

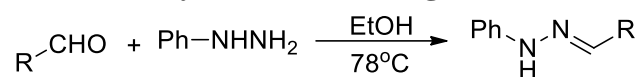
Electrochemical cycloaddition of hydrazones with cyanamide for the synthesis of substituted 5-amine-1,2,4-triazoles

Minghua Yang, Rui Jiang, Yangxiu Mu, Yu Hong, Yaya Wan, Jing Hou, Dong Tang*

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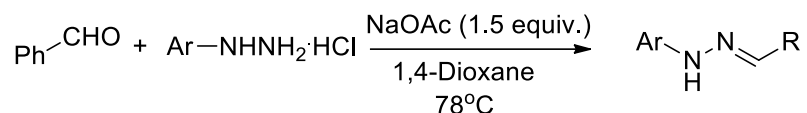
- 1. The procedure for the synthesis of starting material.**
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1. General procedure for the synthesis of starting Materials



Scheme S1

The synthesis of hydrazones was according to a modified procedure. A mixture of arylaldehyde (10 mmol), phenylhydrazine (10 mmol) and absolute ethanol (25ml) in a 100 mL flask was stirred and refluxed for 6 h. After the completion of the reaction, most of the solvent was removed under reduced pressure, and the solid was filtered and washed with petroleum ether and water to obtain final products, which was used for next step without further purification.



Scheme S2

A mixture of benzaldehyde (10 mmol) and sodium acetate (1.5 equiv), ethanol (25 mL) and water (2ml) were added into 100ml flask, the corresponding arylhydrazine hydrochloride was added by small portions. The mixture was stirred at 78°C for 6h. After the completion of the reaction, most of the solvent was removed under reduced pressure, and the solid was filtered and washed with petroleum ether and water to obtain final products, which was used for next step without further purification.

2. General information.

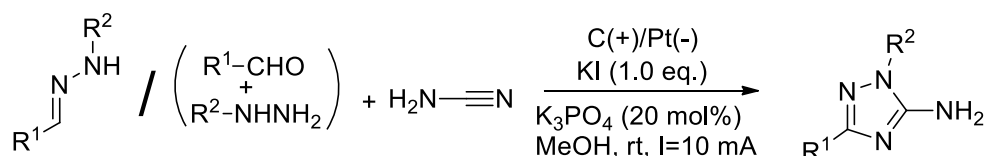
All reagents and solvents were purchased from commercial suppliers and used without further purification, The NMR spectra were recorded at bruker 400 MHz (¹H) and 100 MHz (¹³C) in DMSO-*d*₆ using TMS as as internal reference. The following abbreviations were used to explain the multiplicities: s = singlet, d = doublet, dd = doublet of doublet, t = triplet, dt = doublet of triplet, m = multiplet. Melting points were measured with micro melting point apparatus. The power supply is Maisheng DC regulated power supply, and the electrode of platinum plate (1cm*1cm*0.1mm), graphite rod (diameter 0.6mm), and the reaction vessel (10ml)with 3 electrode holes.





Fig. S1 The reaction equipment of the reaction.

3. General procedure for the synthesis of 1,2,4-triazole derivatives.



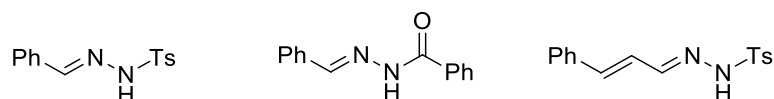
Scheme S3

An undivided cell (10ml) was equipped with graphite rod anode ($\Phi 6$ mm), Pt plate cathode (1 cm \times 1 cm). Hydrazones **1** (0.3 mmol), cyanamide **2** (0.6 mmol), KI (1.0 equiv.), K_3PO_4 (20 mol%) and MeOH (8 mL) were added into the cell at room temperature (or aldehydes **4** (0.3 mmol), hydrazines (0.3 mmol), cyanamide **2** (0.6 mmol), KI (1.0 equiv.), K_3PO_4 (20 mol%) and MeOH (8 mL) were added into the cell at room temperature). The mixture was stirred and electrolyze under constant current conditions (10mA) for 5h. When the reaction was finished, the mixture was then dried over MgSO_4 and removed under vacuum to obtain crude products. The residue was purified by column chromatography on silica gel using the eluent with petroleum ether/EtOAc (1/1).

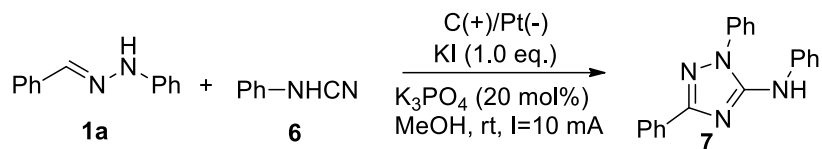
4. The electrochemical method by employing different hydrazones and cyanamides

To further broaden the scope of this protocol, several different type hydrazones including N'-benzylidene-4-methylbenzenesulfonylhydrazide, N'-benzylidenebenzohydrazide and 4-methyl-N'-(3-phenylallylidene)benzenesulfonylhydrazide were reacted with 2a under the standard conditions (Scheme s4-a), and no desired products was observed by LC-MS. When the functional cyanamides, such as N-phenylcyanamide and N-cyanobenzamide, was employed, only a small amount of products are produced according to LCMS (See Fig. S2 and Fig. S3).

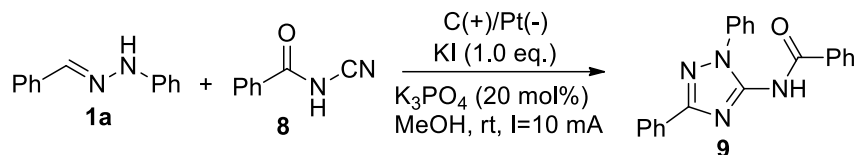
(a) Different hydrazones failed to apply with this reaction



(b) The reaction of **1a** and N-phenylcyanamide



(c) (The reaction of **1a** and N-cyanobenzamide)



Scheme S4.

