

# Ionic Liquid-assisted Fabrication of Bioactive Heterogeneous Magnetic Nanocatalyst with Antioxidant and Antibacterial Activities for the Synthesis of Polyhydroquinoline Derivatives

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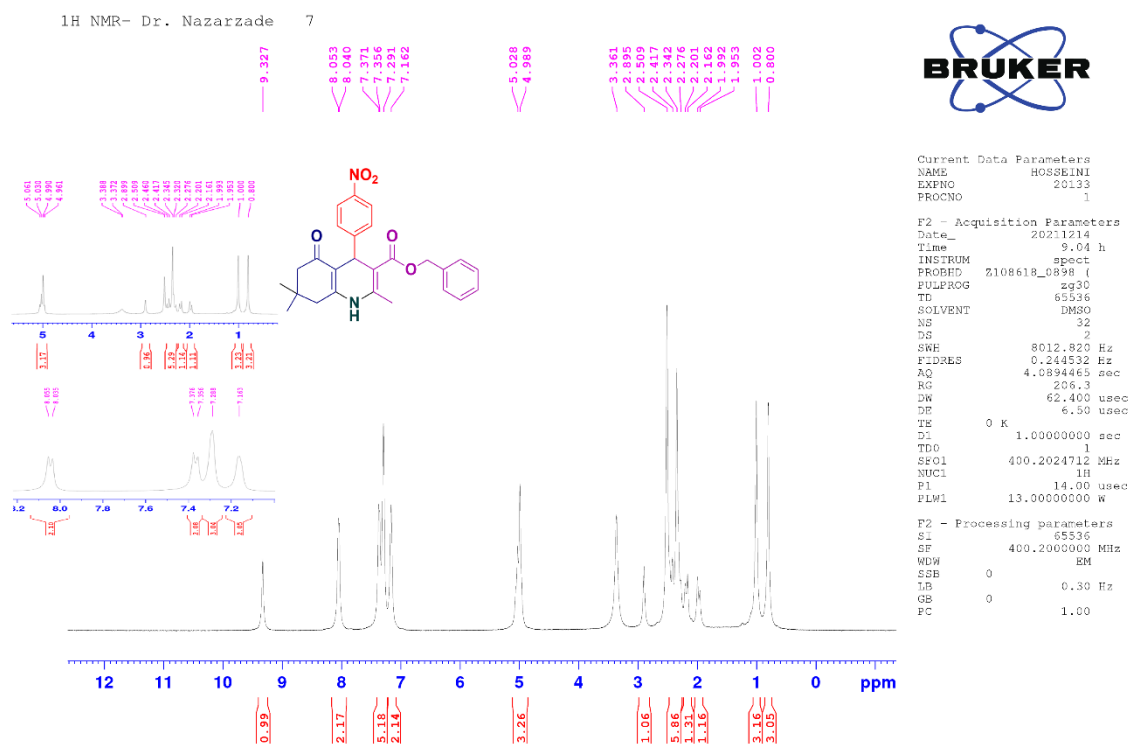
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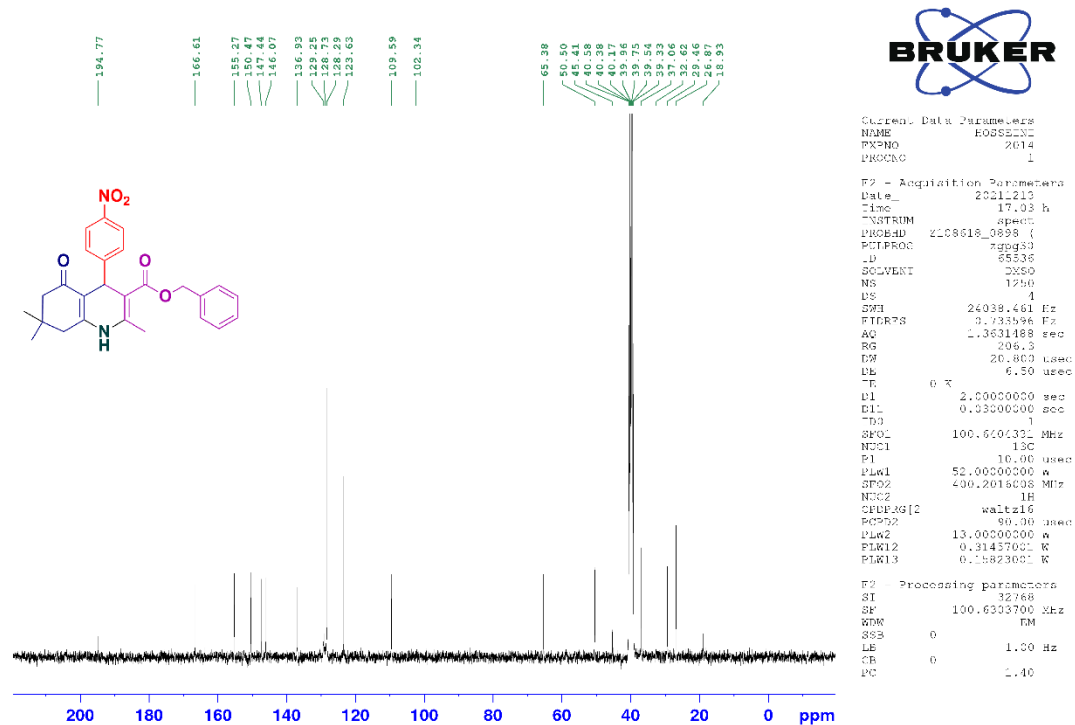
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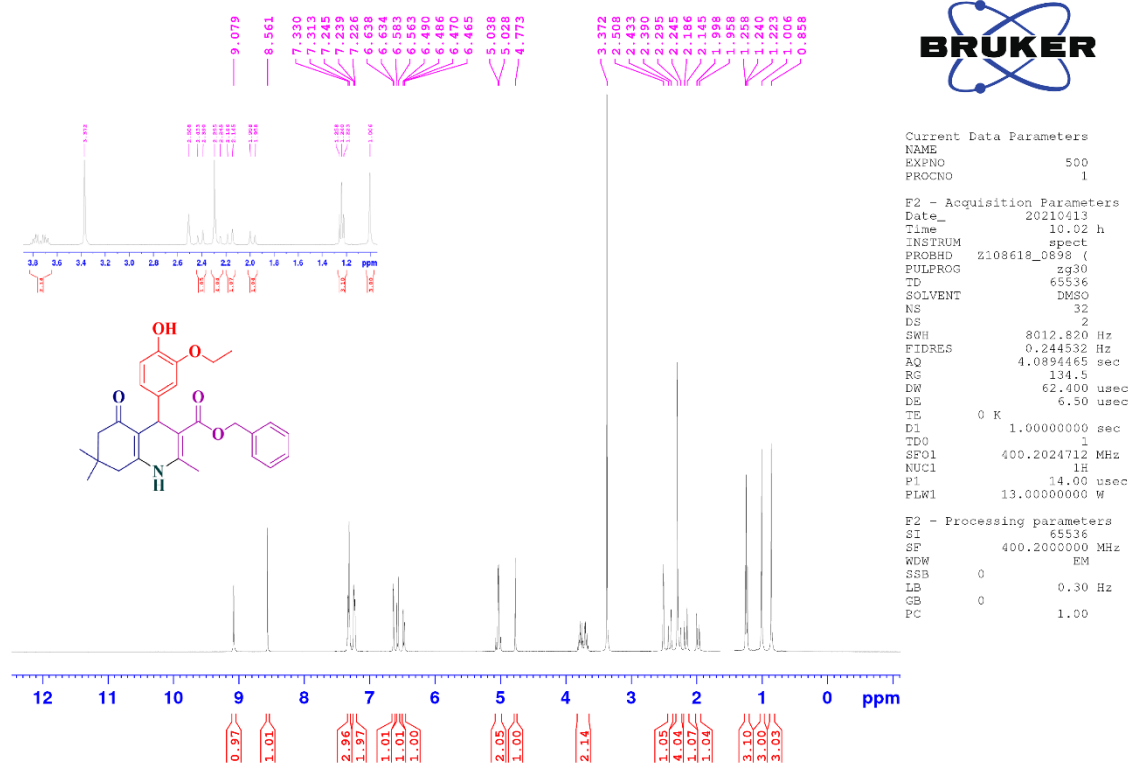
\* Correspondence: ehsan.nazarzadehzare@gmail.com or e.nazarzadeh@du.ac.ir



