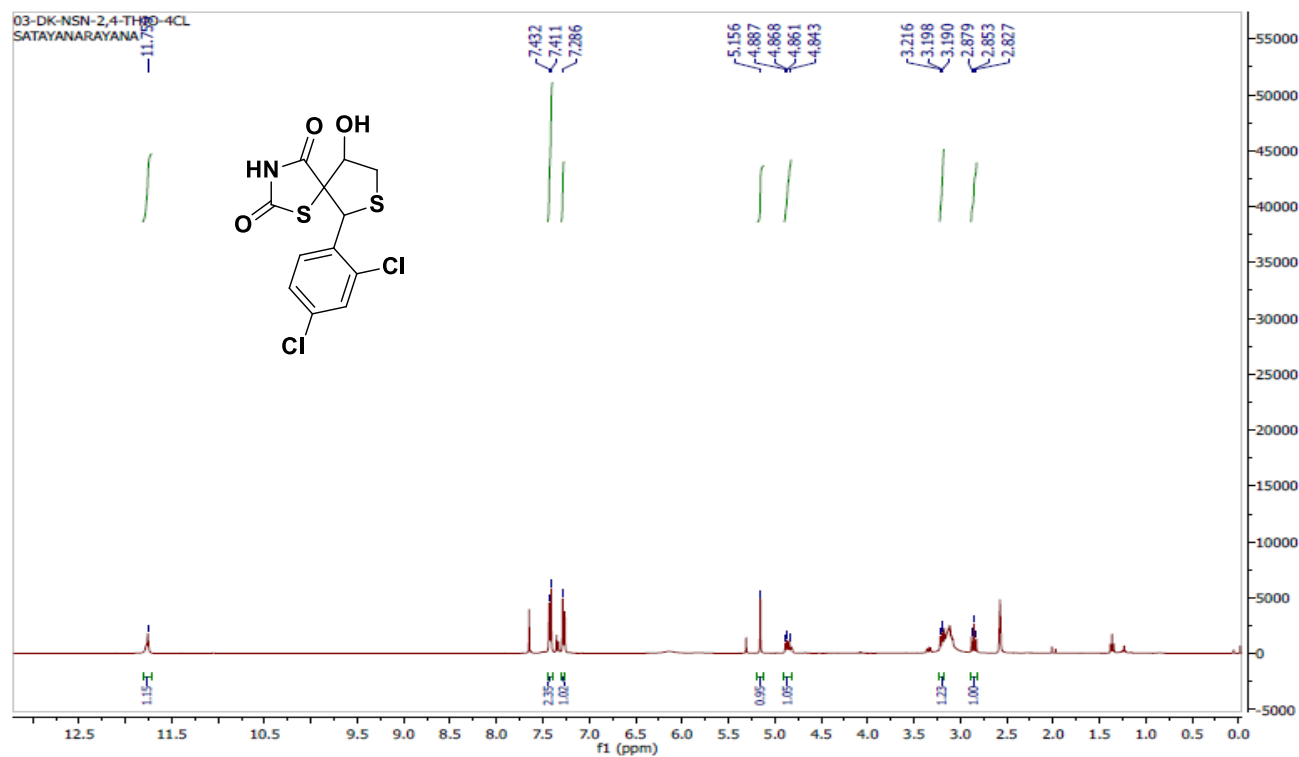
6-(4-chlorophenyl)-9-hydroxy-1,7-dithia-3-azaspiro[4.4]nonane-2,4-dione (8i):

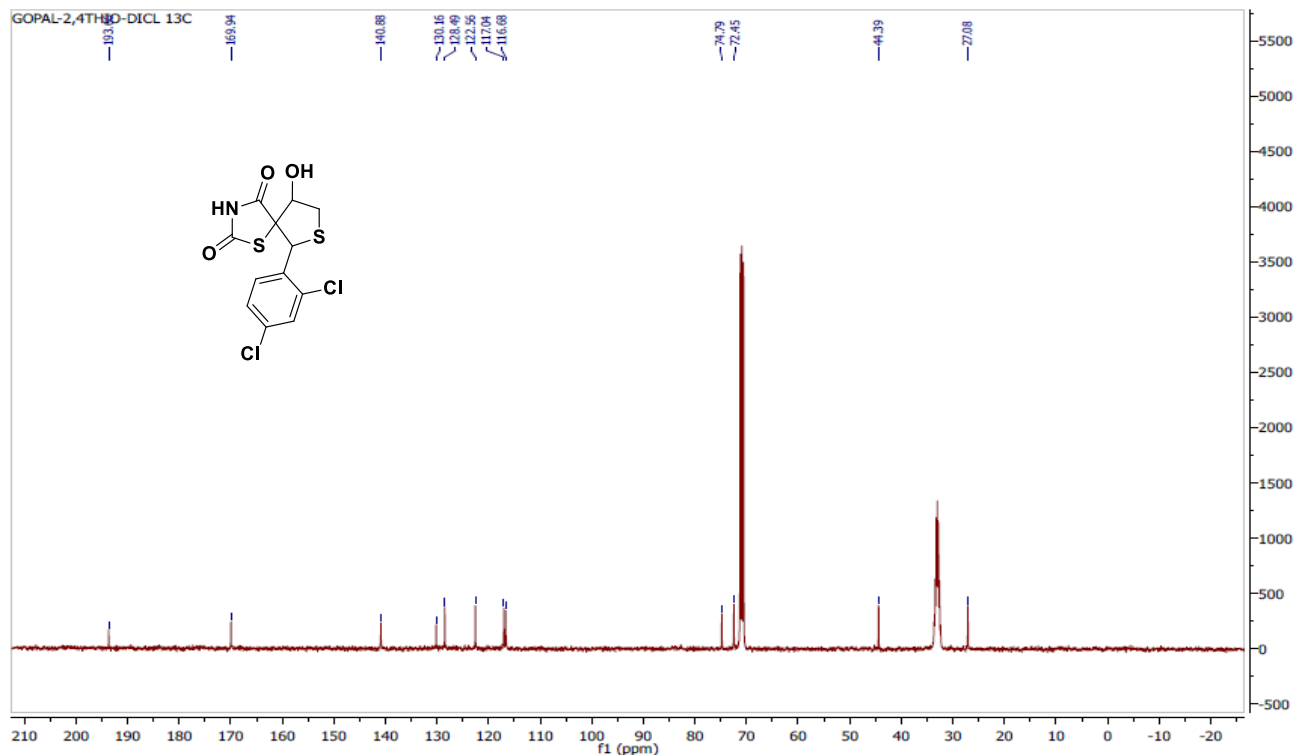
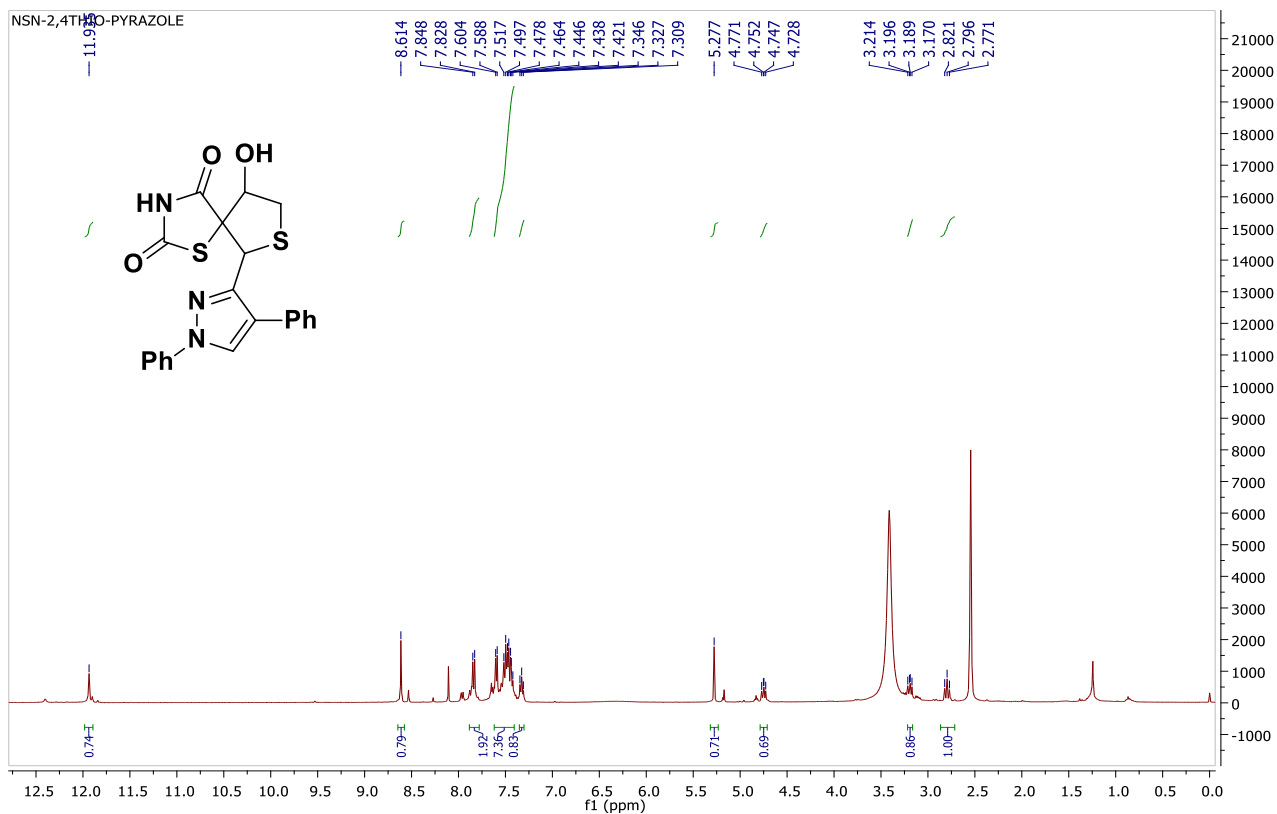