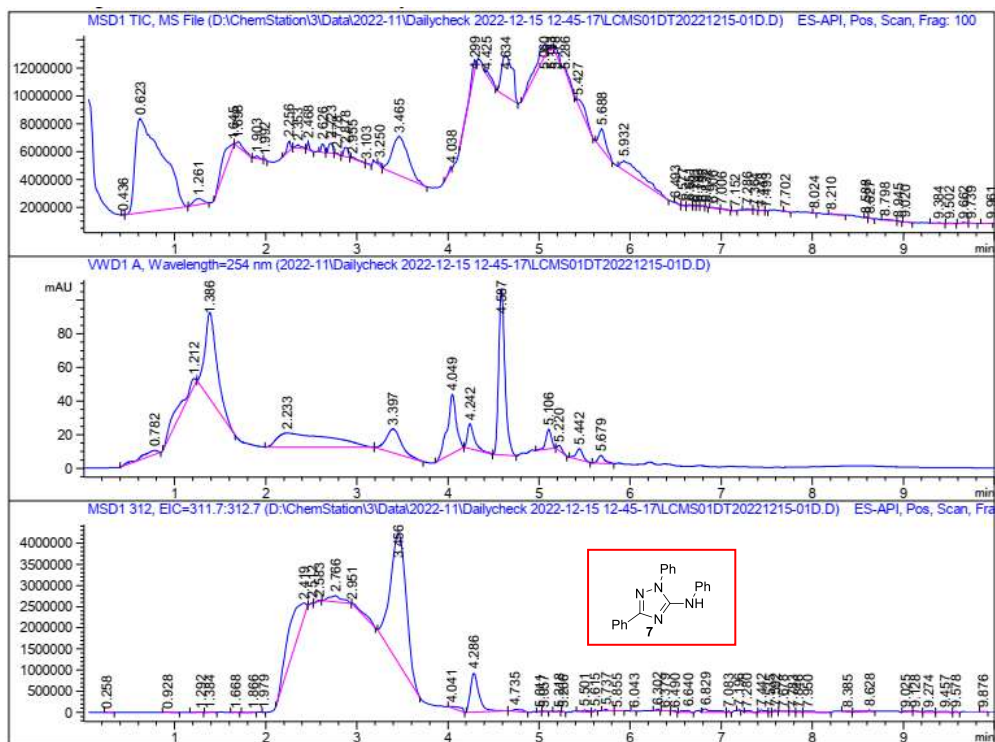


Fig. S2

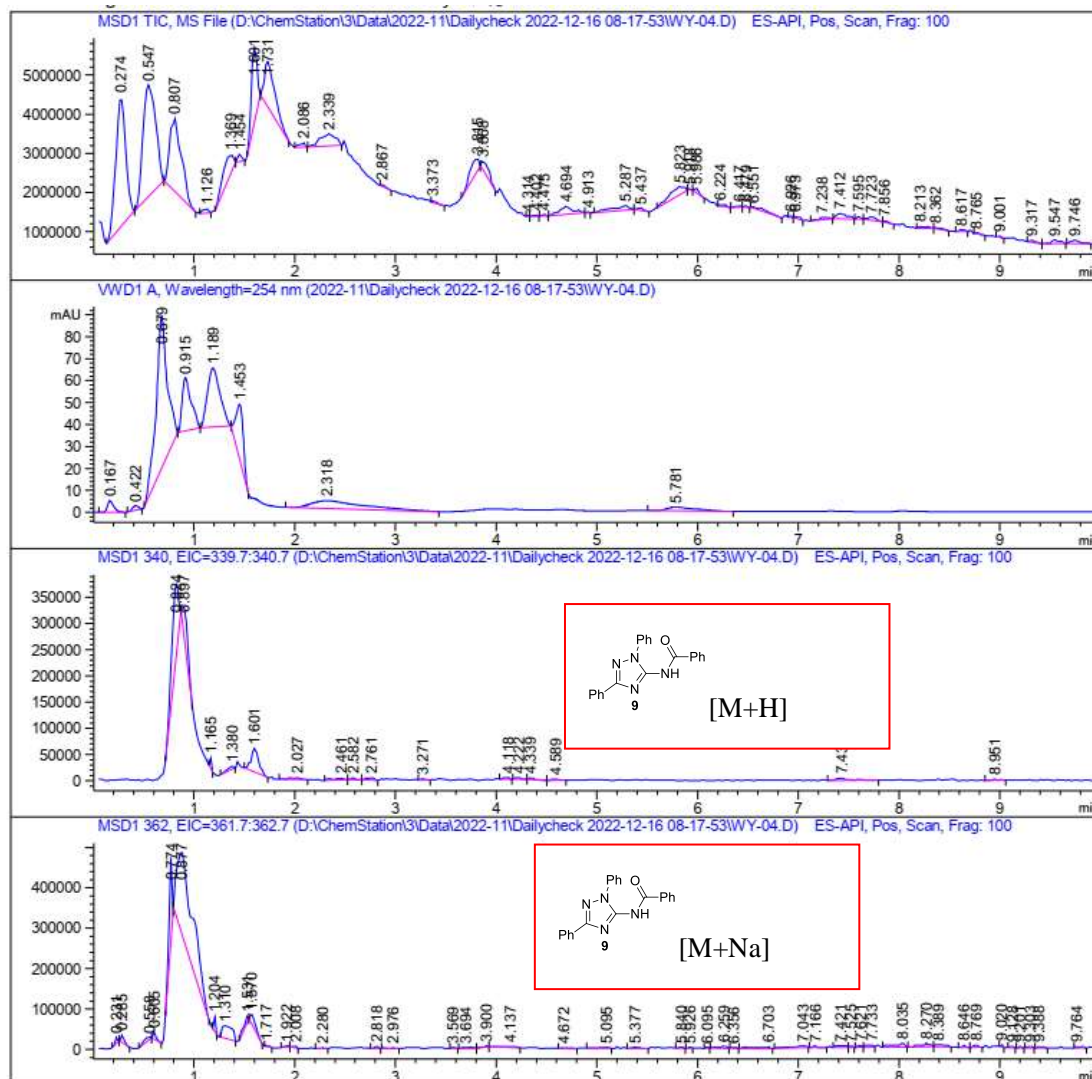
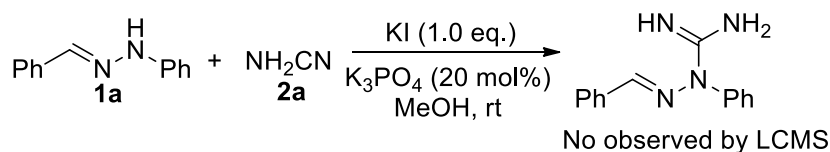


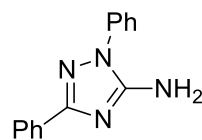
Fig. S3

5. The investigation of the mechanism



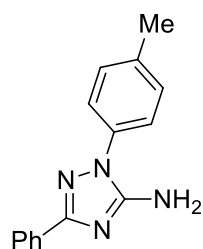
Control experiment was conducted by the employment of **1a** and **2a** under the standard conditions without current, and only starting material **1a** was observed by LCMS.

6. Spectra data of the products



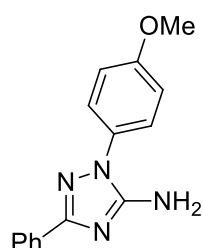
1,3-diphenyl-1H-1,2,4-triazol-5-amine, **3aa**, mp 146-147 °C, yellow solid, ^1H NMR (400 MHz, Chloroform-*d*) δ 8.01 – 7.93 (m, 2H), 7.57 – 7.50 (m, 2H), 7.46 (t, J = 7.9 Hz, 2H), 7.40 – 7.29 (m, 4H), 5.09 (s, 2H). ^{13}C NMR (101 MHz, Chloroform-*d*) δ 159.39, 154.23, 136.89,

130.94, 129.91, 129.22, 128.55, 128.24, 126.18, 123.53. LCMS (ESI) calcd for C₁₄H₁₂N₄ (positive mode) 236.2, found 236.7.



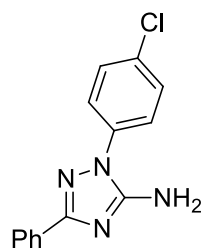
3-phenyl-1-(p-tolyl)-1H-1,2,4-triazol-5-amine, **3ab**, yellow oil, ¹H NMR (400

MHz, DMSO-*d*₆) δ 8.01 – 7.89 (m, 2H), 7.54 – 7.48 (m, 2H), 7.49 – 7.38 (m, 4H), 7.38 – 7.31 (m, 2H), 6.51 (s, 2H), 2.37 (s, 3H). ¹³C NMR (101 MHz, DMSO-*d*₆) δ 155.78, 137.07, 130.31, 129.24, 128.99, 126.00, 123.39, 40.18, 39.97, 39.76, 21.09. LCMS (ESI) calcd for C₁₅H₁₄N₄ (positive mode) 250.2, found 250.7.



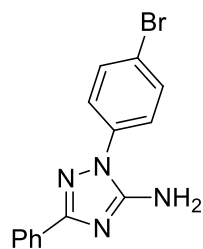
1-(4-methoxyphenyl)-3-phenyl-1H-1,2,4-triazol-5-amine, **3ac**, mp 171-173 °C,

yellow solid, ¹H NMR (400 MHz, DMSO-*d*₆) δ 7.98 – 7.87 (m, 2H), 7.54 – 7.46 (m, 2H), 7.47 – 7.33 (m, 3H), 7.08 (d, *J* = 9.0 Hz, 2H), 6.41 (s, 2H), 3.82 (s, 3H). ¹³C NMR (101 MHz, DMSO-*d*₆) δ 158.79, 158.29, 155.86, 132.00, 130.60, 129.17, 128.98, 125.94, 125.56, 115.01, 55.94. LCMS (ESI) calcd for C₁₅H₁₄N₄O (positive mode) 266.2, found 266.6.



1-(4-chlorophenyl)-3-phenyl-1H-1,2,4-triazol-5-amine, **3ad**, mp 174-176 °C,

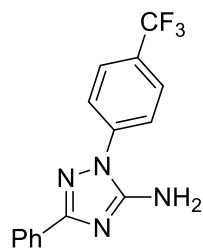
yellow solid, ¹H NMR (400 MHz, DMSO-*d*₆) δ 7.96 (dq, *J* = 6.4, 1.2 Hz, 2H), 7.70 – 7.63 (m, 2H), 7.63 – 7.56 (m, 2H), 7.48 – 7.35 (m, 3H), 6.68 (s, 2H). ¹³C NMR (101 MHz, DMSO-*d*₆) δ 158.91, 155.98, 136.56, 131.76, 131.68, 129.86, 129.44, 129.03, 126.09, 125.10, 40.17, 39.96, 39.75. LCMS (ESI) calcd for C₁₄H₁₁N₄Cl (positive mode) 270.7, found 270.6.