**Figure S1.** <sup>1</sup>H-NMR spectra of benzyl 2,7,7-trimethyl-4-(4-nitrophenyl)-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (Table 5, Entry2)

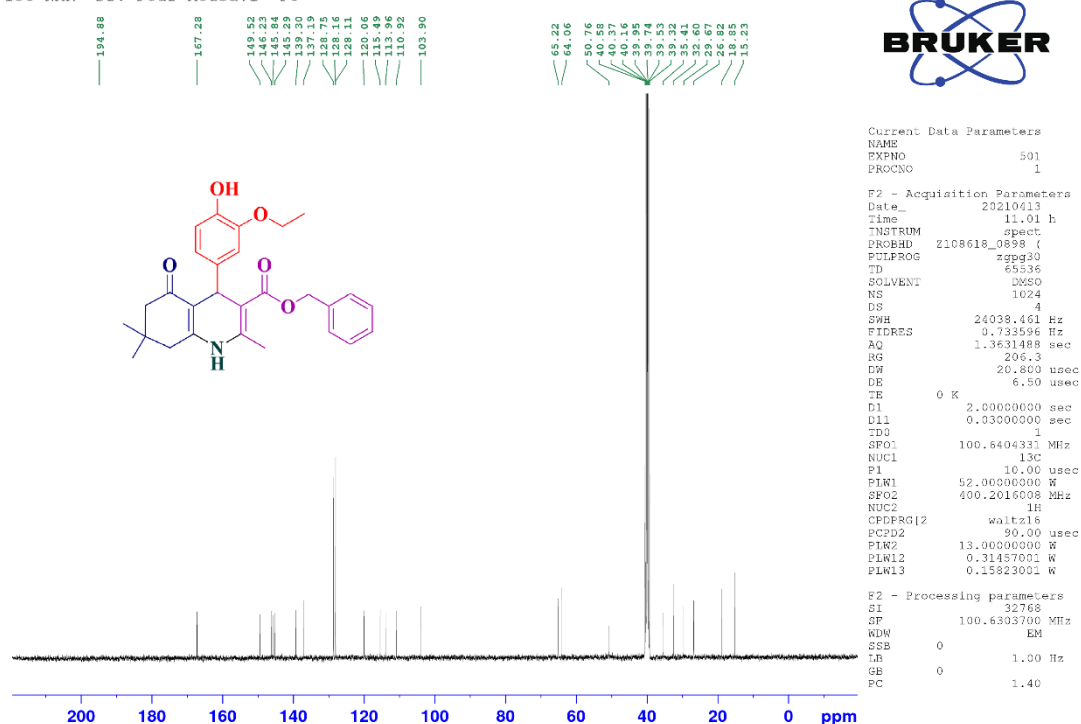


**Figure S2.** <sup>13</sup>C-NMR spectra of benzyl 2,7,7-trimethyl-4-(4-nitrophenyl)-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (Table 5, Entry 2)

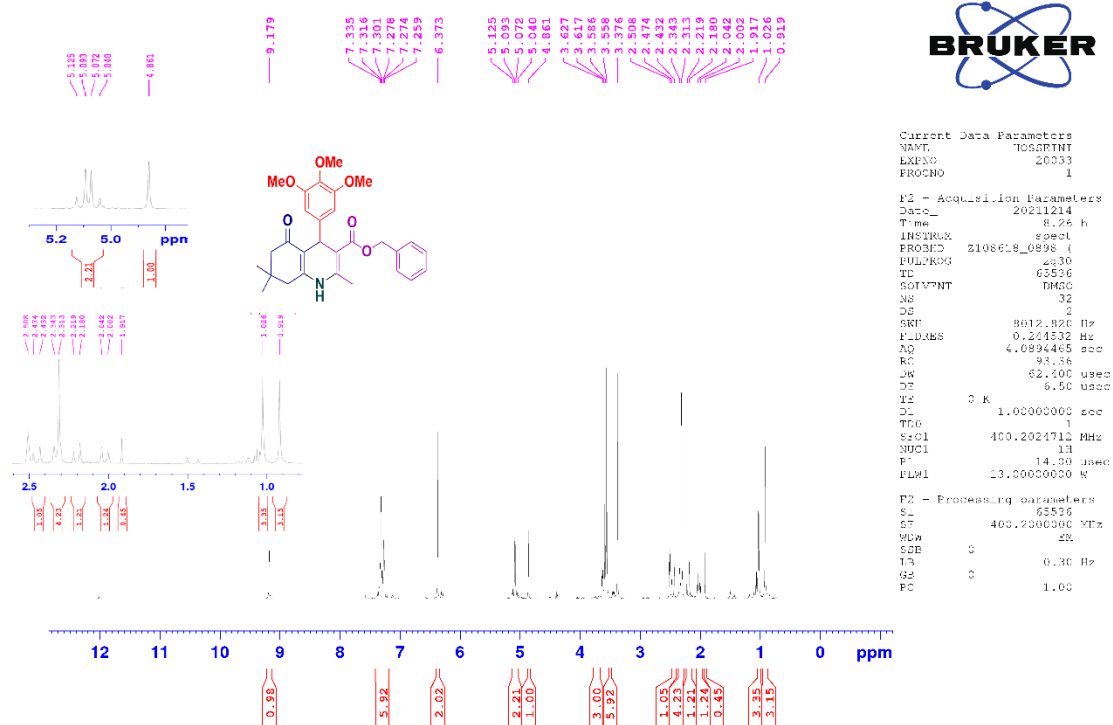


**Figure S3.** <sup>1</sup>H-NMR spectra of Benzyl4-(3-ethoxy-4-hydroxyphenyl)-2,7,7-trimethyl-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (**Table 5, Entry3**)