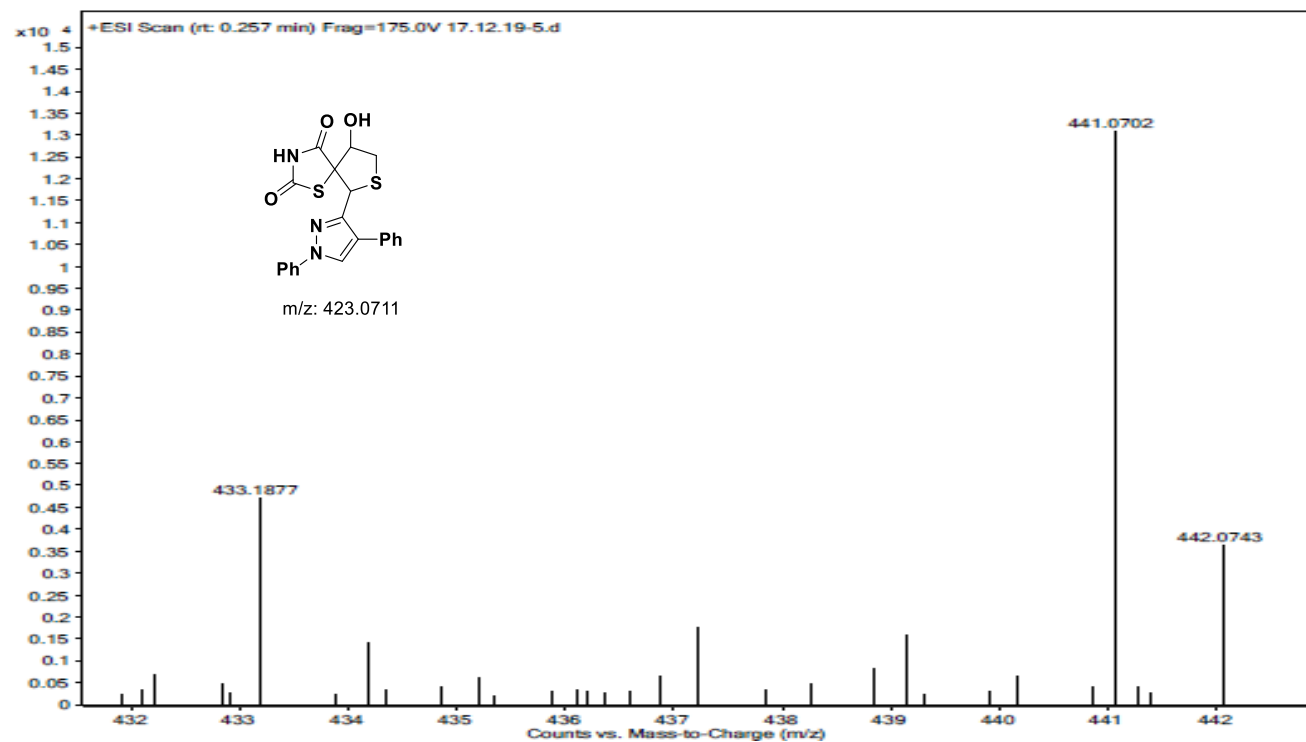
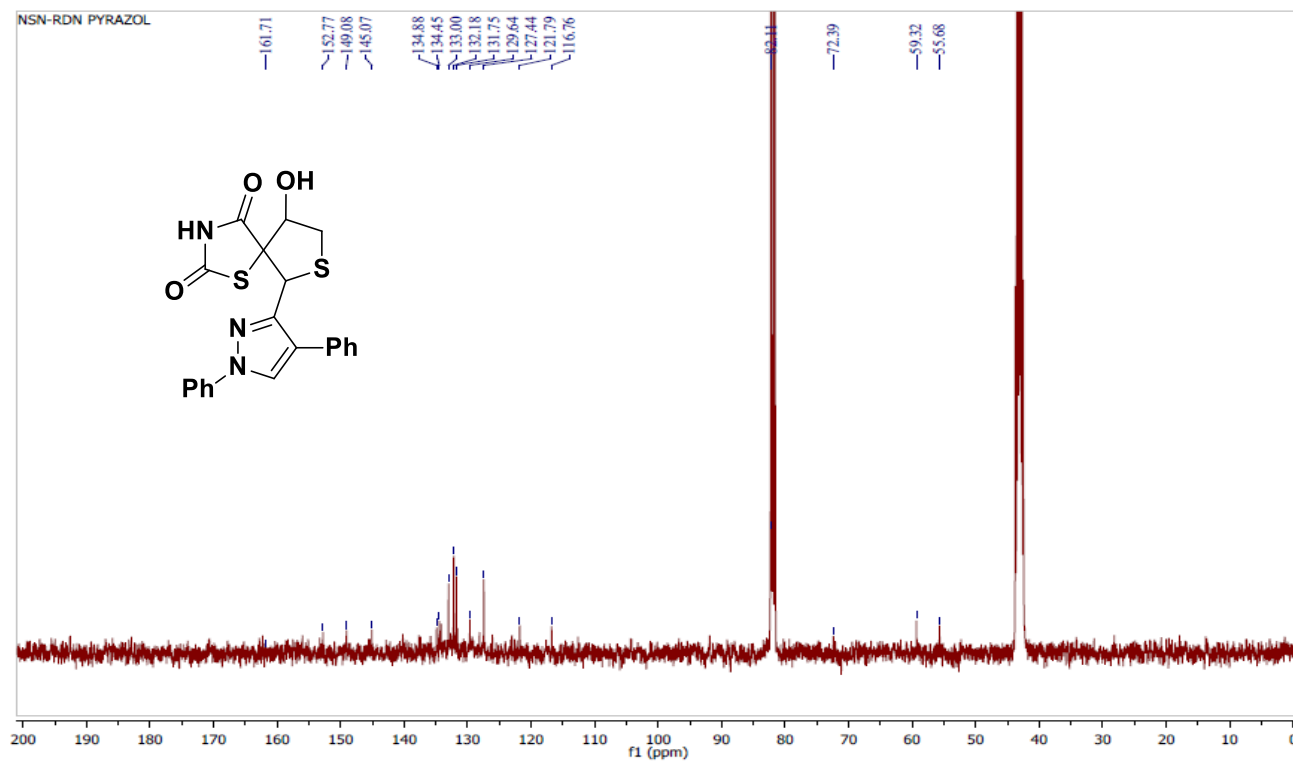
**6-(3-chlorophenyl)-9-hydroxy-1,7-dithia-3-azaspiro[4.4]nonane-2,4-dione (8j):**

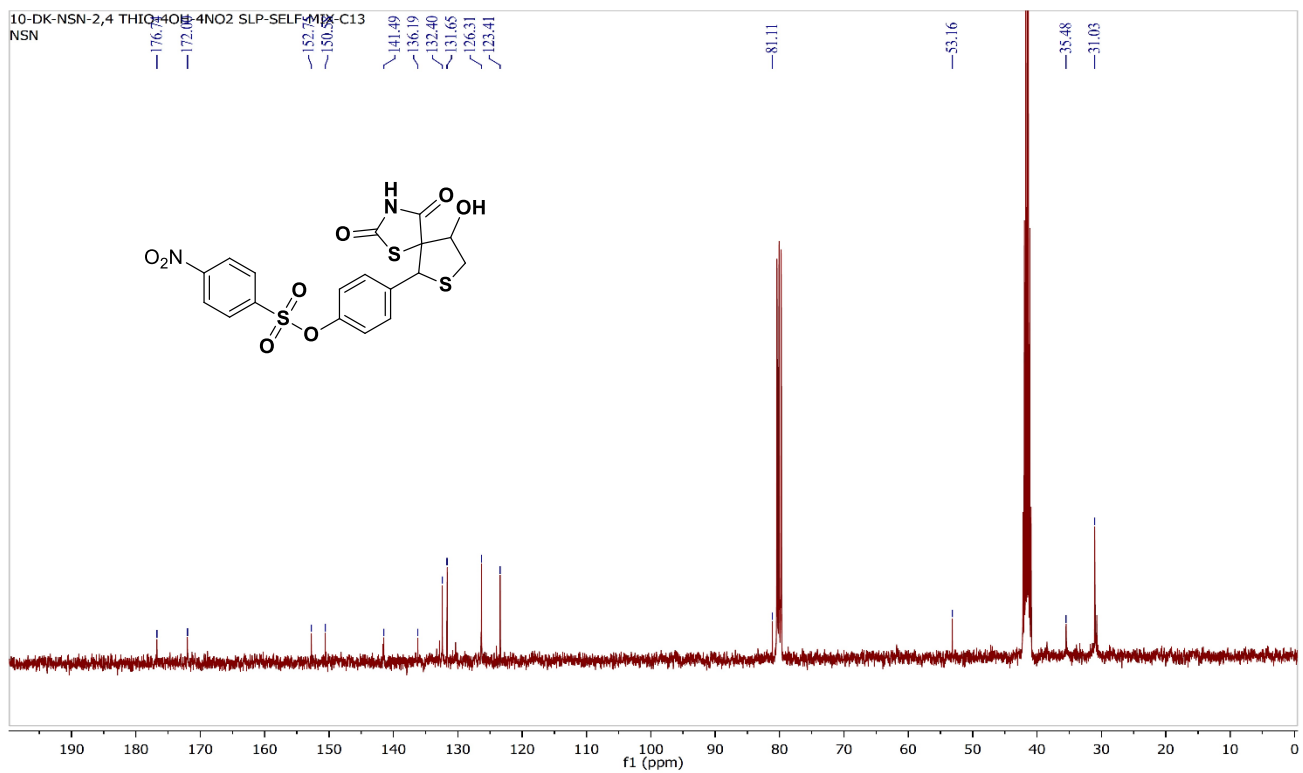
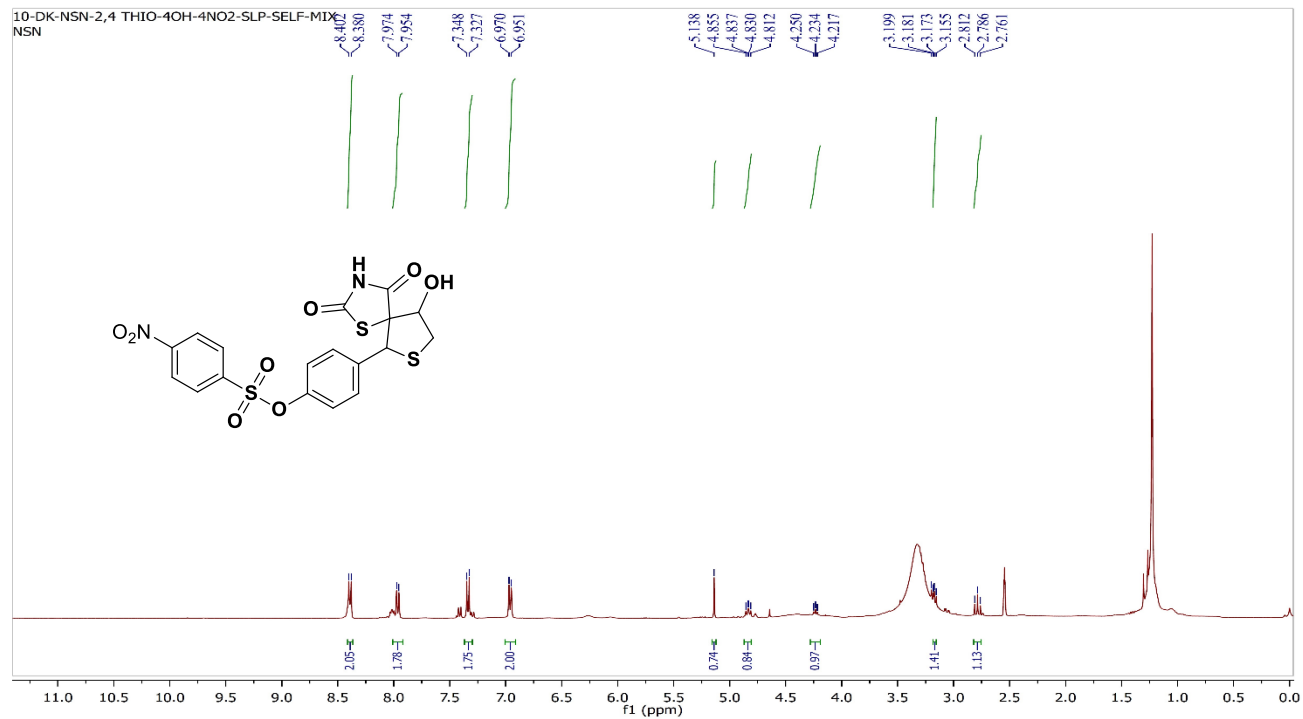