3-phenyl-[1,2,4]triazolo[4,3-a]pyridine, **3ae**, mp 165-167 °C, yellow solid, ¹H

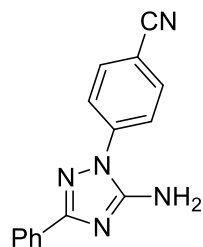
NMR (400 MHz, DMSO-*d*₆) δ 8.03 – 7.90 (m, 2H), 7.77 – 7.67 (m, 2H), 7.64 – 7.56 (m, 2H), 7.53 – 7.33 (m, 3H), 6.68 (s, 2H). ¹³C NMR (101 MHz, DMSO-*d*₆) δ 158.94, 155.95, 136.98, 132.78, 131.66,

129.45, 129.04, 126.10, 125.33, 120.07, 40.17, 39.96, 39.75. LCMS (ESI) calcd for C₁₄H₁₁N₄Br (positive mode) 315.1, found 314.7 and 316.7.



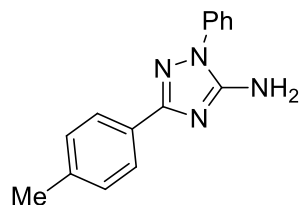
3-phenyl-1-(4-(trifluoromethyl)phenyl)-1H-1,2,4-triazol-5-amine, **3af**, mp

144-146 °C, yellow solid, ¹H NMR (400 MHz, DMSO-*d*₆) δ 7.99 (ddd, *J* = 8.3, 2.7, 1.5 Hz, 2H), 7.90 (s, 4H), 7.52 – 7.36 (m, 3H), 6.85 (d, *J* = 4.7 Hz, 2H). ¹³C NMR (101 MHz, DMSO-*d*₆) δ 159.33, 156.21, 131.48, 129.61, 129.06, 127.11, 127.07, 126.19, 123.21, 40.15, 39.94, 39.73. ¹⁹F NMR (376 MHz, DMSO-*d*₆) δ -60.85. LCMS (ESI) calcd for C₁₅H₁₁F₃N₄ (positive mode) 304.2, found 304.6.



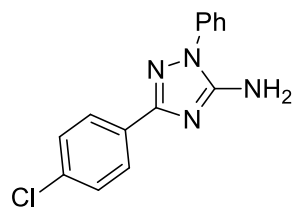
4-(5-amino-3-phenyl-1H-1,2,4-triazol-1-yl)benzonitrile, **3ag**, yellow oil, ¹H

NMR (400 MHz, DMSO-*d*₆) δ 8.06 – 8.00 (m, 2H), 7.99 – 7.94 (m, 2H), 7.90 – 7.84 (m, 2H), 7.51 – 7.38 (m, 3H), 6.90 (s, 2H). ¹³C NMR (101 MHz, DMSO-*d*₆) δ 159.49, 156.27, 141.36, 134.20, 131.33, 129.75, 129.10, 126.24, 123.01, 118.96, 109.27. LCMS (ESI) calcd for C₁₅H₁₁N₅ (positive mode) 261.2, found 261.7.



1-phenyl-3-(p-tolyl)-1H-1,2,4-triazol-5-amine, **3ah**, mp 140-142 °C,

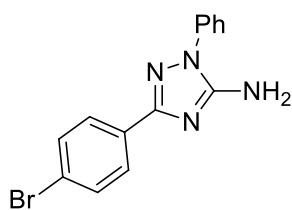
yellow solid, ¹H NMR (400 MHz, DMSO-*d*₆) δ 7.84 (d, *J* = 8.0 Hz, 2H), 7.62 (dd, *J* = 8.4, 1.5 Hz, 2H), 7.54 (t, *J* = 7.9 Hz, 2H), 7.40 (d, *J* = 7.2 Hz, 1H), 7.25 (d, *J* = 8.0 Hz, 2H), 6.55 (s, 2H), 2.34 (s, 3H). ¹³C NMR (101 MHz, DMSO-*d*₆) δ 158.75, 155.72, 138.72, 137.79, 129.89, 129.57, 129.15, 127.47, 126.04, 123.24, 21.41. LCMS (ESI) calcd for C₁₅H₁₄N₄ (positive mode) 250.2, found 250.7.



3-(4-chlorophenyl)-1-phenyl-1H-1,2,4-triazol-5-amine, **3ai**, mp 155-156

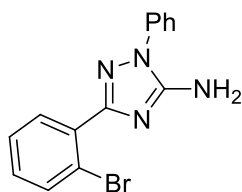
°C, yellow solid, ¹H NMR (400 MHz, DMSO-*d*₆) δ 8.01 – 7.93 (m, 2H), 7.63 (d, *J* = 8.0 Hz, 2H), 7.59 – 7.47 (m, 4H), 7.45 – 7.34 (m, 1H), 6.62 (s, 2H). ¹³C NMR (101 MHz, DMSO-*d*₆) δ 157.79, 155.97, 137.63, 133.90, 130.73, 129.93, 129.13, 127.76, 127.70, 123.40. LCMS (ESI) calcd for C₁₄H₁₁N₄Cl

(positive mode) 270.7, found 270.6.



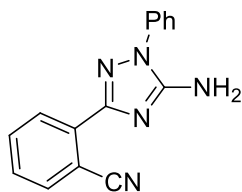
3-(4-bromophenyl)-1-phenyl-1H-1,2,4-triazol-5-amine, **3aj**, mp 177-179 °C,

yellow solid, ^1H NMR (400 MHz, DMSO- d_6) δ 7.95 – 7.86 (m, 2H), 7.69 – 7.57 (m, 4H), 7.54 (dd, J = 8.6, 7.1 Hz, 2H), 7.46 – 7.35 (m, 1H), 6.62 (s, 2H). ^{13}C NMR (101 MHz, DMSO- d_6) δ 157.84, 155.96, 137.62, 132.05, 131.08, 129.93, 128.05, 127.71, 123.40, 122.56. LCMS (ESI) calcd for $\text{C}_{14}\text{H}_{11}\text{N}_4\text{Br}$ (positive mode) 315.1, found 314.5 and 316.5.



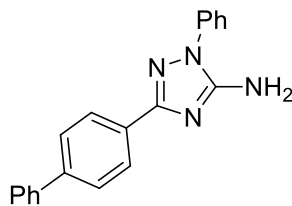
3-(2-bromophenyl)-1-phenyl-1H-1,2,4-triazol-5-amine, **3ak**, mp

160-162 °C, yellow solid, ^1H NMR (400 MHz, DMSO- d_6) δ 7.82 (dd, J = 7.7, 1.8 Hz, 1H), 7.74 (dd, J = 8.0, 1.2 Hz, 1H), 7.68 – 7.61 (m, 2H), 7.55 (dd, J = 8.6, 7.2 Hz, 2H), 7.47 (td, J = 7.5, 1.3 Hz, 1H), 7.43 – 7.37 (m, 1H), 7.34 (td, J = 7.7, 1.8 Hz, 1H), 6.62 (s, 2H). ^{13}C NMR (101 MHz, DMSO- d_6) δ 158.48, 155.26, 137.65, 134.21, 132.89, 131.80, 130.81, 129.94, 127.99, 127.58, 123.17, 121.26. LCMS (ESI) calcd for $\text{C}_{14}\text{H}_{11}\text{N}_4\text{Br}$ (positive mode) 315.1, found 314.5 and 316.5.

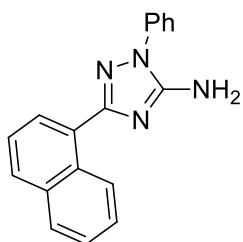


2-(5-amino-1-phenyl-1H-1,2,4-triazol-3-yl)benzotrile, **3al**, mp 213-215 °C,

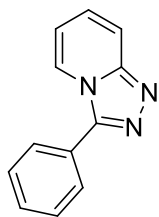
yellow solid, ^1H NMR (400 MHz, DMSO- d_6) δ 8.09 (dd, J = 8.0, 1.2 Hz, 1H), 7.92 (dd, J = 7.7, 1.3 Hz, 1H), 7.79 (td, J = 7.8, 1.4 Hz, 1H), 7.70 – 7.64 (m, 2H), 7.64 – 7.52 (m, 3H), 7.48 – 7.40 (m, 1H), 6.75 (s, 2H). ^{13}C NMR (101 MHz, DMSO- d_6) δ 156.53, 155.86, 137.47, 135.26, 133.77, 133.69, 130.00, 129.87, 128.92, 127.84, 123.21, 118.91, 116.95. LCMS (ESI) calcd for $\text{C}_{15}\text{H}_{11}\text{N}_5$ (positive mode) 261.2, found 261.7.