<sup>13</sup>C NMR- Dr. Pour Mousavi P5

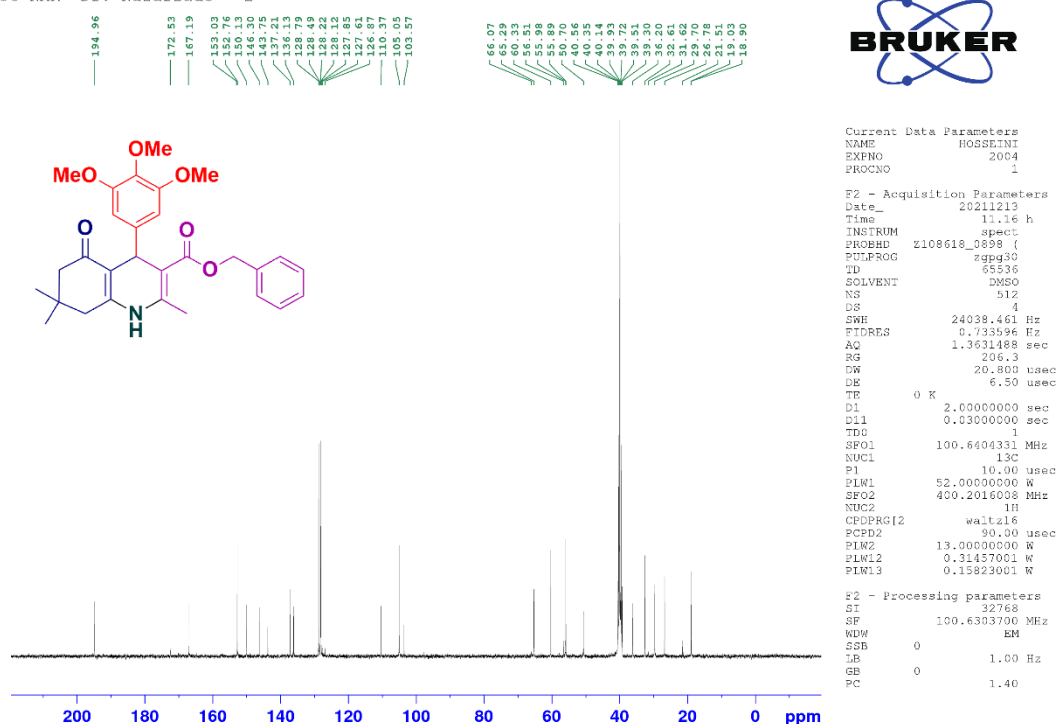


**Figure S4.** <sup>13</sup>C-NMR spectra of Benzyl4-(3-ethoxy-4-hydroxyphenyl)-2,7,7-trimethyl-5-oxo-1,4,5,6,7,8-hexahydroquino line -3-carboxylate (**Table 5, Entry3**)

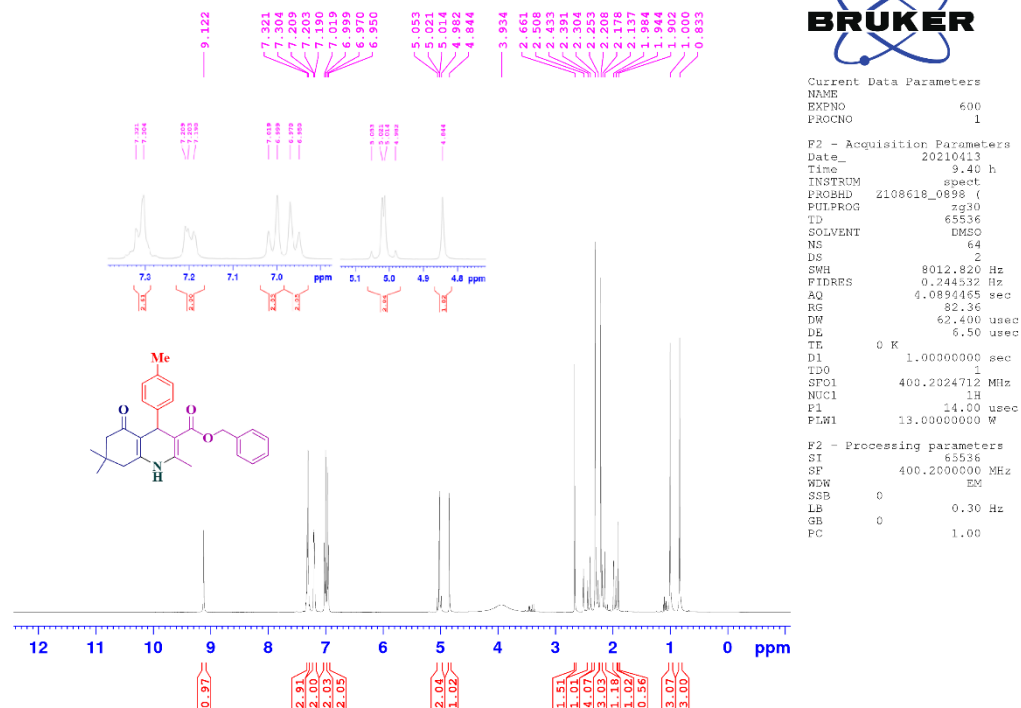


**Figure S5.** <sup>1</sup>H-NMR spectra of benzyl 2,7,7-trimethyl-5-oxo-4-(3,4,5-trimethoxyphenyl)-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (**Table 5, Entry 5**)