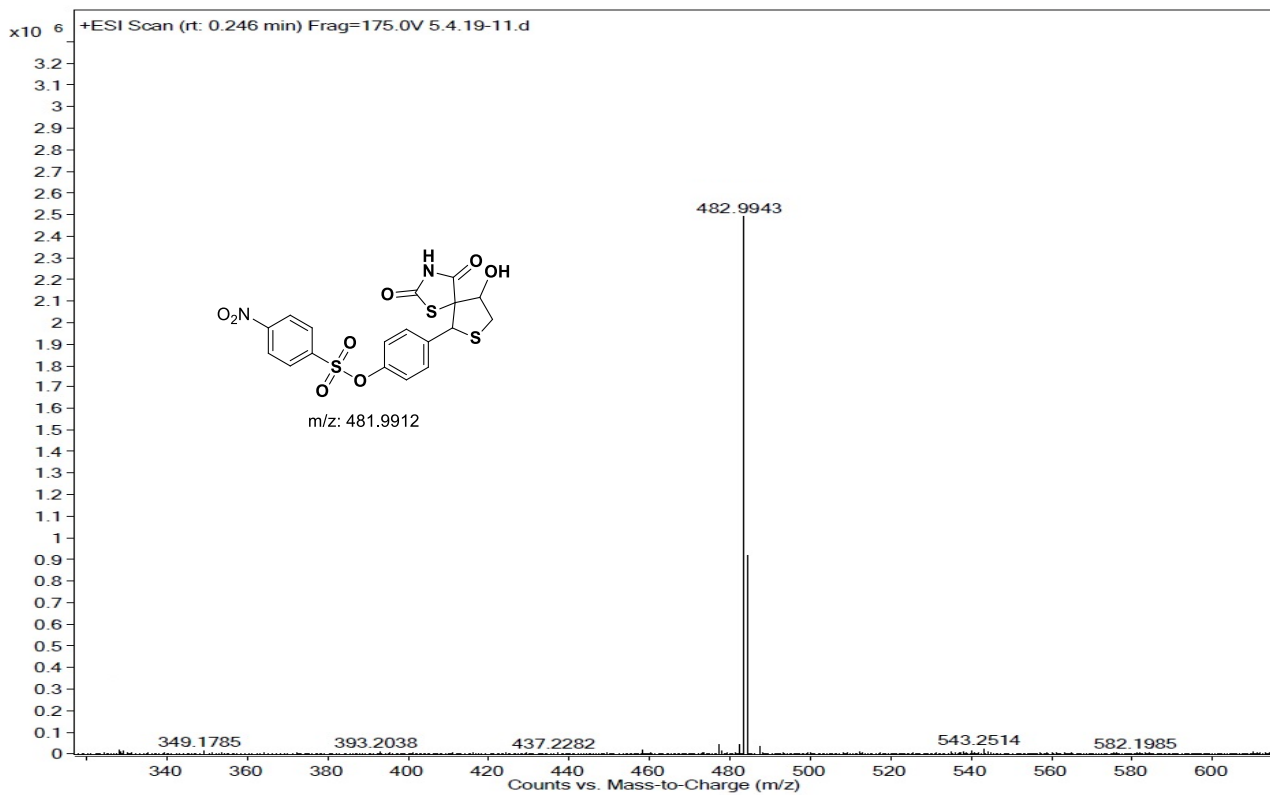
9-hydroxy-6-(4-nitrophenyl)-1,7-dithia-3-azaspiro[4.4]nonane-2,4-dione (8k):

**6-(2,4-dichlorophenyl)-9-hydroxy-1,7-dithia-3-azaspiro[4.4]nonane-2,4-dione (8l):**

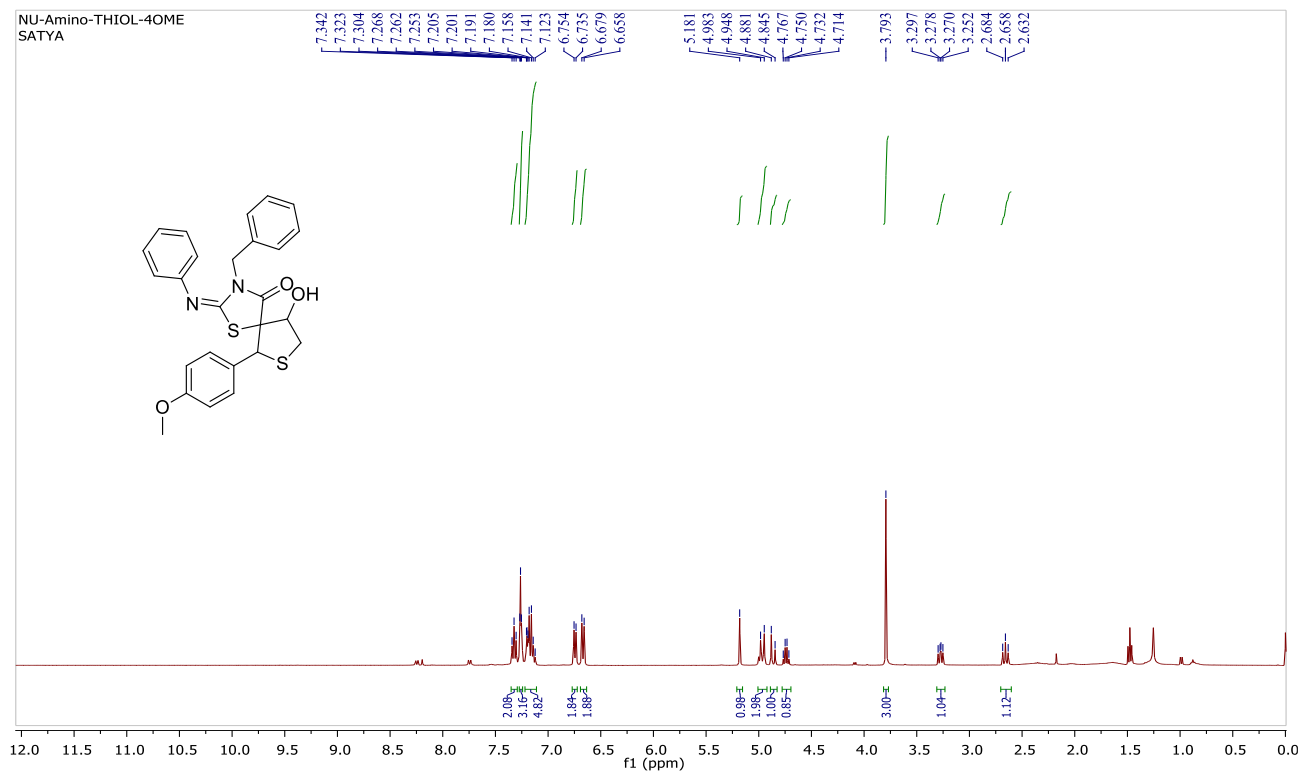
**6-(1,4-diphenyl-1H-pyrazol-3-yl)-9-hydroxy-1,7-dithia-3-azaspiro[4.4]nonane-2,4-dione (8m):**

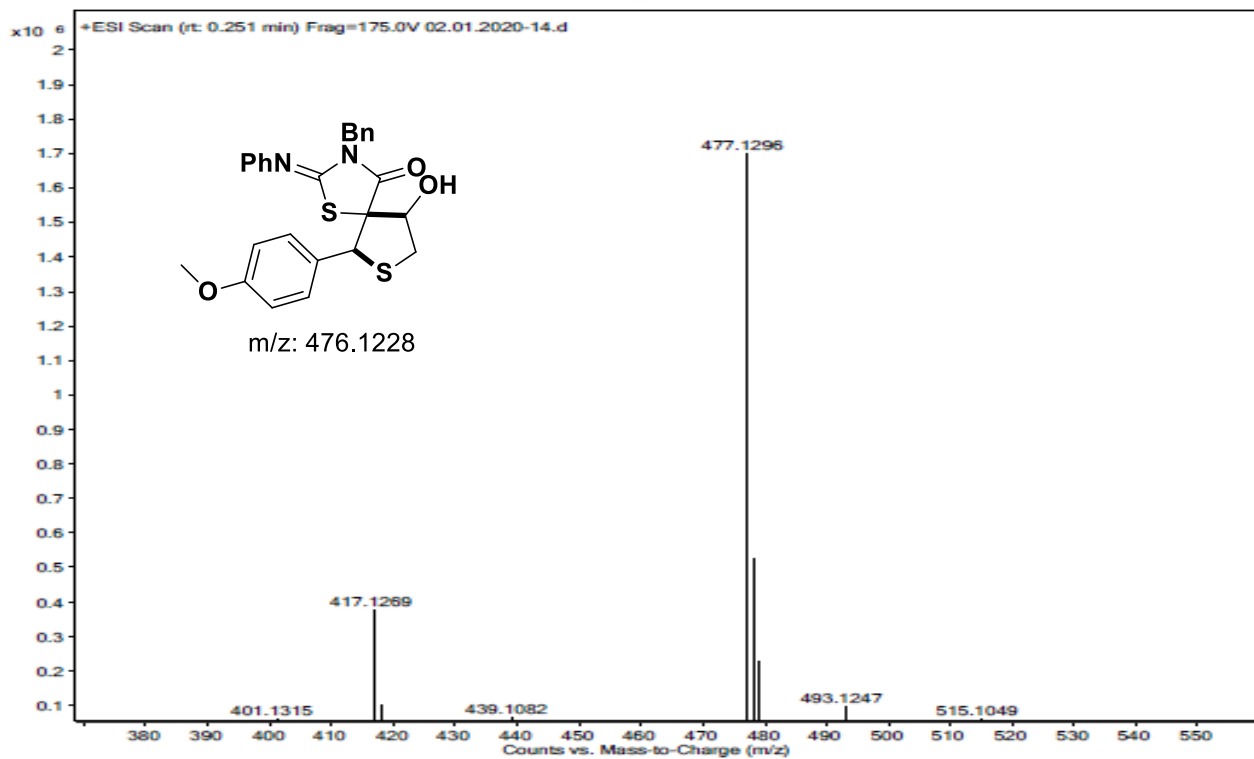
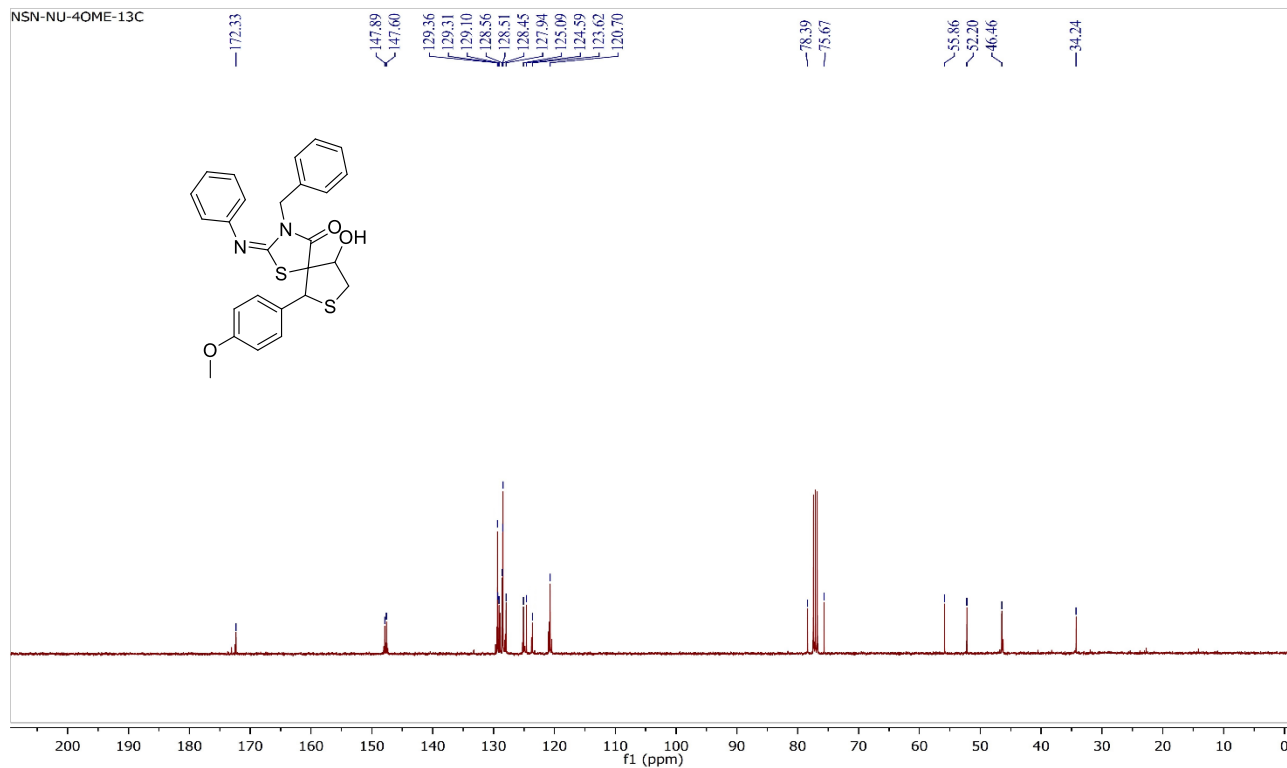