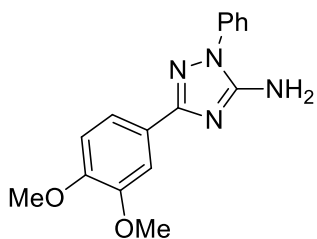
3-([1,1'-biphenyl]-4-yl)-1-phenyl-1H-1,2,4-triazol-5-amine, **3am**, yellow oil, ^1H NMR (400 MHz, DMSO- d_6) δ 7.75 (dd, J = 7.4, 1.7 Hz, 1H), 7.52 – 7.39 (m, 5H), 7.38 – 7.25 (m, 9H), 6.40 (s, 2H). ^{13}C NMR (101 MHz, DMSO- d_6) δ 130.90, 130.43, 129.72, 129.36, 129.27, 128.19, 127.62, 127.17, 127.02, 122.70, 116.95. LCMS (ESI) calcd for $\text{C}_{20}\text{H}_{16}\text{N}_4$ (positive mode) 312.3, found 312.7.



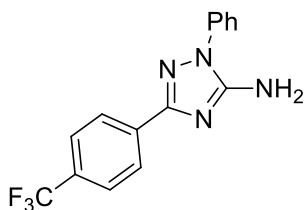
3-(naphthalen-1-yl)-1-phenyl-1H-1,2,4-triazol-5-amine, **3an**, yellow oil, ^1H NMR (400 MHz, $\text{DMSO-}d_6$) δ 9.35 – 9.20 (m, 1H), 8.22 (dt, $J = 7.3, 1.4$ Hz, 1H), 7.99 (dt, $J = 8.0, 1.7$ Hz, 2H), 7.84 – 7.68 (m, 2H), 7.68 – 7.52 (m, 5H), 7.52 – 7.35 (m, 1H), 6.71 (d, $J = 2.5$ Hz, 2H). ^{13}C NMR (101 MHz, $\text{DMSO-}d_6$) δ 159.47, 155.25, 137.77, 134.11, 130.70, 130.00, 129.85, 128.85, 128.57, 127.67, 127.63, 127.17, 127.04, 126.34, 125.81, 123.38. LCMS (ESI) calcd for $\text{C}_{18}\text{H}_{14}\text{N}_4$ (positive mode) 286.3, found 286.7.



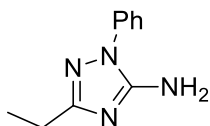
3-phenyl-[1,2,4]triazolo[4,3-a]pyridine, **3at**, mp 140-142 °C, yellow solid, ^1H NMR (400 MHz, $\text{DMSO-}d_6$) δ 8.57 (dt, $J = 7.0, 1.1$ Hz, 1H), 7.94 – 7.79 (m, 3H), 7.67 – 7.51 (m, 3H), 7.51 – 7.36 (m, 1H), 7.06 – 6.97 (m, 1H). ^{13}C NMR (101 MHz, $\text{DMSO-}d_6$) δ 150.46, 146.45, 130.44, 129.74, 128.55, 128.40, 127.05, 124.35, 116.11, 114.92.



3-(3,4-dimethoxyphenyl)-1-phenyl-1H-1,2,4-triazol-5-amine, **3au**, mp 158-160 °C, yellow solid, ^1H NMR (400 MHz, $\text{DMSO-}d_6$) δ 7.63 – 7.59 (m, 2H), 7.56 – 7.49 (m, 3H), 7.47 (d, $J = 1.9$ Hz, 1H), 7.40 (d, $J = 7.4$ Hz, 1H), 7.02 (d, $J = 8.4$ Hz, 1H), 6.52 (s, 2H), 3.80 (d, $J = 2.6$ Hz, 6H). ^{13}C NMR (101 MHz, $\text{DMSO-}d_6$) δ 158.64, 155.67, 149.92, 149.05, 137.79, 129.89, 127.45, 124.59, 123.30, 118.77, 112.08, 109.26, 55.96, 55.81. LCMS (ESI) calcd for $\text{C}_{16}\text{H}_{16}\text{N}_4\text{O}_2$ (positive mode) 296.3, found 296.6.

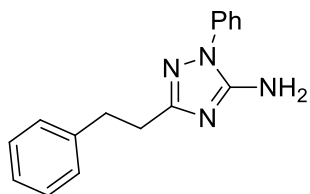


1-phenyl-3-(4-(trifluoromethyl)phenyl)-1H-1,2,4-triazol-5-amine, **3av**, mp 202-204 °C, yellow solid, ^1H NMR (400 MHz, $\text{DMSO-}d_6$) δ 8.21 – 8.06 (m, 2H), 7.90 – 7.76 (m, 2H), 7.71 – 7.60 (m, 2H), 7.60 – 7.53 (m, 2H), 7.51 – 7.35 (m, 1H), 6.68 (s, 2H). ^{13}C NMR (101 MHz, $\text{DMSO-}d_6$) δ 156.12, 129.97, 127.90, 126.60, 126.09, 126.05, 123.53, 40.17, 39.97, 39.76. ^{19}F NMR (376 MHz, $\text{DMSO-}d_6$) δ -61.06. LCMS (ESI) calcd for $\text{C}_{15}\text{H}_{11}\text{F}_3\text{N}_4$ (positive mode) 304.2, found 304.6.

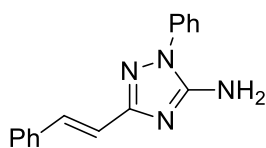


3-ethyl-1-phenyl-1H-1,2,4-triazol-5-amine, **3aw**, mp 114-116 °C, yellow solid,

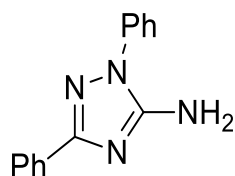
^1H NMR (400 MHz, $\text{DMSO-}d_6$) δ 7.54 – 7.45 (m, 4H), 7.36 – 7.29 (m, 1H), 6.32 (s, 2H), 2.47 (q, J = 7.6 Hz, 2H), 1.18 (t, J = 7.6 Hz, 3H). ^{13}C NMR (101 MHz, $\text{DMSO-}d_6$) δ 162.60, 155.14, 137.93, 129.78, 126.97, 122.79, 21.81, 12.76. LCMS (ESI) calcd for $\text{C}_{10}\text{H}_{12}\text{N}_4$ (positive mode) 188.2, found 188.7.



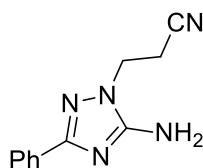
3-phenethyl-1-phenyl-1H-1,2,4-triazol-5-amine, **3ax**, yellow oil, ^1H NMR (400 MHz, $\text{DMSO-}d_6$) δ 7.59 – 7.43 (m, 4H), 7.38 – 7.23 (m, 5H), 7.23 – 7.14 (m, 1H), 6.37 (s, 2H), 2.97 (dd, J = 9.5, 6.5 Hz, 2H), 2.82 – 2.70 (m, 2H). ^{13}C NMR (101 MHz, $\text{DMSO-}d_6$) δ 160.95, 155.18, 141.98, 137.89, 129.80, 128.75, 127.03, 126.35, 122.80, 33.90, 30.35. LCMS (ESI) calcd for $\text{C}_{16}\text{H}_{16}\text{N}_4$ (positive mode) 264.3, found 264.7.



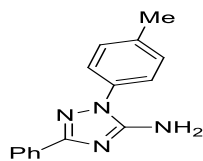
1-phenyl-3-styryl-1H-1,2,4-triazol-5-amine, **3ay**, mp 203-205 °C, yellow solid, ^1H NMR (400 MHz, $\text{DMSO-}d_6$) δ 7.65 – 7.61 (m, 2H), 7.61 – 7.56 (m, 2H), 7.53 (dd, J = 8.7, 7.1 Hz, 2H), 7.39 (td, J = 6.6, 5.9, 2.3 Hz, 3H), 7.34 – 7.28 (m, 2H), 7.01 (d, J = 16.2 Hz, 1H), 6.53 (s, 2H). ^{13}C NMR (101 MHz, $\text{DMSO-}d_6$) δ 158.75, 155.40, 137.70, 136.70, 132.80, 129.91, 129.25, 128.66, 127.42, 127.28, 123.04, 119.03. LCMS (ESI) calcd for $\text{C}_{16}\text{H}_{14}\text{N}_4$ (positive mode) 262.3, found 262.6.