<sup>13</sup>C NMR- Dr. Nazarzade 2

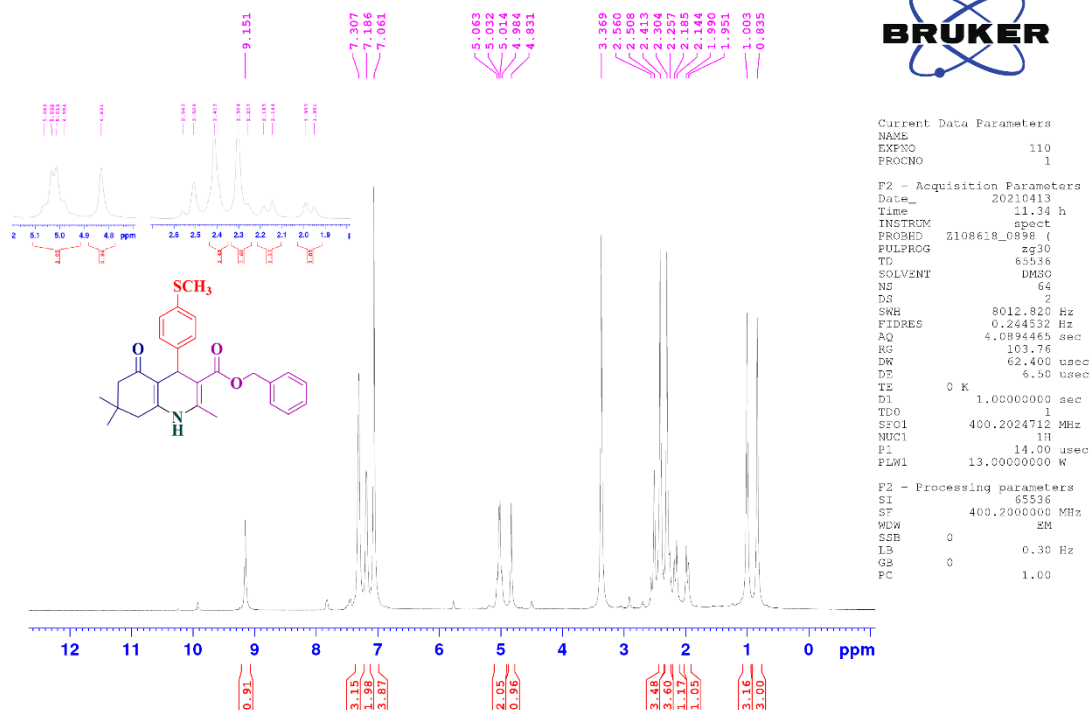


**Figure S6.** <sup>13</sup>C-NMR spectra of benzyl 2,7,7-trimethyl-5-oxo-4-(3,4,5-trimethoxyphenyl)-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (**Table 5, Entry 5**)

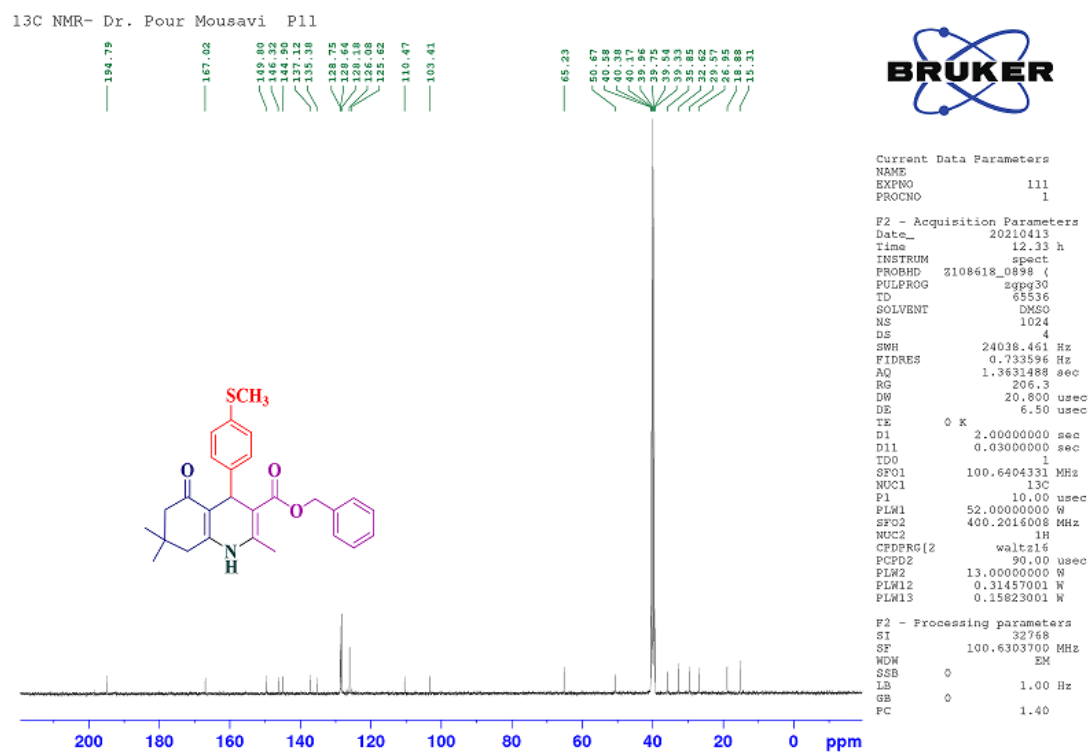


**Figure S7.** <sup>1</sup>H-NMR spectra of Benzyl 2,7,7-trimethyl-5-oxo-4-(p-tolyl)-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (Table 5, Entry 9).

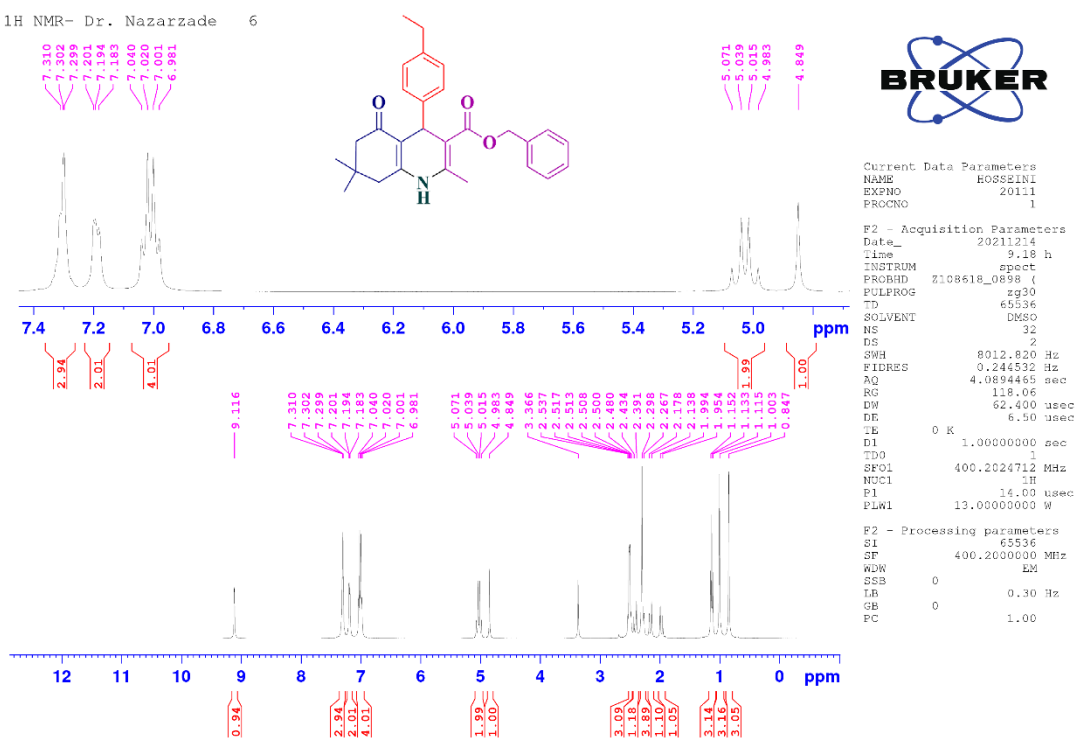




**Figure S9.** <sup>1</sup>H-NMR spectra of Benzyl 2,7,7-trimethyl-4-(4-(methylthio)phenyl)-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (Table 5, Entry10)