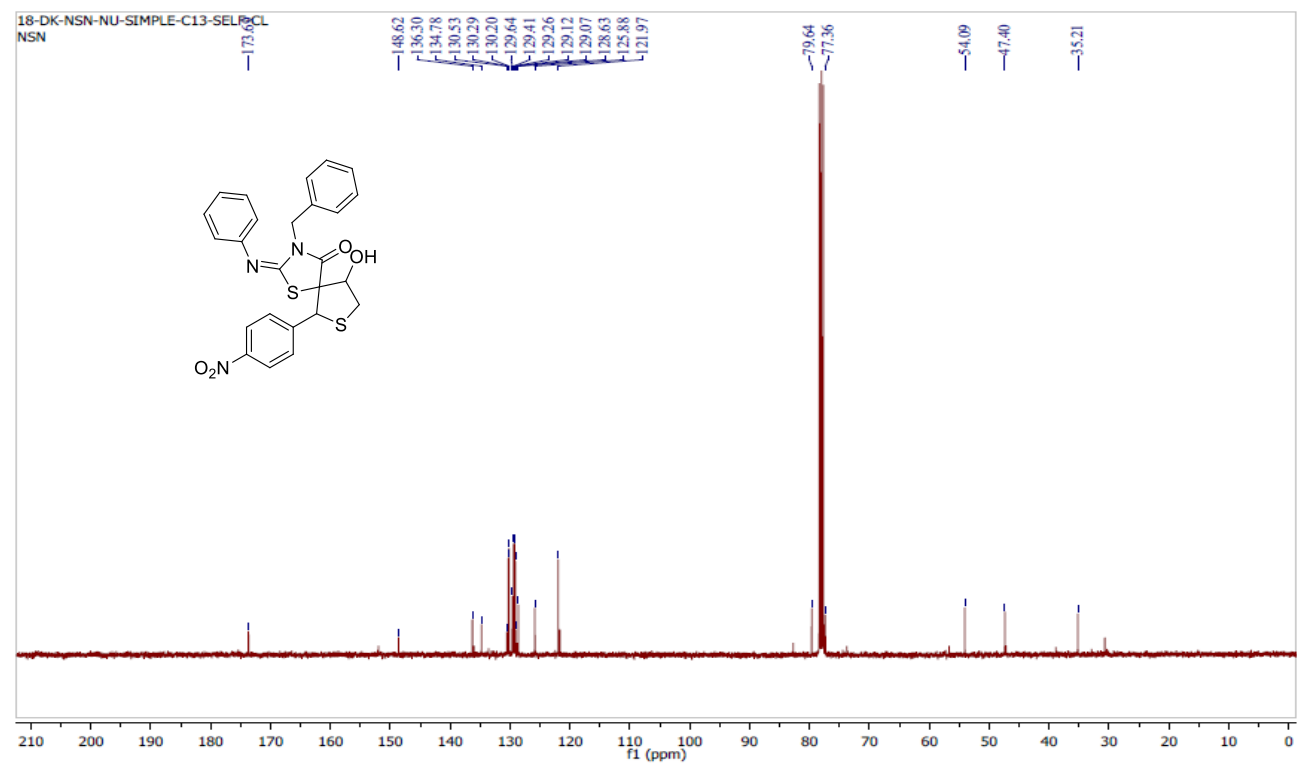
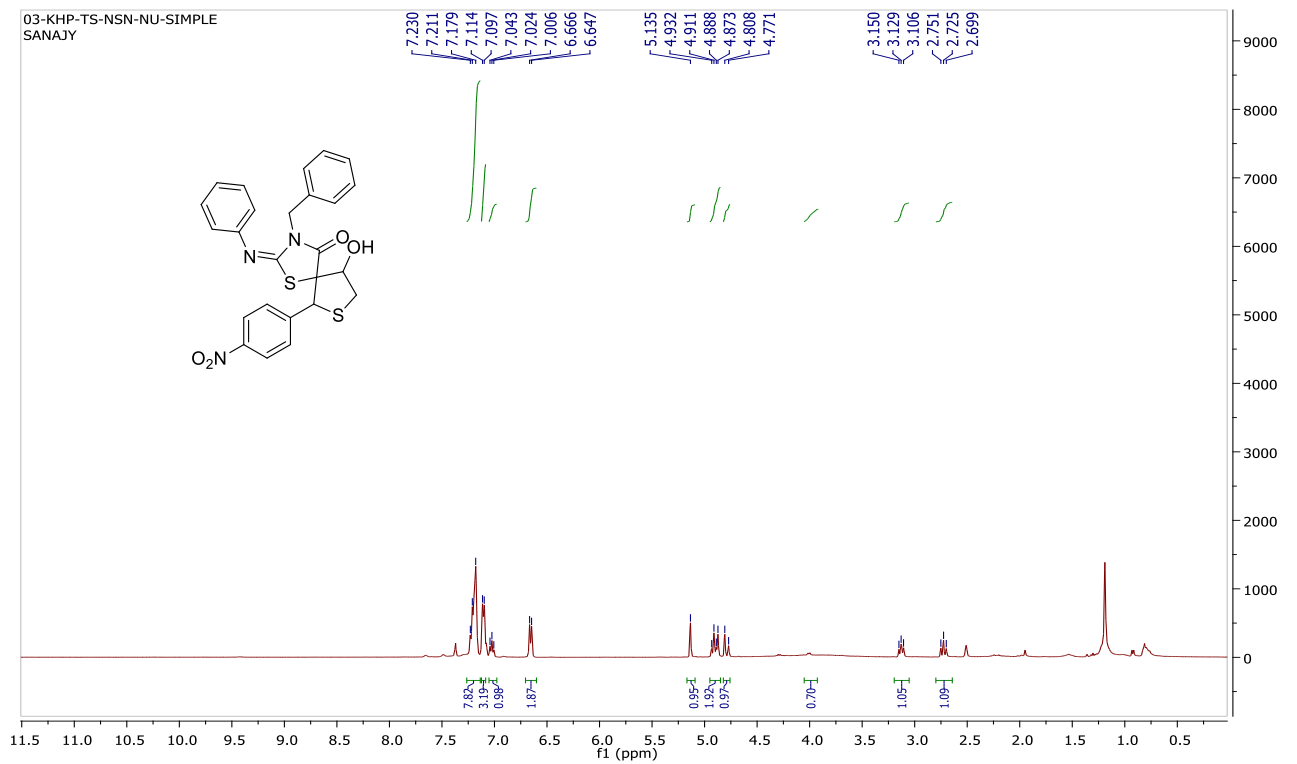
4-((5S,6R,9S)-9-hydroxy-2,4-dioxo-1,7-dithia-3-azaspiro[4.4]nonan-6-yl)phenyl 4-nitrobenzene sulfonate (8n):

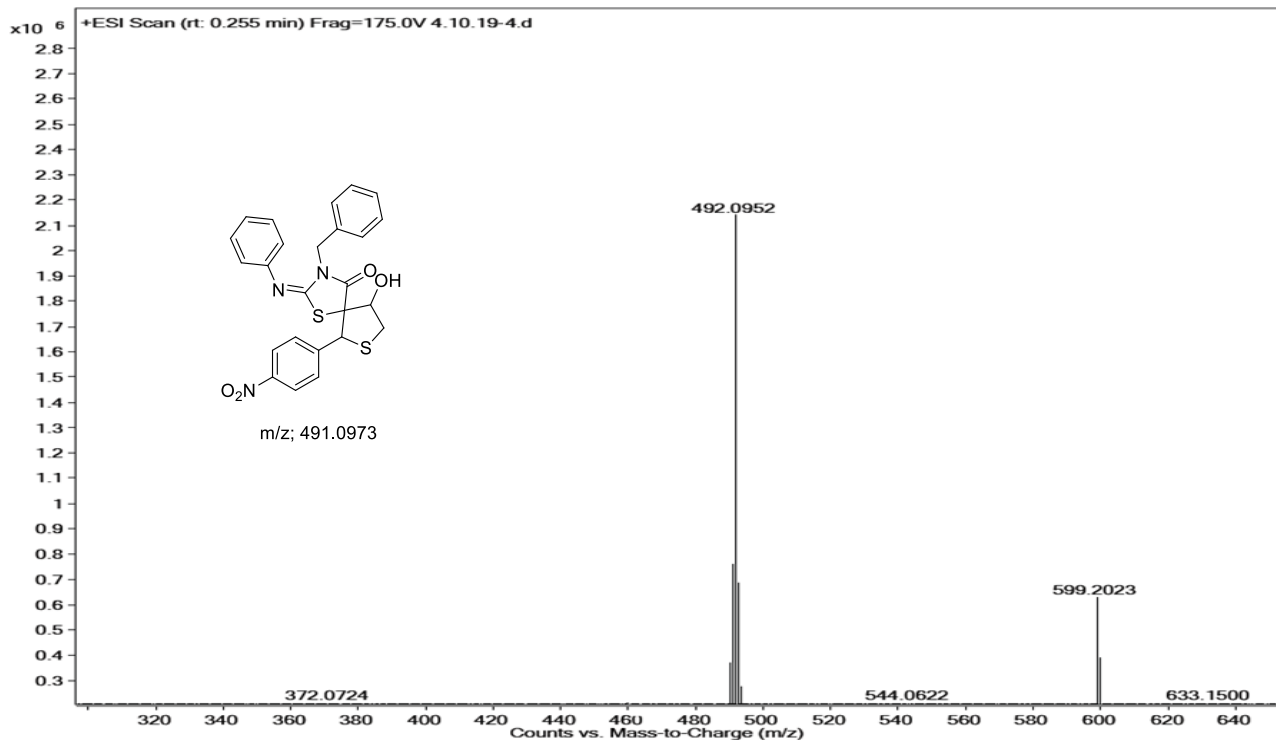
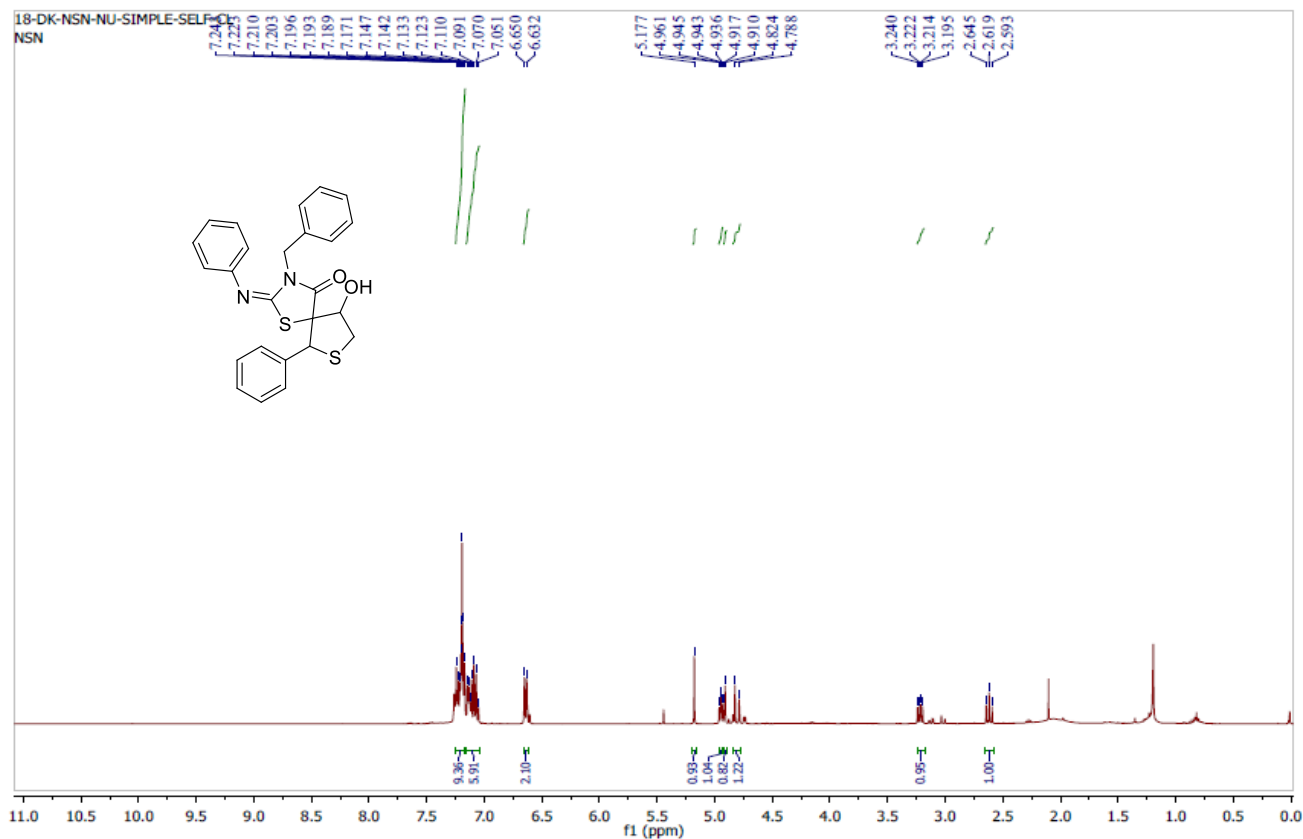