3-(furan-2-yl)-1-phenyl-1H-1,2,4-triazol-5-amine, **3az**, mp 149-151 °C, yellow solid, ^1H NMR (400 MHz, $\text{DMSO-}d_6$) δ 7.76 (dd, J = 1.8, 0.8 Hz, 1H), 7.59 (dd, J = 8.6, 1.4 Hz, 2H), 7.53 (dd, J = 8.8, 7.0 Hz, 2H), 7.41 (d, J = 7.2 Hz, 1H), 6.82 (dd, J = 3.4, 0.9 Hz, 1H), 6.62 – 6.58 (m, 3H). ^{13}C NMR (101 MHz, $\text{DMSO-}d_6$) δ 155.54, 152.42, 147.15, 143.91, 137.54, 129.93, 127.63, 123.27, 112.00, 109.27. LCMS (ESI) calcd for $\text{C}_{12}\text{H}_{10}\text{N}_4\text{O}$ (positive mode) 226.2, found 226.6.



3-(5-amino-3-phenyl-1H-1,2,4-triazol-1-yl)propanenitrile, **3ba**, mp 239-242 °C, white solid, ^1H NMR (400 MHz, $\text{DMSO-}d_6$) δ 7.87 (d, J = 7.4 Hz, 1H), 7.49 – 7.33 (m, 2H), 6.49 (s, 1H), 4.26 – 4.15 (m, 1H), 3.04 – 2.95 (m, 1H). ^{13}C NMR (101 MHz, $\text{DMSO-}d_6$) δ 158.17, 156.55, 132.19, 128.98, 128.90, 125.82, 118.91, 41.94, 17.83. LCMS (ESI) calcd for $\text{C}_{11}\text{H}_{11}\text{N}_5$ (positive mode) 213.2, found 213.6.

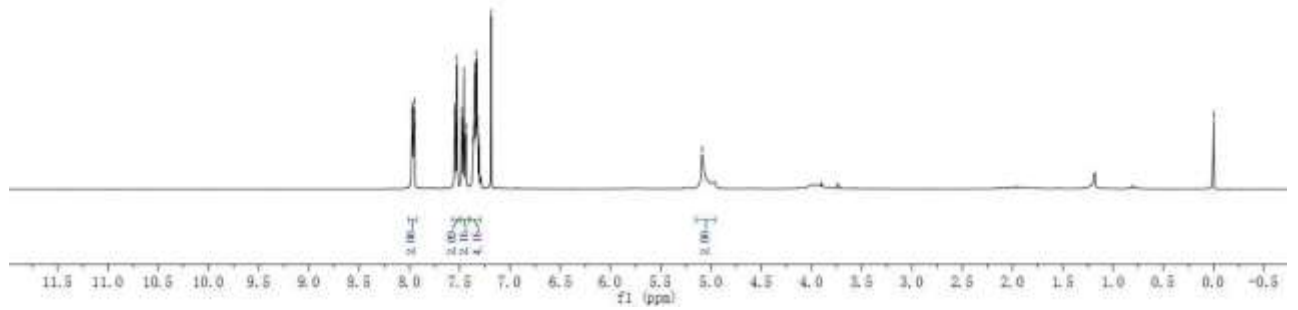
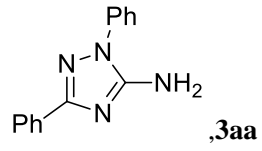


1-(tert-butyl)-3-phenyl-1H-1,2,4-triazol-5-amine, **3bb**, mp 101-104 °C, white

solid, ^1H NMR (400 MHz, $\text{DMSO-}d_6$) δ 7.95 – 7.77 (m, 2H), 7.43 – 7.24 (m, 3H), 5.99 (s, 2H), 1.56 (d, $J = 1.2$ Hz, 9H). ^{13}C NMR (101 MHz, $\text{DMSO-}d_6$) δ 155.26, 132.64, 128.80, 128.53, 125.62, 116.92, 57.55, 28.87. LCMS (ESI) calcd for $\text{C}_{12}\text{H}_{16}\text{N}_4$ (positive mode) 216.2, found 216.7