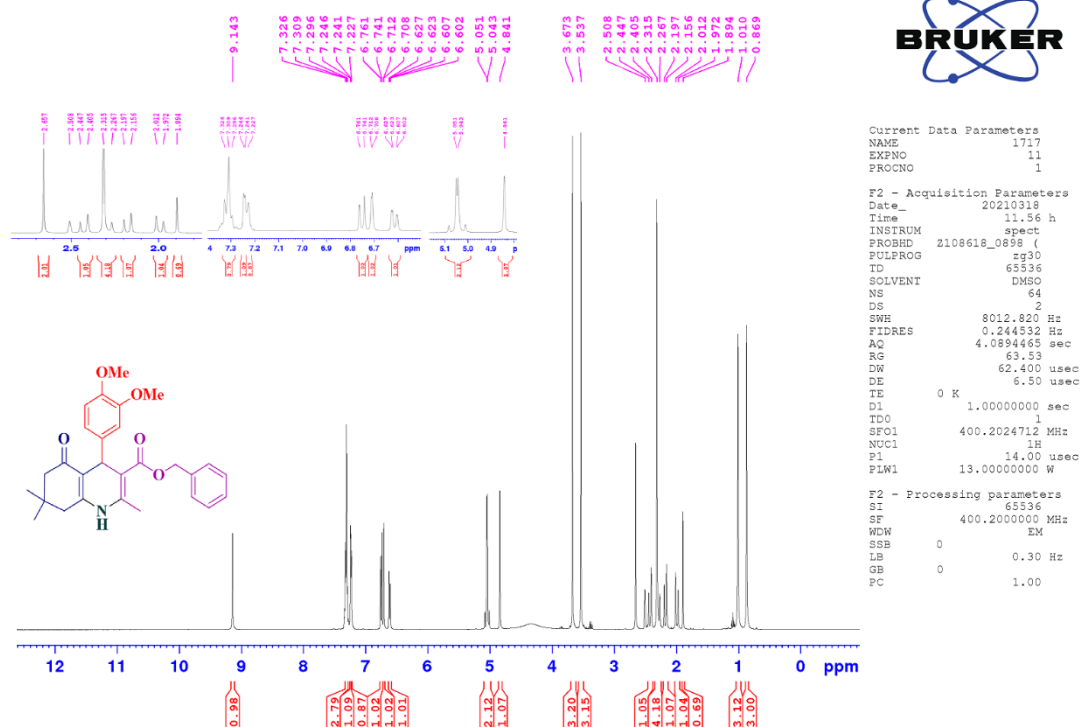
**Figure S10.** <sup>13</sup>C-NMR spectra of Benzyl 2,7,7-trimethyl-4-(4-(methylthio)phenyl)-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (**Table 5, Entry10**)



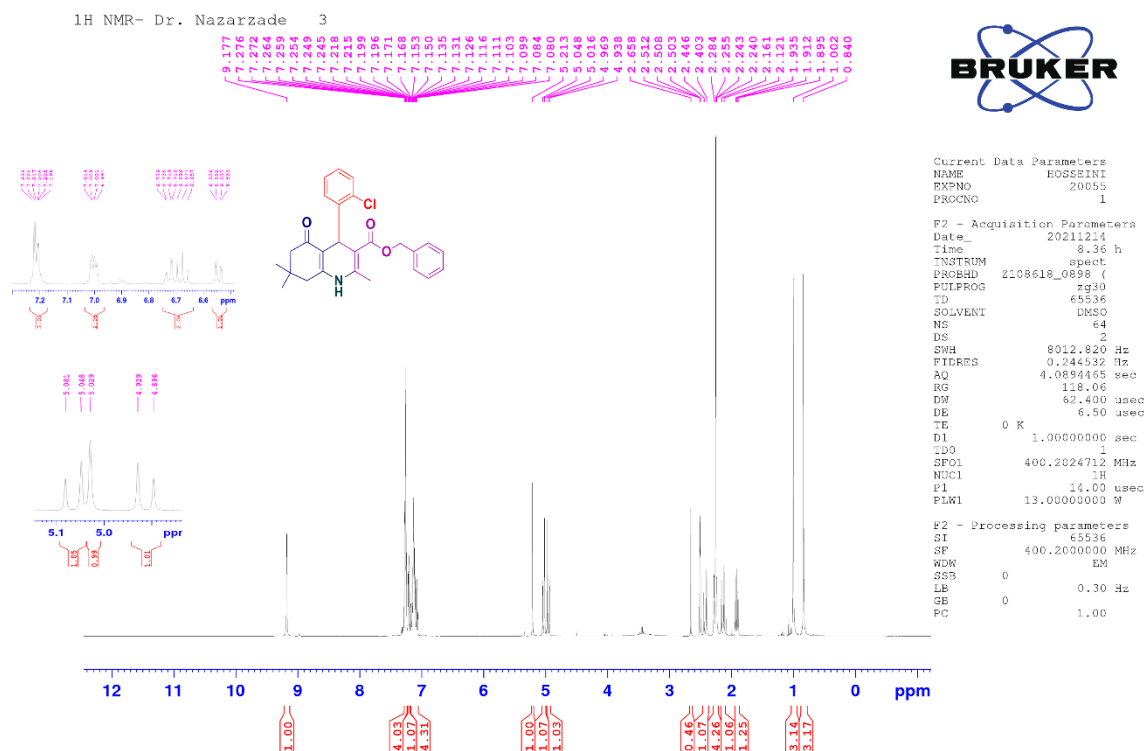
**Figure S11.** <sup>1</sup>H-NMR spectra of benzyl 4-(4-ethylphenyl)-2,7,7-trimethyl-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (Table 5, Entry 13)