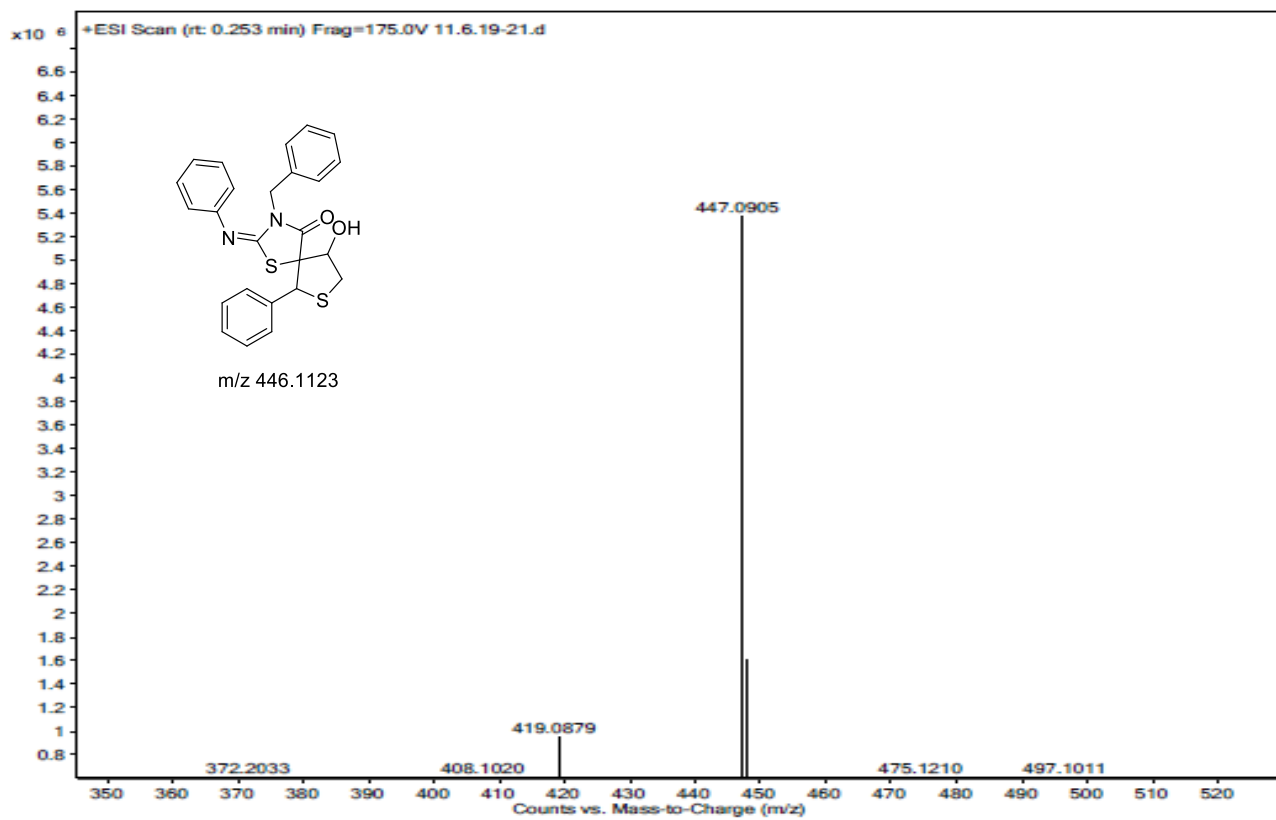
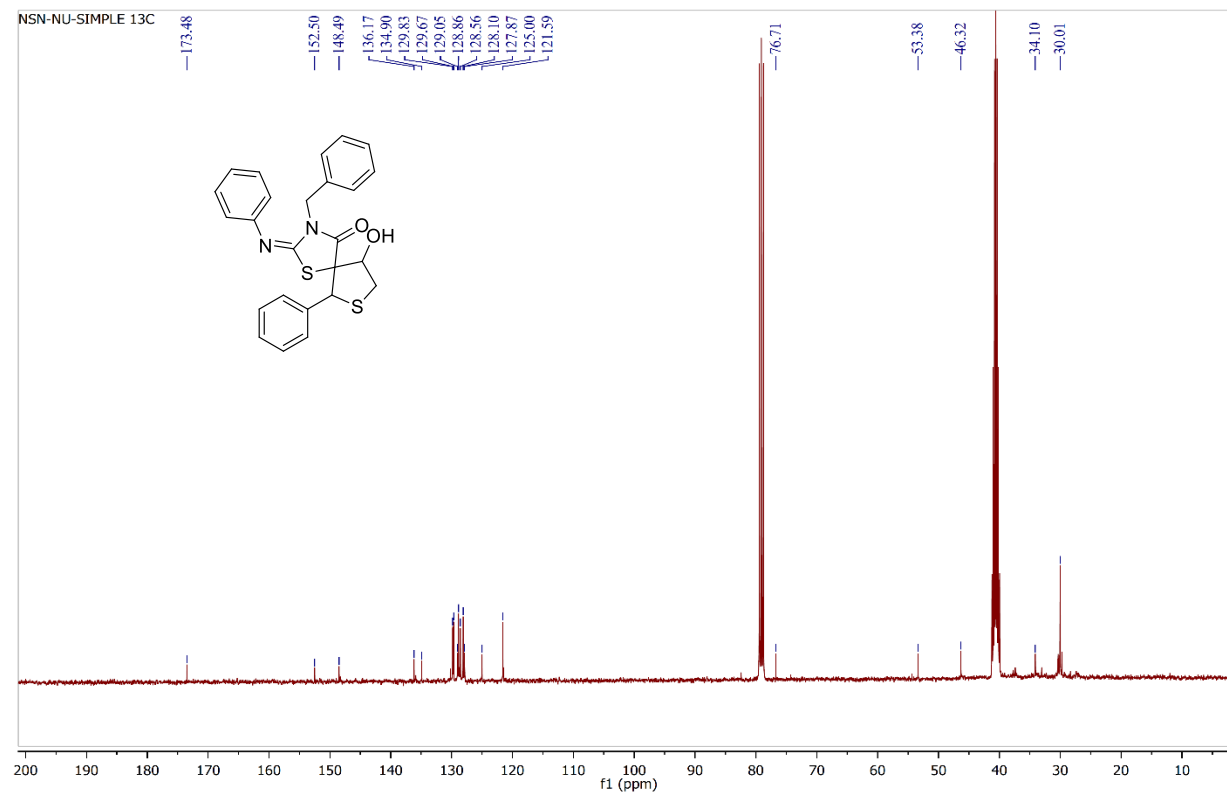
2-(benzylimino)-9-hydroxy-6-(4-methoxyphenyl)-3-phenyl-1,7-dithia-3-azaspiro[4.4]nonan-4-one (9a):

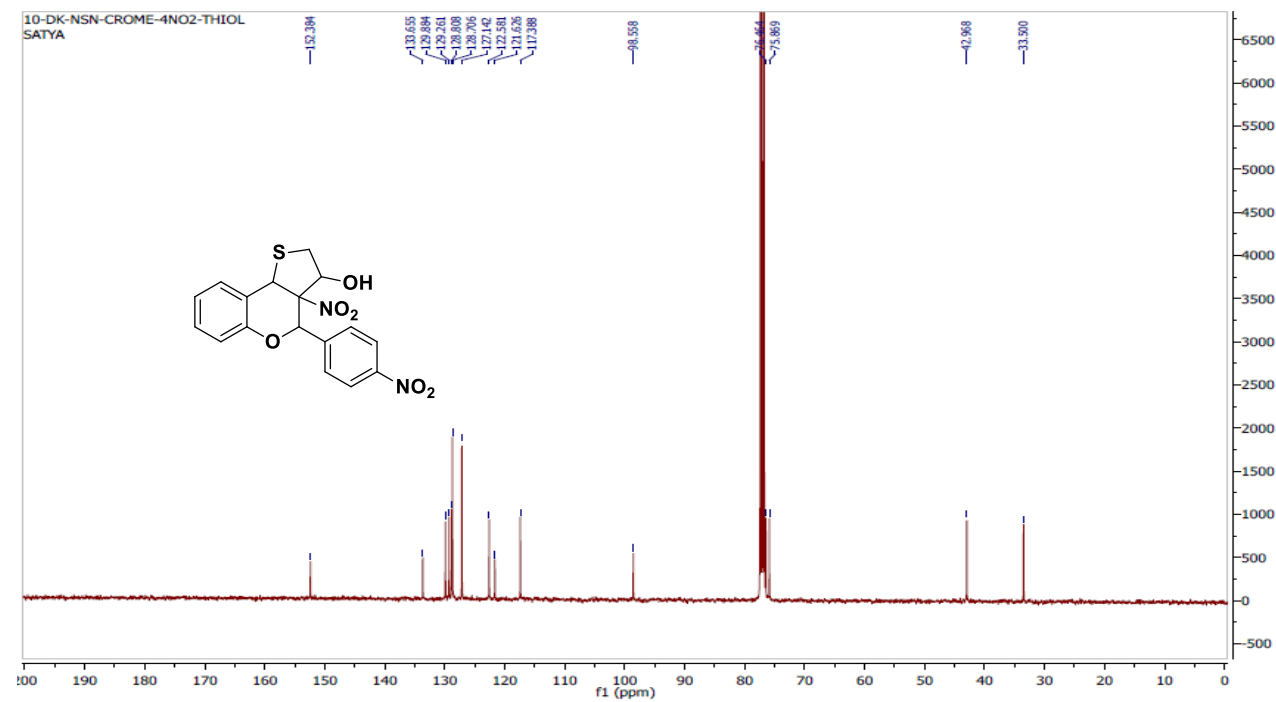
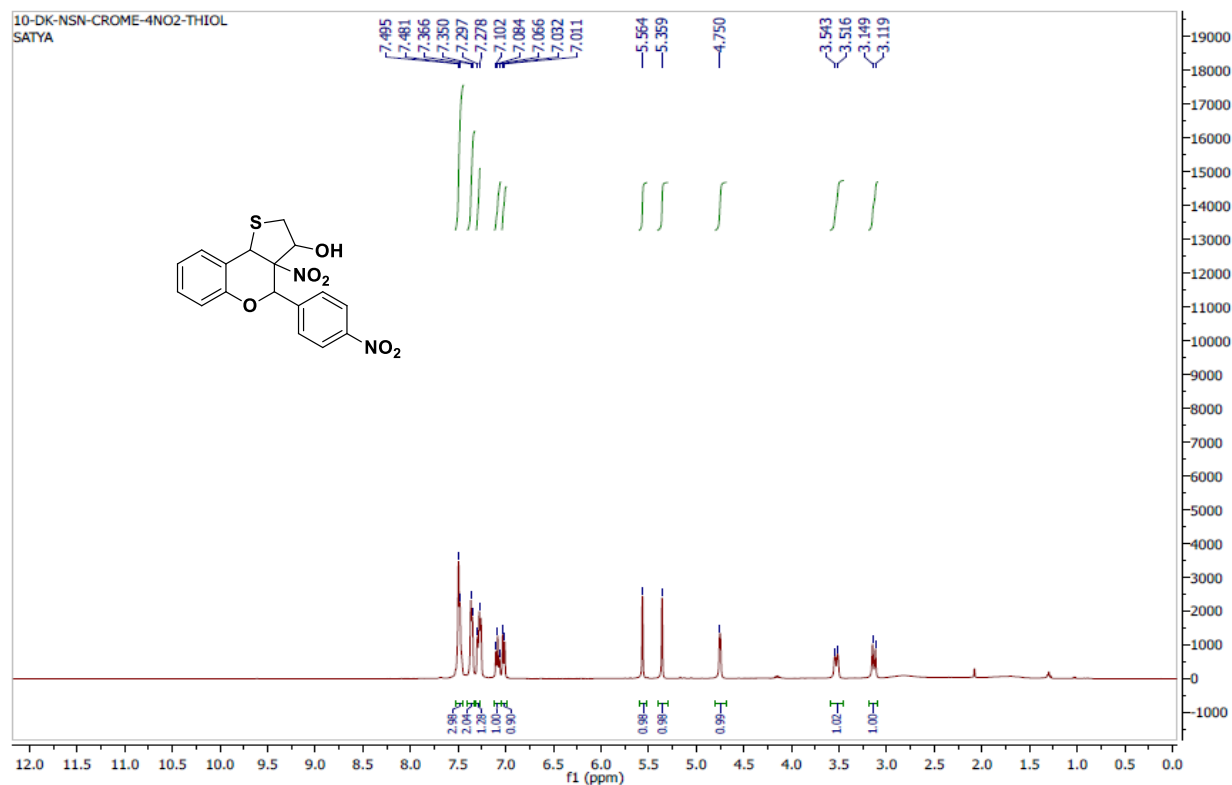