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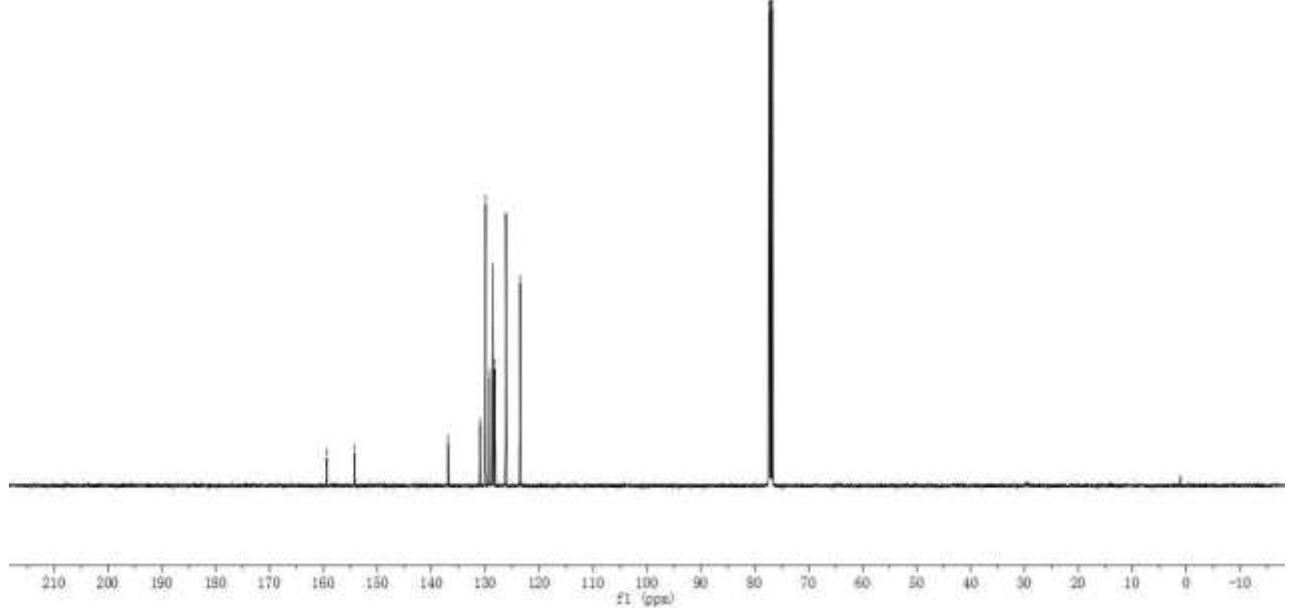
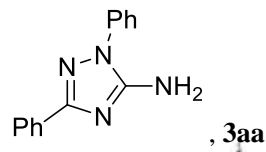
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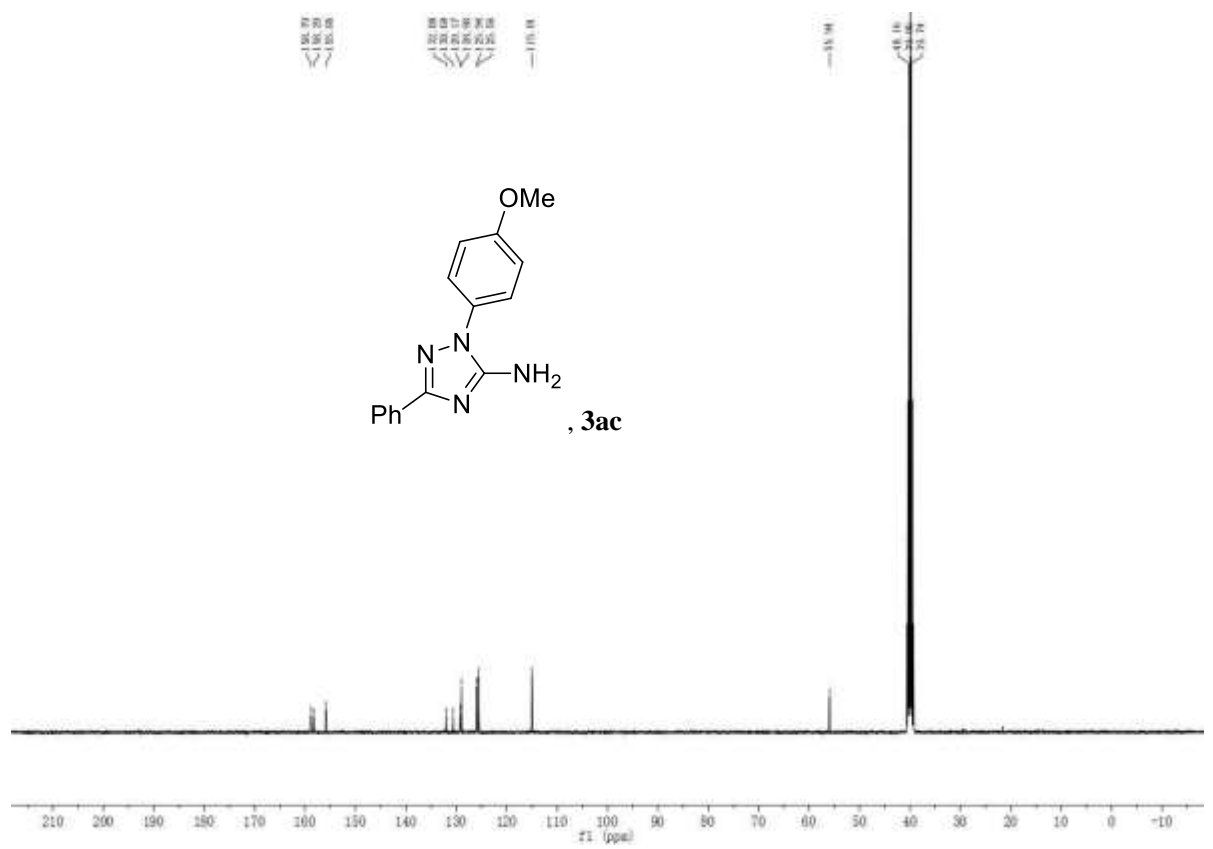
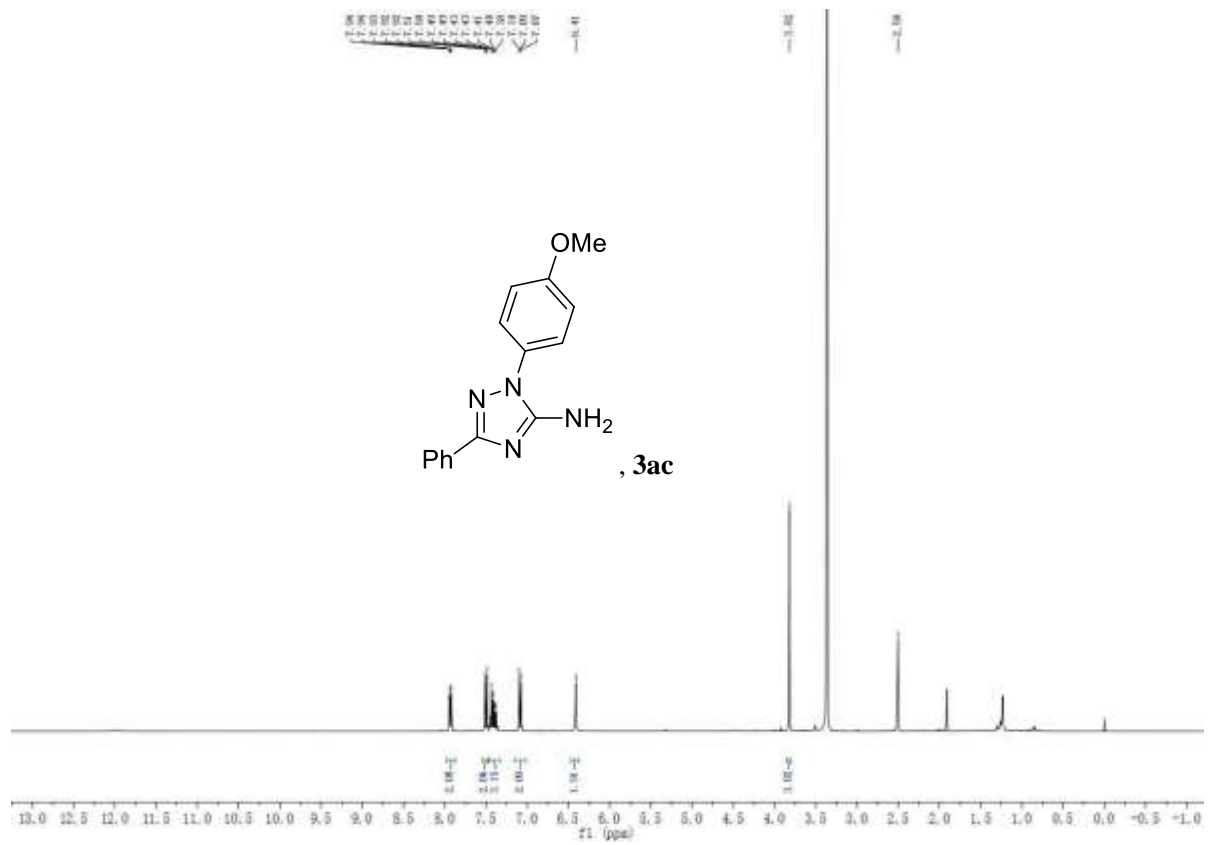