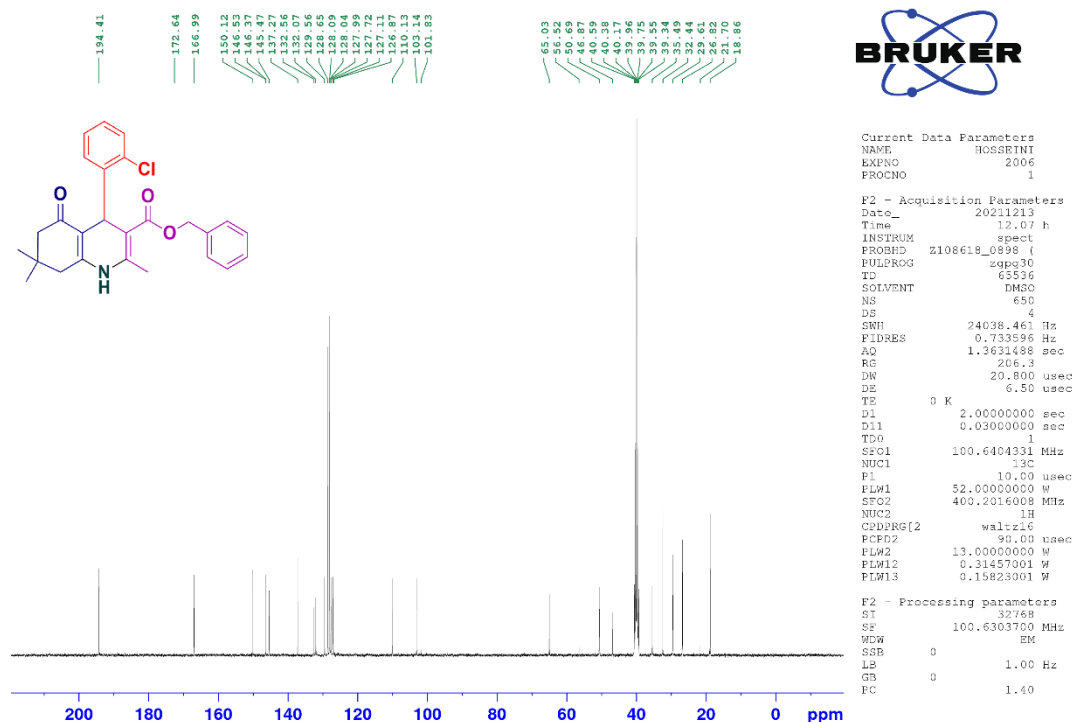
<sup>1</sup>H NMR- P7



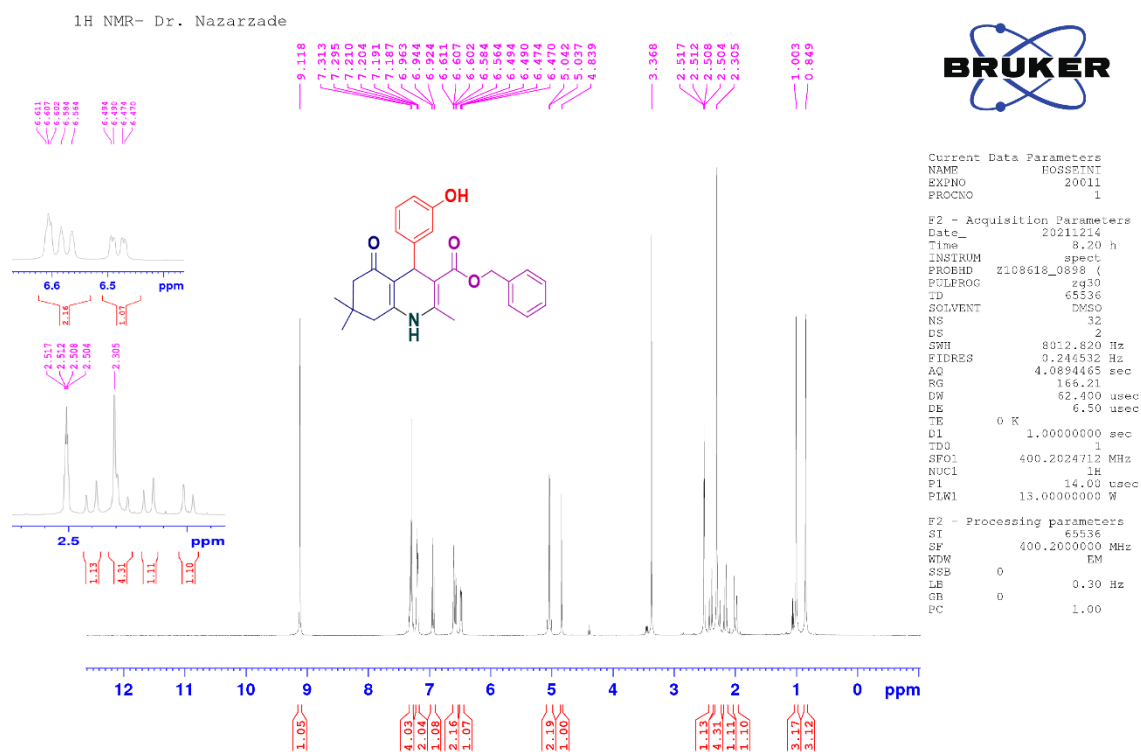
**Figure S13.** <sup>1</sup>H-NMR spectra of Benzyl 4-(3,4-dimethoxyphenyl)-2,7,7-trimethyl-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (**Table 5, Entry15**)



**Figure S14.** <sup>1</sup>H-NMR spectra of benzyl 4-(2-chlorophenyl)-2,7,7-trimethyl-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (**Table 5, Entry 18**)

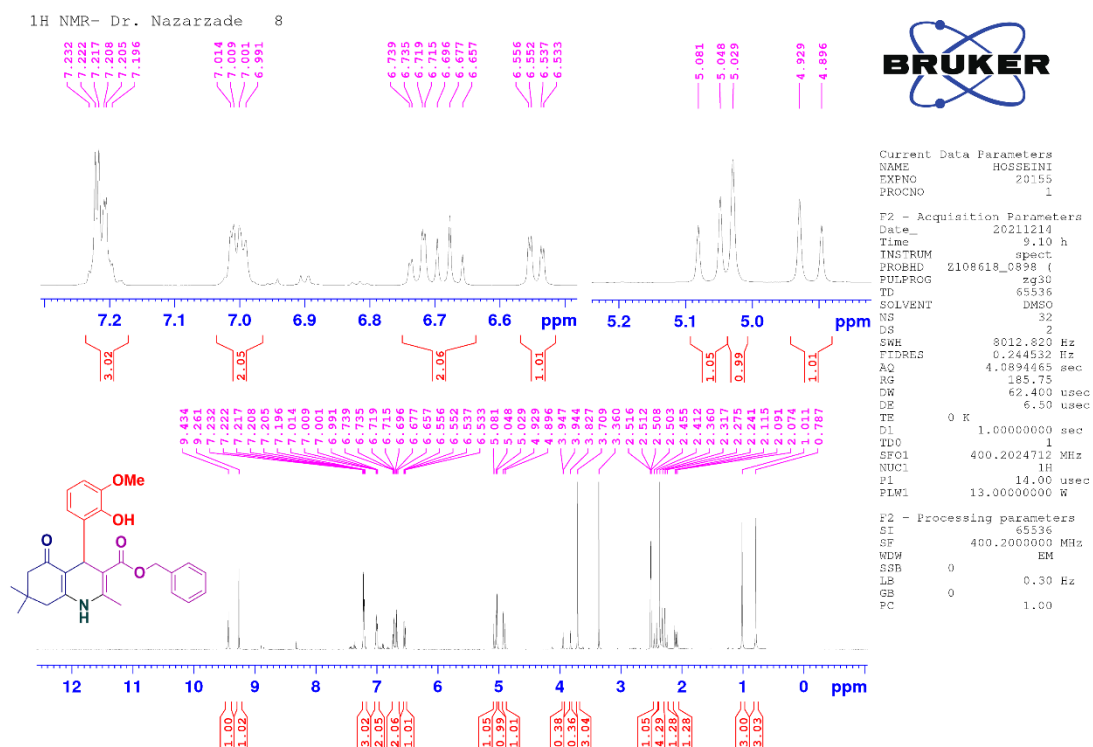


**Figure S15.** <sup>13</sup>C-NMR spectra of benzyl 4-(2-chlorophenyl)-2,7,7-trimethyl-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (**Table 5, Entry 18**)