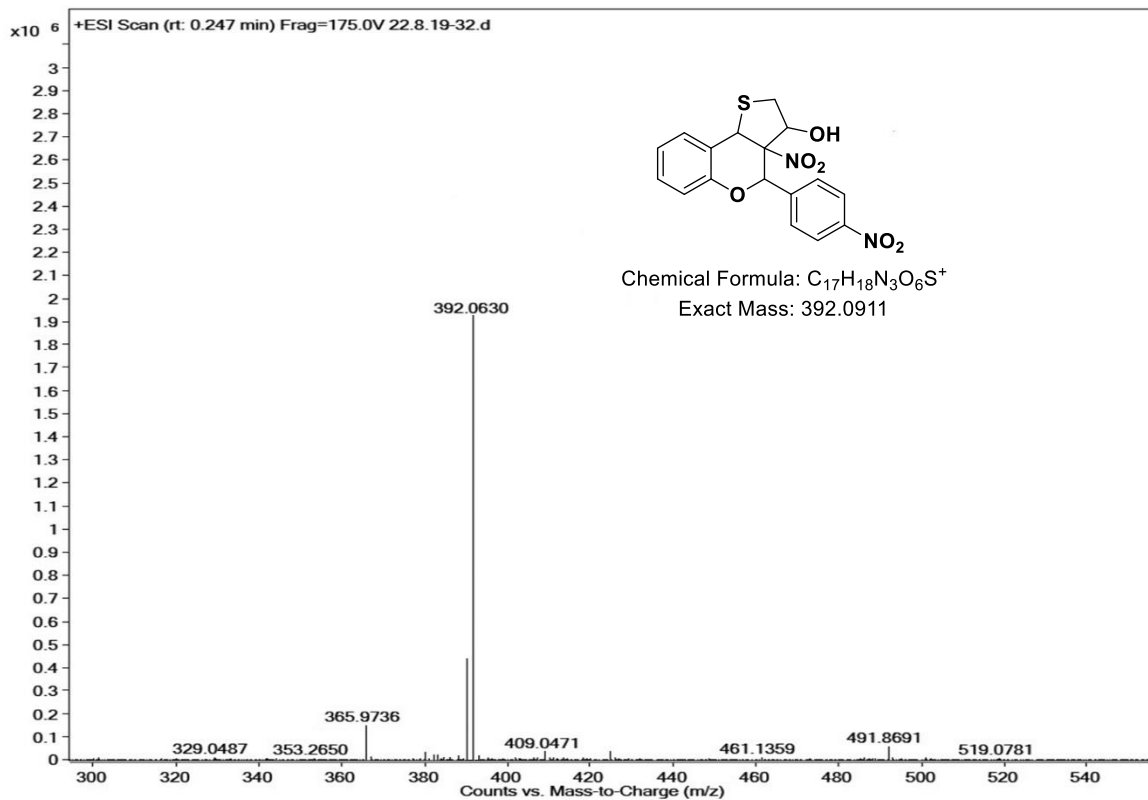
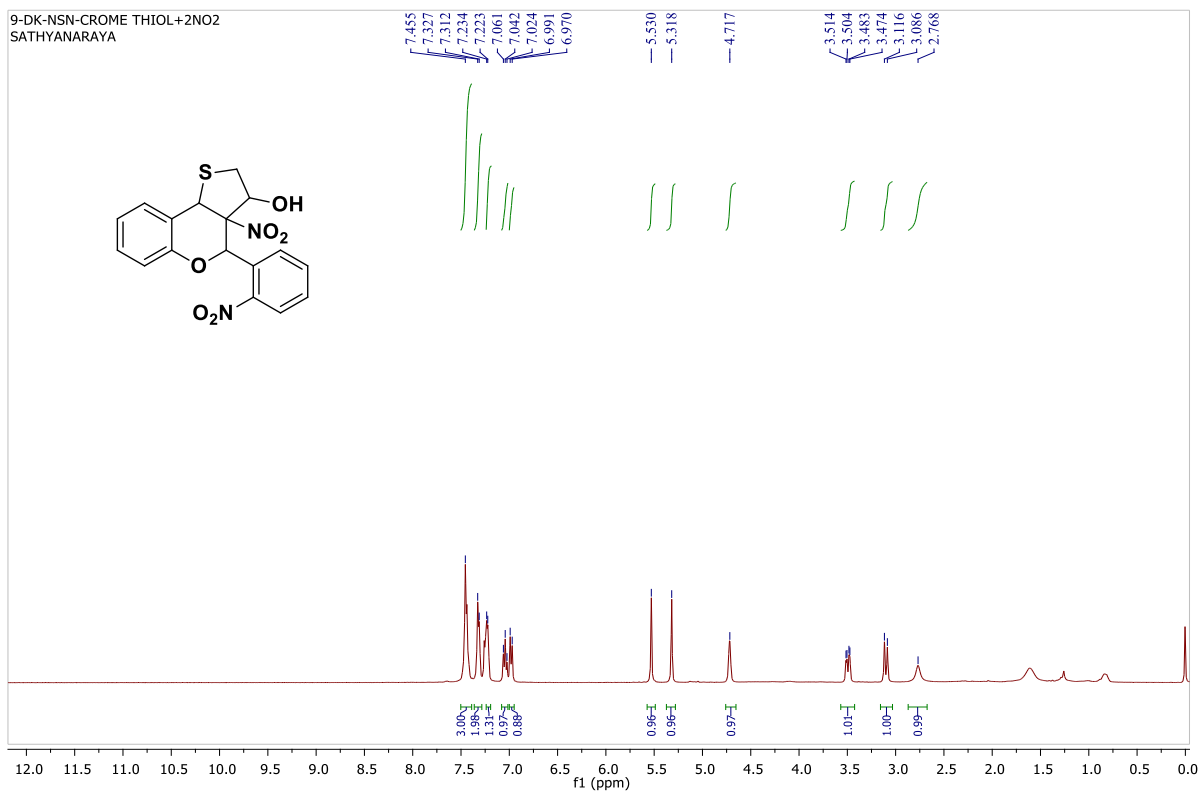