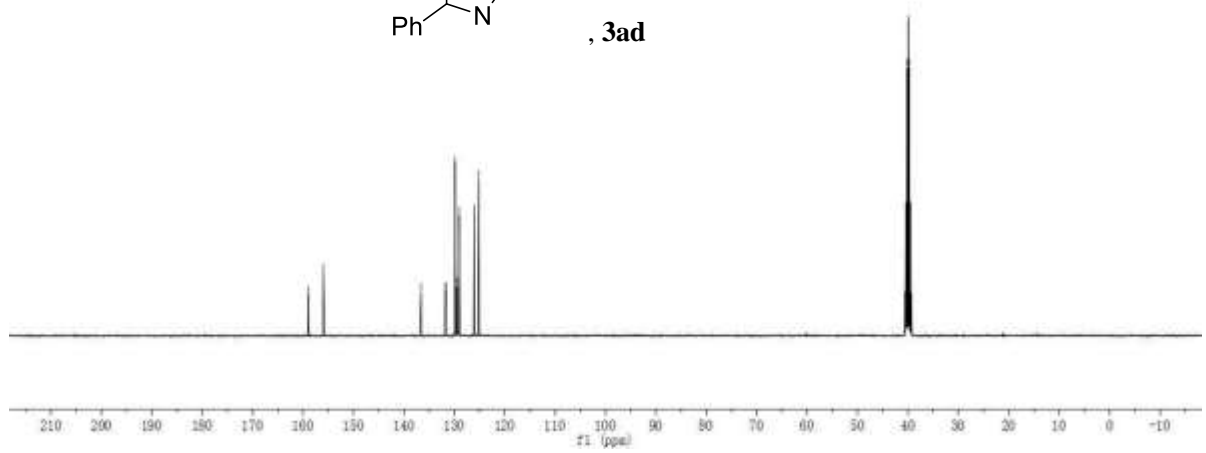
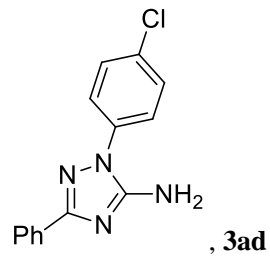
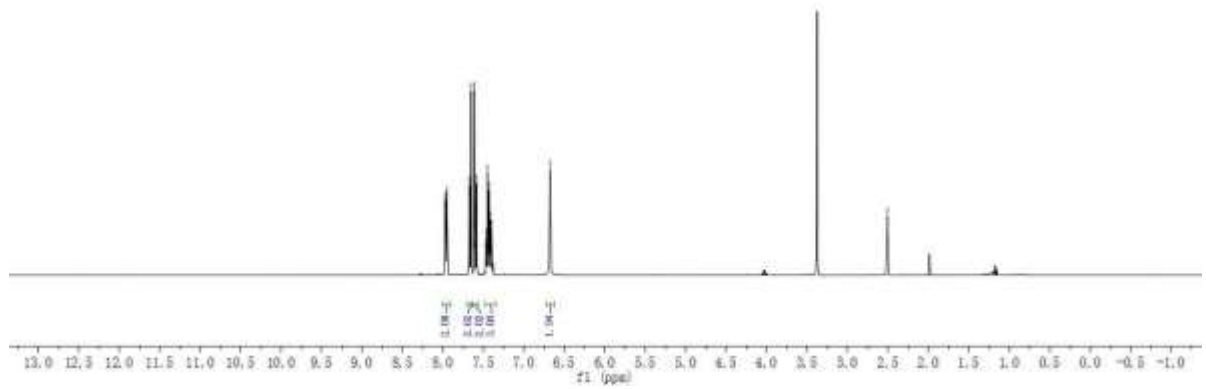
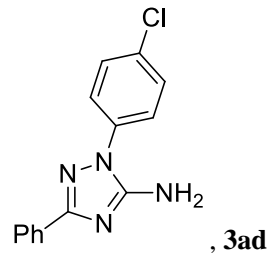
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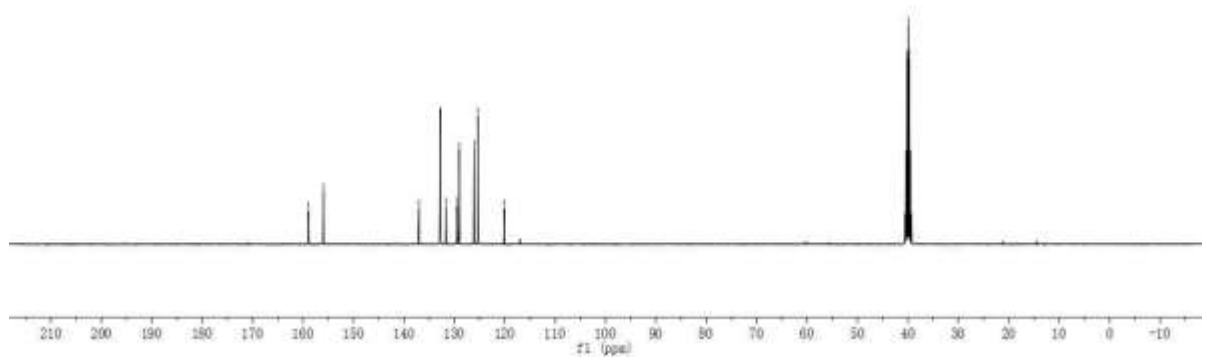
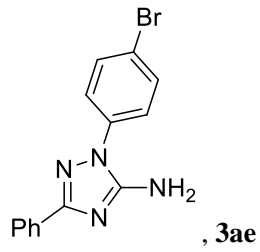
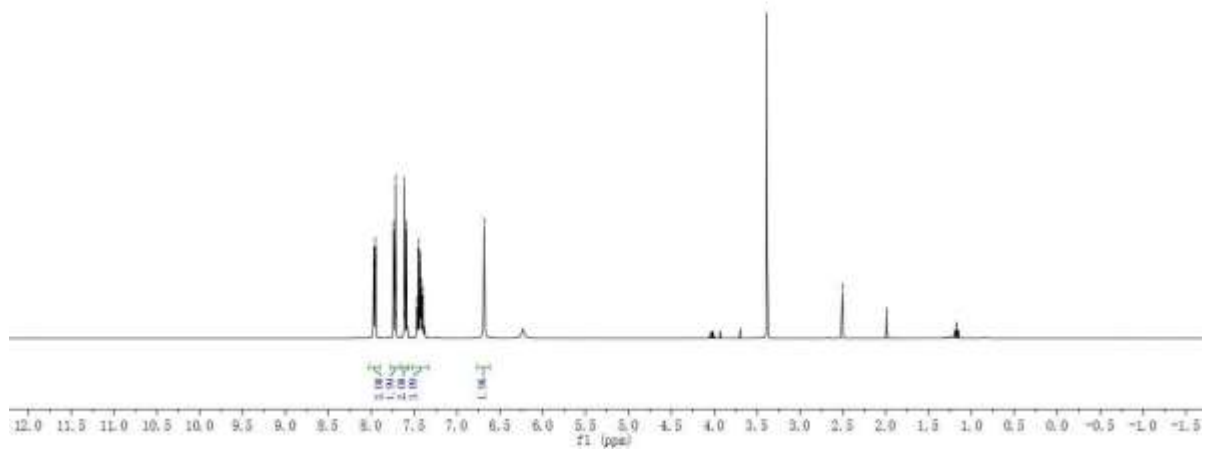
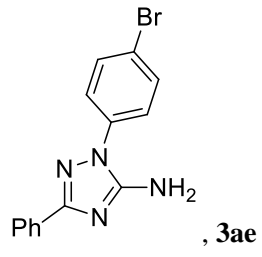