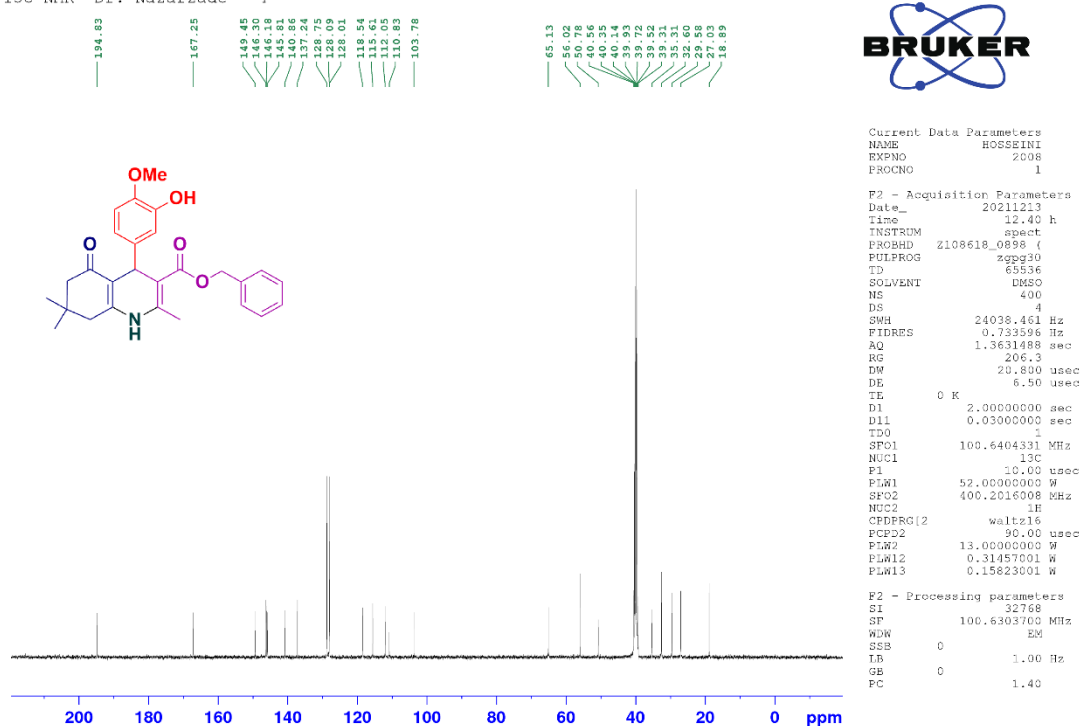


**Figure S16.** <sup>1</sup>H-NMR spectra of benzyl 4-(3-hydroxyphenyl)-2,7,7-trimethyl-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (**Table 5, Entry 19**)

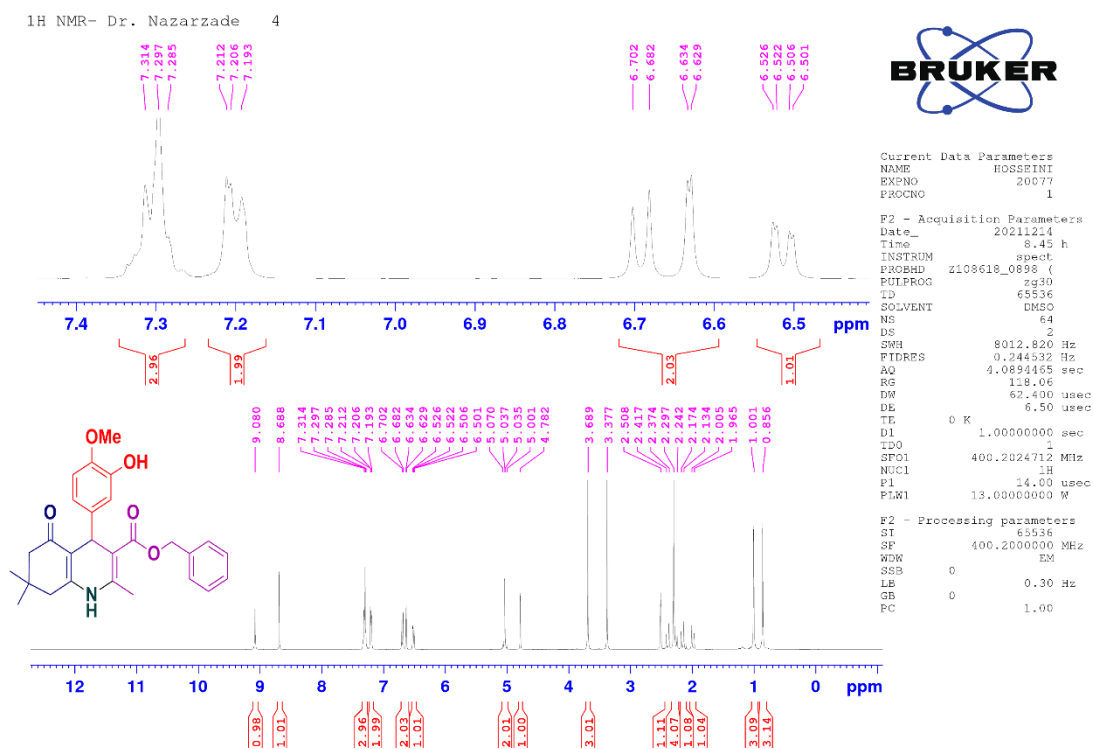




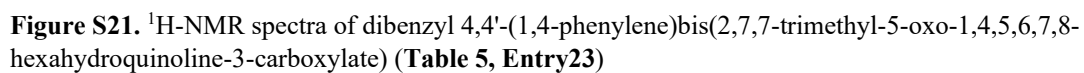
**Figure S18.** <sup>1</sup>H-NMR spectra of benzyl 4-(2-hydroxy-3-methoxyphenyl)-2,7,7-trimethyl-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (Table 5, Entry 20)