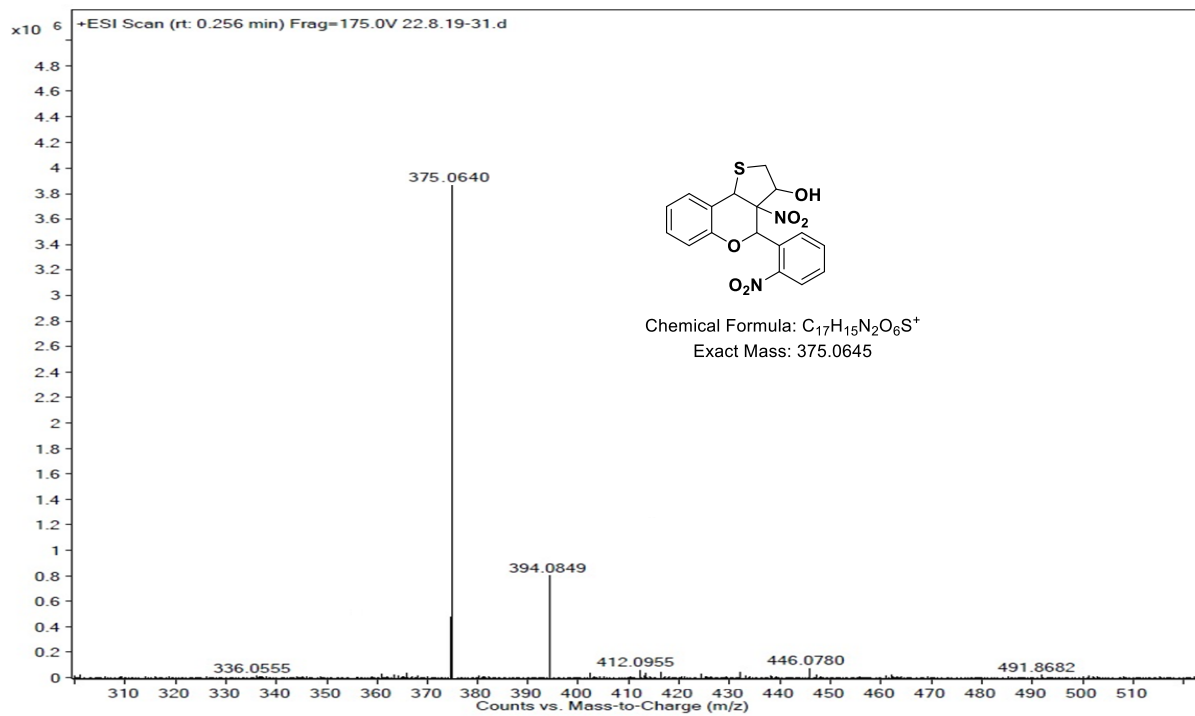
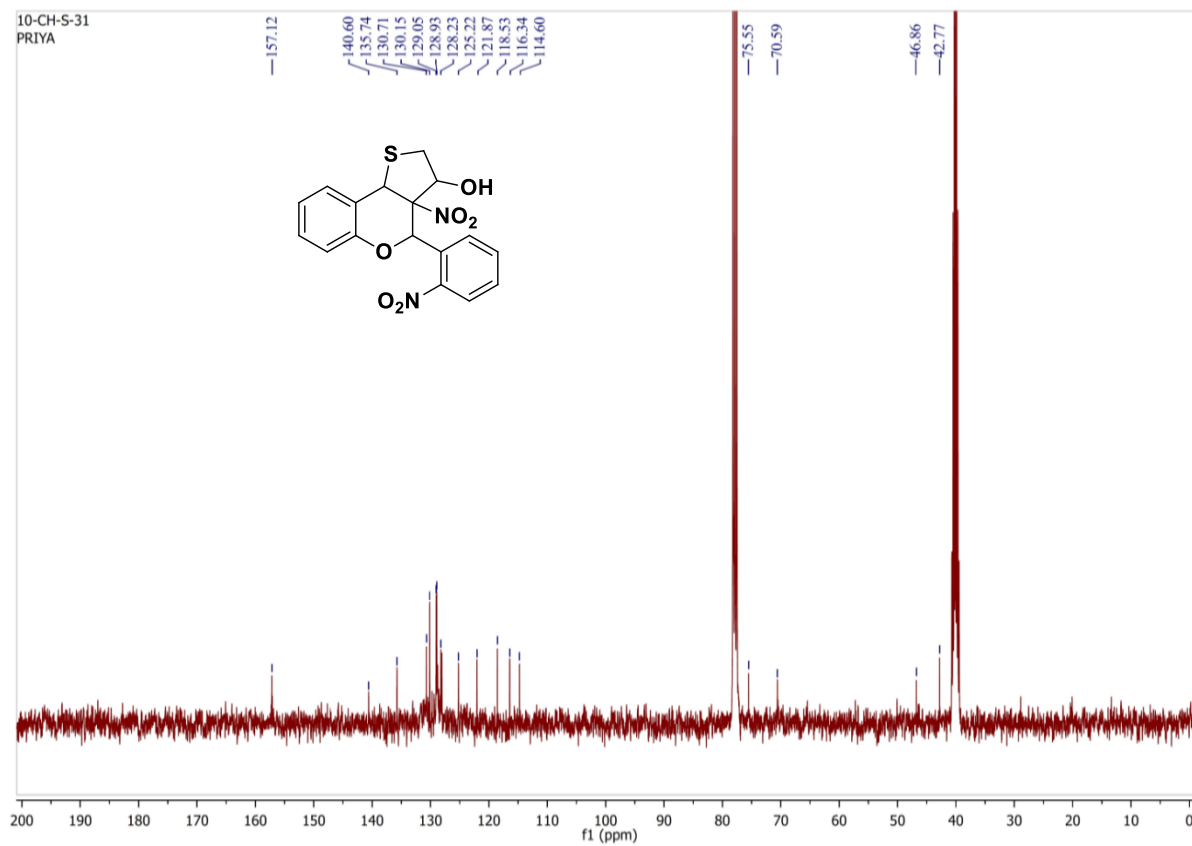
2-(benzylimino)-9-hydroxy-6-(4-nitrophenyl)-3-phenyl-1,7-dithia-3-azaspiro[4.4]nonan-4-one (9b):

**3-benzyl-9-hydroxy-6-phenyl-2-(phenylimino)-1,7-dithia-3-azaspiro[4.4]nonan-4-one (9c):**

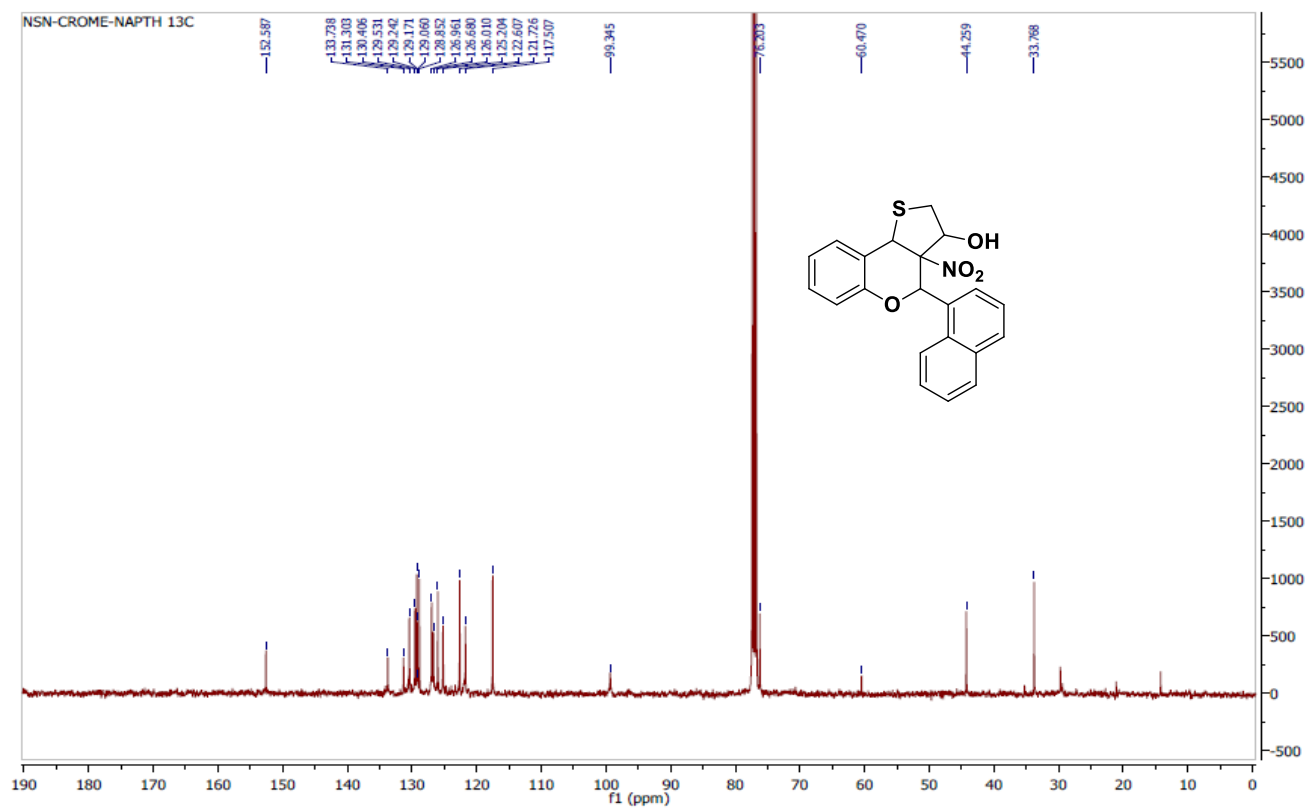
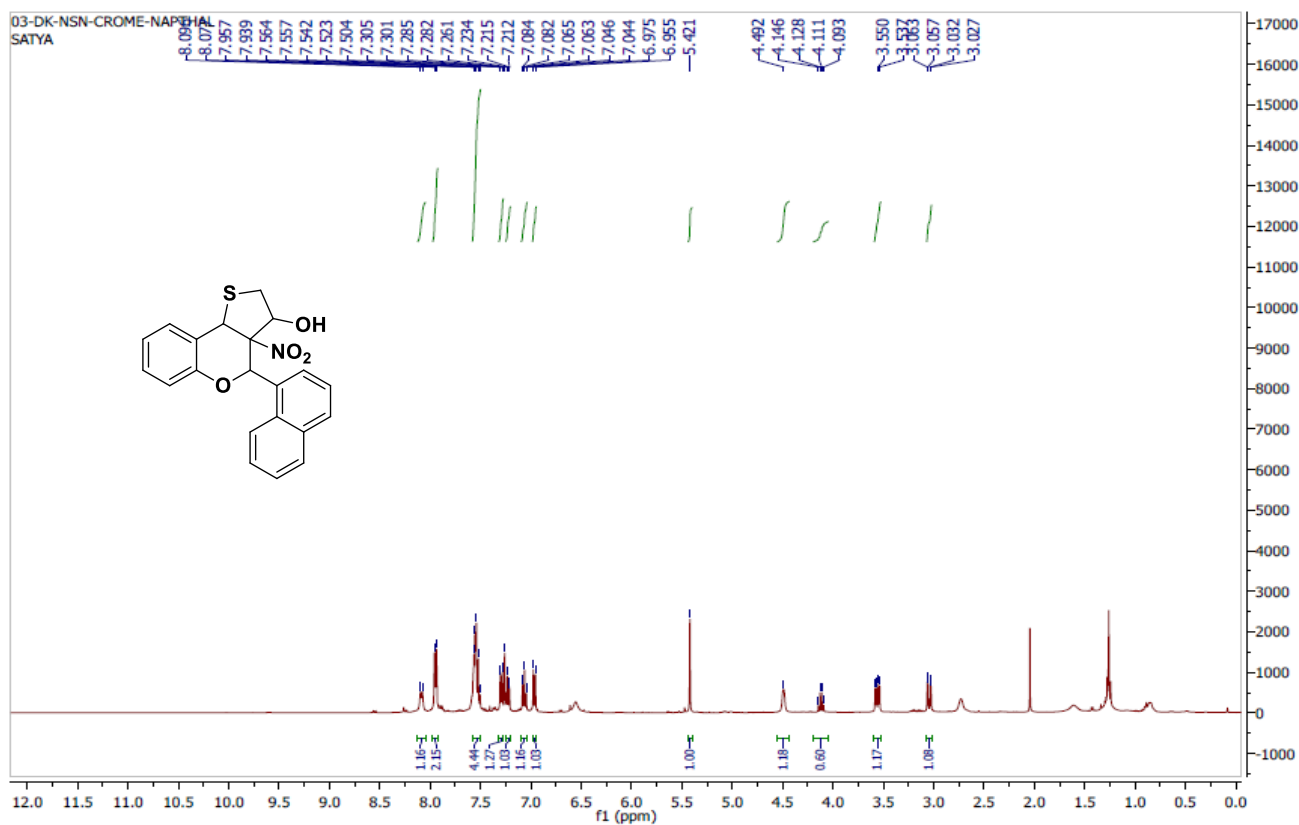