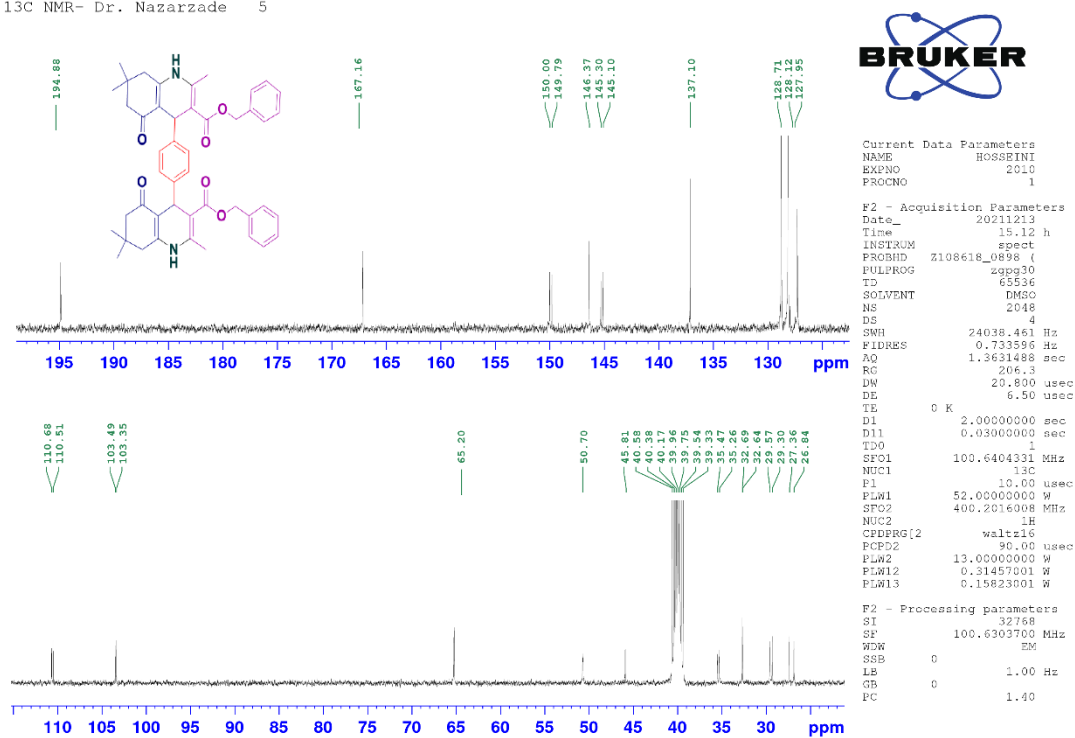


**Figure S19.** <sup>13</sup>C-NMR spectra of benzyl 4-(3-hydroxy-4-methoxyphenyl)-2,7,7-trimethyl-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (Table 5, Entry 20)



**Figure S20.** <sup>1</sup>H-NMR spectra of benzyl 4-(3-hydroxy-4-methoxyphenyl)-2,7,7-trimethyl-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate (Table 5, Entry 22)





**Figure S22.**  $^{13}\text{C}$ -NMR spectra of dibenzyl 4,4'-(1,4-phenylene)bis(2,7,7-trimethyl-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate) (Table 5, Entry 23)

Chemical structure of compound 10 is shown in the top left. The <sup>1</sup>H NMR spectrum (CDCl<sub>3</sub>) shows peaks from 0 to 10 ppm. Integration values are provided below the baseline, and peak lists with chemical shifts are on the right.

Integration values (from left to right): 0.77, 2.84, 2.02, 2.11, 1.08, 1.02, 0.84, 1.84, 2.05, 1.09, 4.48, 1.13, 2.29, 2.40, 3.13, 3.00.

Peak lists (from left to right):

- 8.992
- 7.298, 7.185, 7.112, 7.086, 7.057, 7.026, 6.840, 6.815, 6.735, 6.711, 6.688
- 5.084, 5.028, 4.986, 4.965, 4.922
- 3.904, 3.880, 3.776, 3.371
- 2.525, 2.446, 2.390, 2.345, 2.245, 2.159, 2.103, 1.927, 1.873, 1.723, 1.498, 1.005, 0.842



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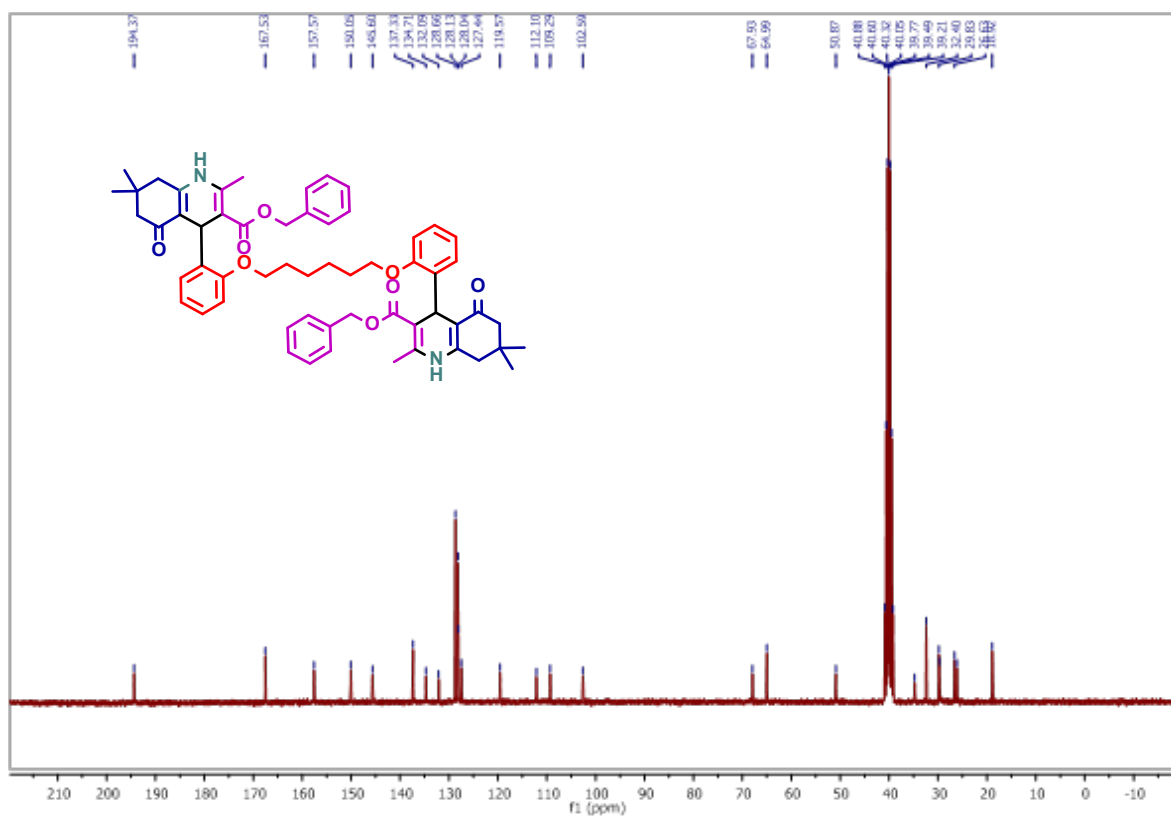
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PLW1                  6.40000010 W

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SF                    300.8100000 MHz
WDW                    EM
SSB                     0
LB                     0
GB                     0
PC                     1.00

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23



**Figure S24.**  $^{13}\text{C}$ -NMR Spectra of dibenzyl 4,4'-((hexane-1,6-diylbis(oxy))bis(2,1-phenylene))bis(2,7,7-trimethyl-5-oxo-1,4,5,6,7,8-hexahydroquinoline-3-carboxylate) (Table 3, Entry 24)