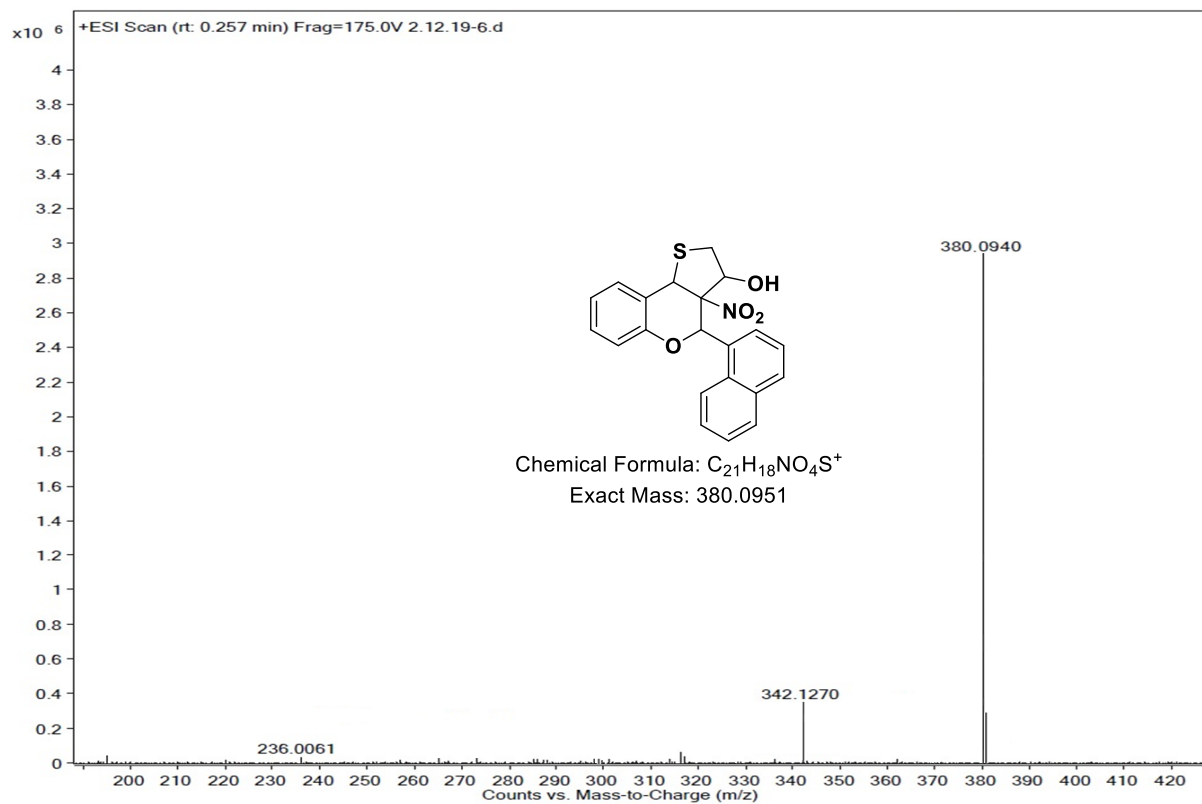
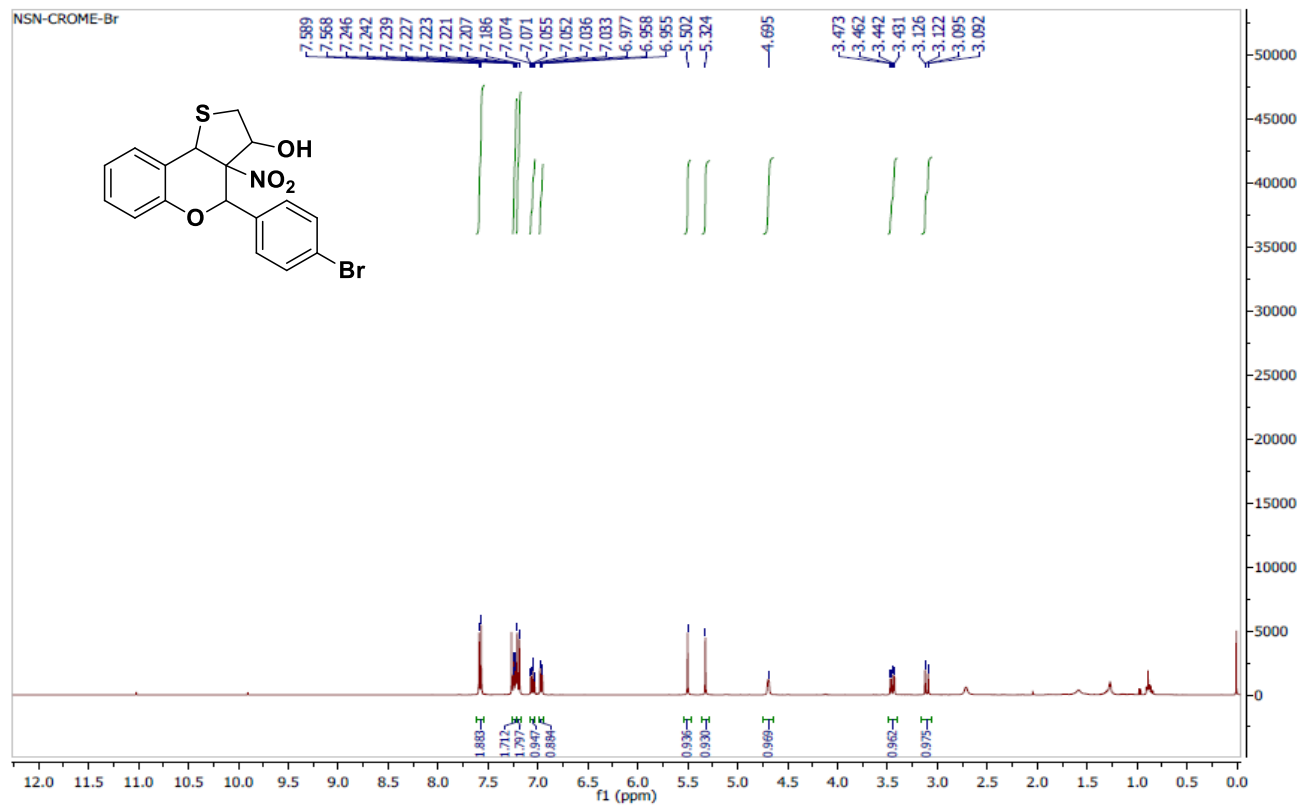
3a-nitro-4-(4-nitrophenyl)-3,3a,4,9b-tetrahydro-2H-thieno[3,2-c]chromen-3-ol (13a):

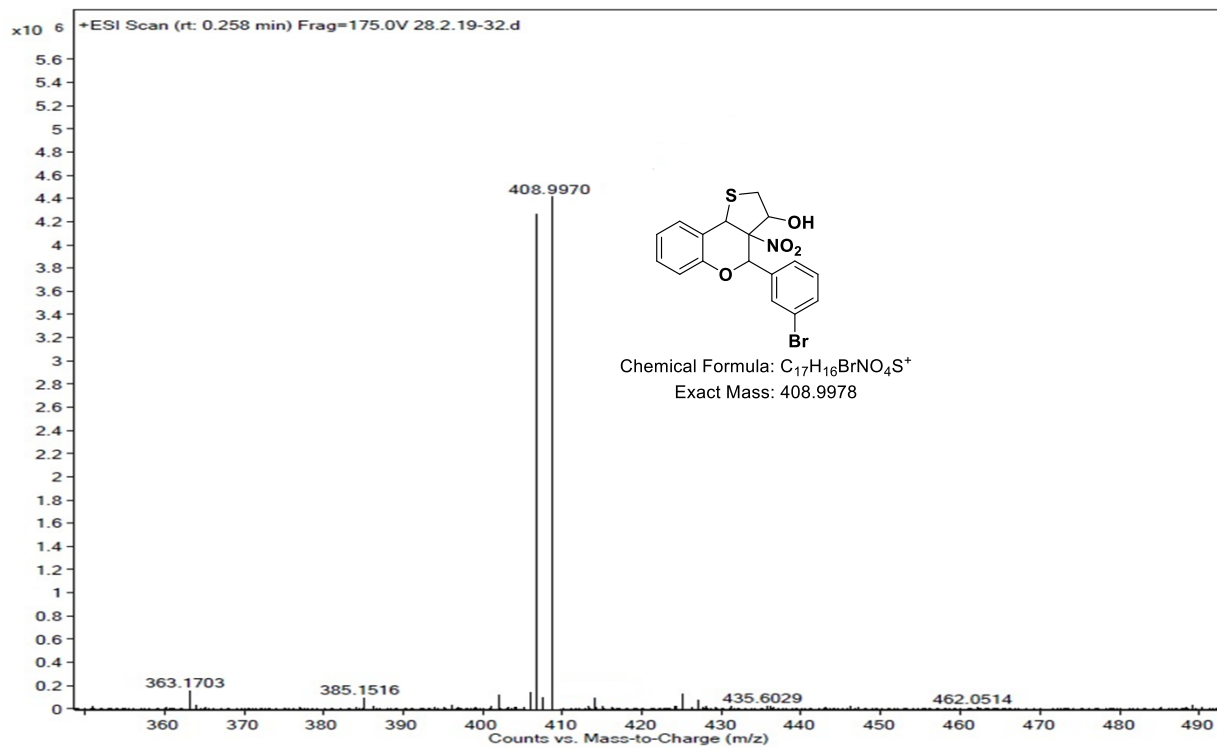
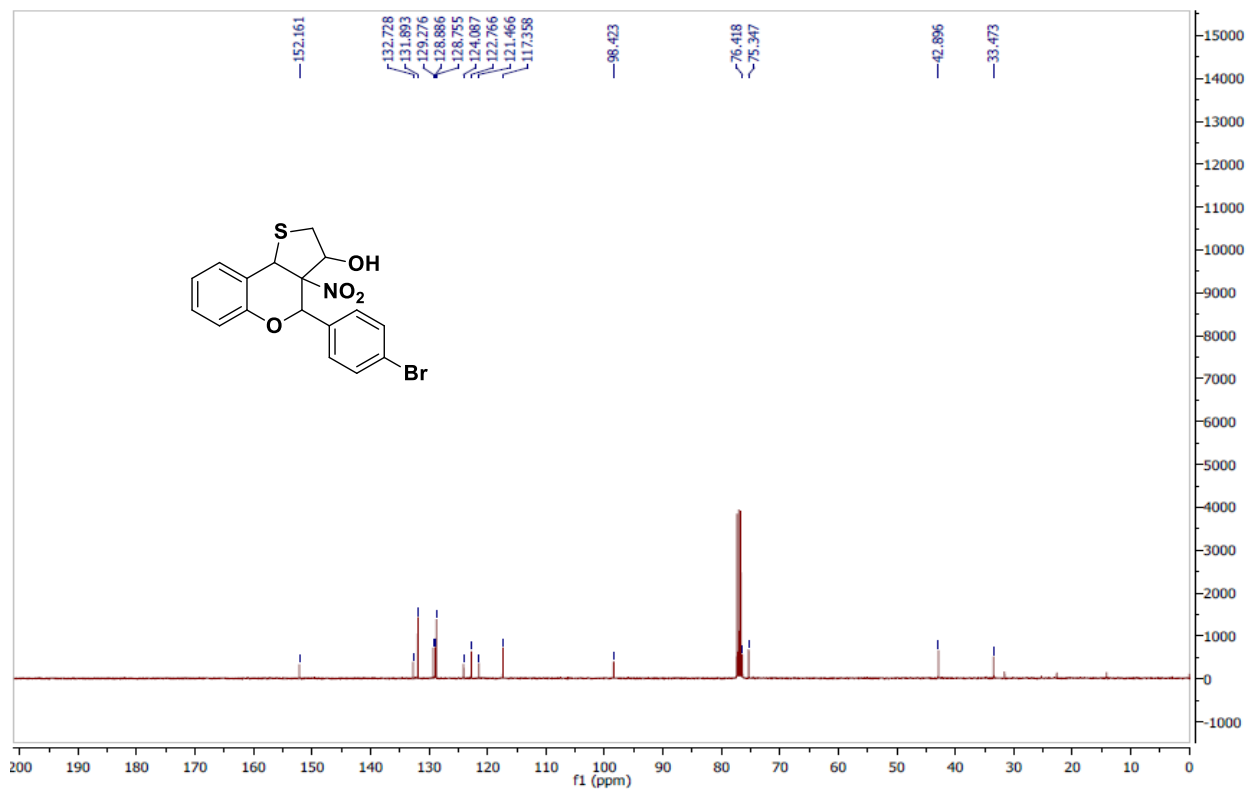
**3a-nitro-4-(2-nitrophenyl)-3,3a,4,9b-tetrahydro-2H-thieno[3,2-c]chromen-3-ol (13b):**



4-(naphthalen-1-yl)-3a-nitro-3a,4,9b-tetrahydro-2H-thieno[3,2-c]chromen-3-ol (13c) :



**4-(4-bromophenyl)-3a-nitro-3,3a,4,9b-tetrahydro-2H-thieno[3,2-c]chromen-3-ol (13d):**



4-(3,4-dimethoxyphenyl)-3a-nitro-3,3a,4,9b-tetrahydro-2H-thieno[3,2-c]chromen-3-ol (13e):