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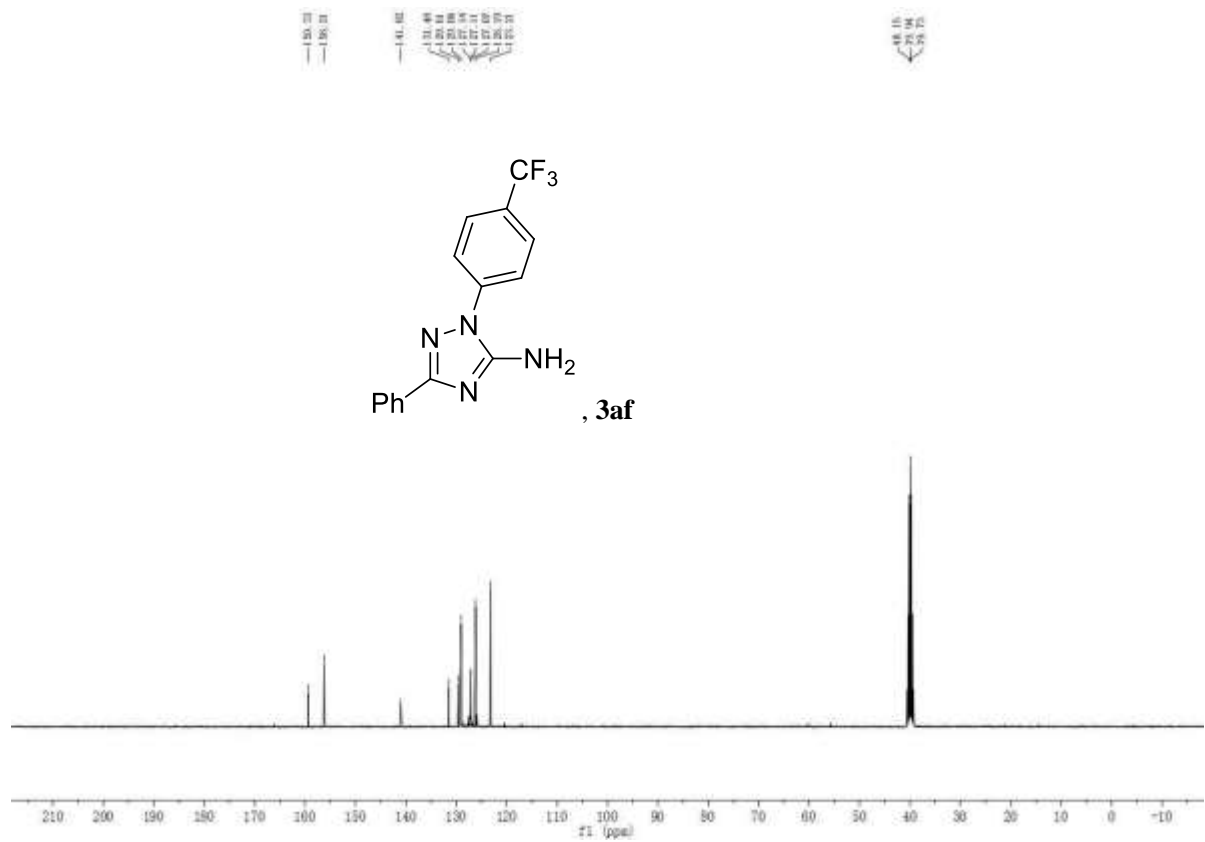
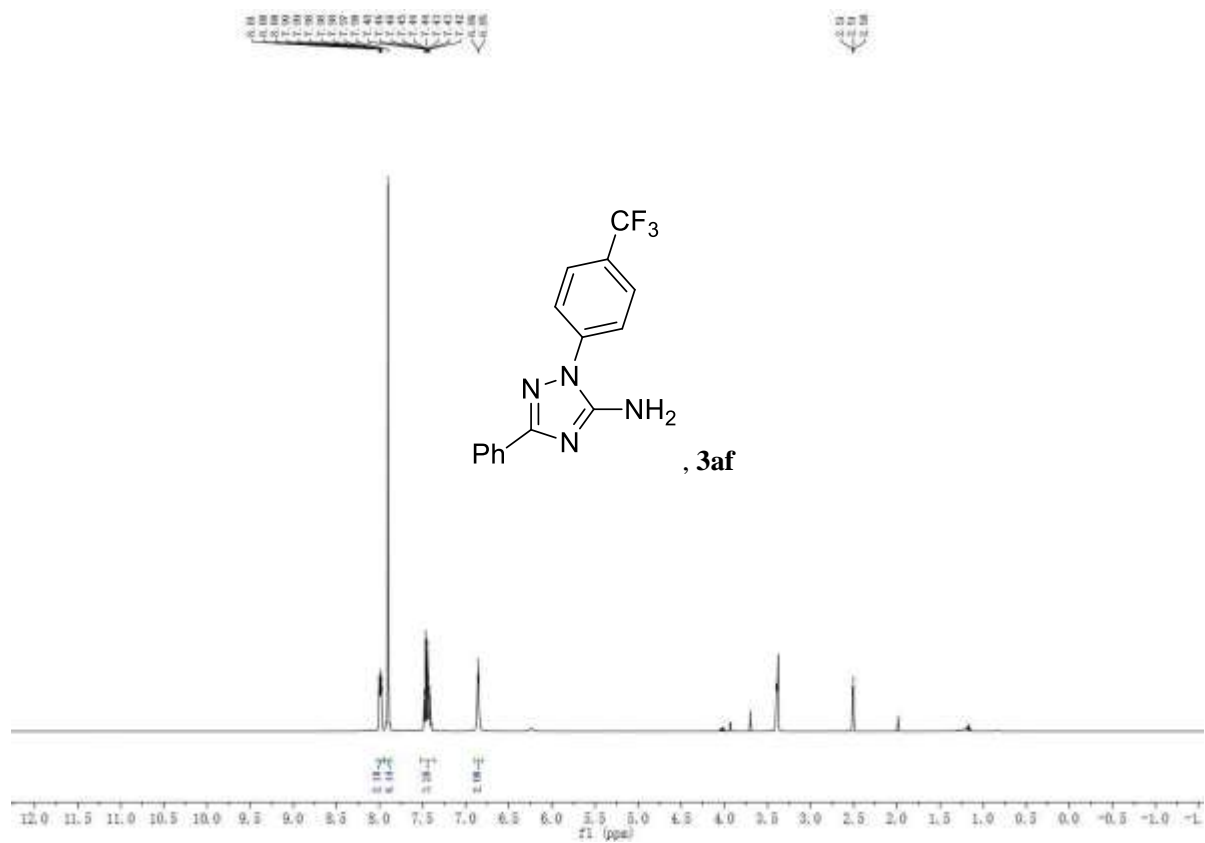
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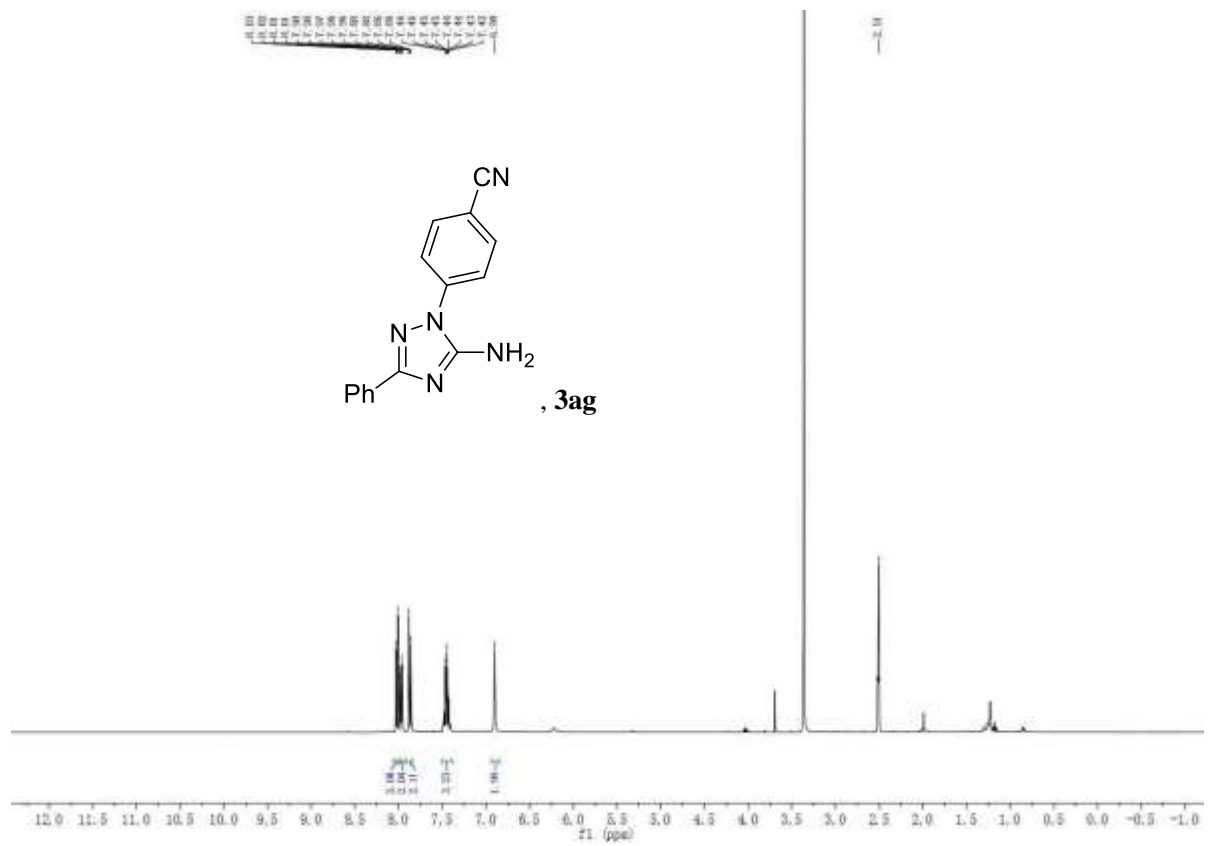
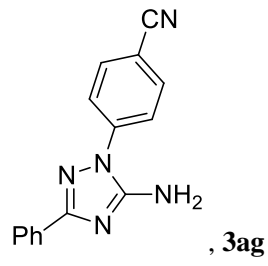
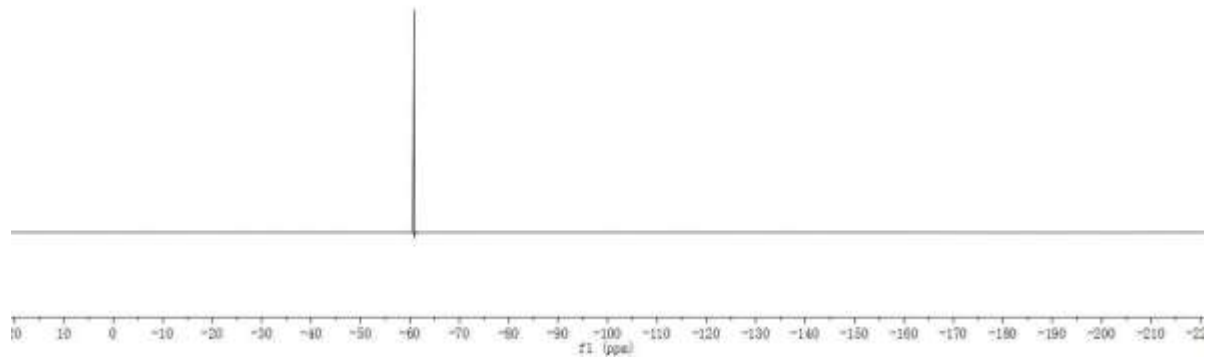
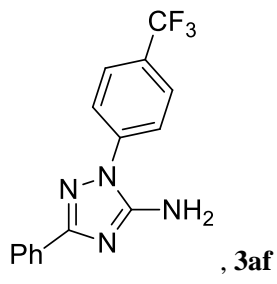


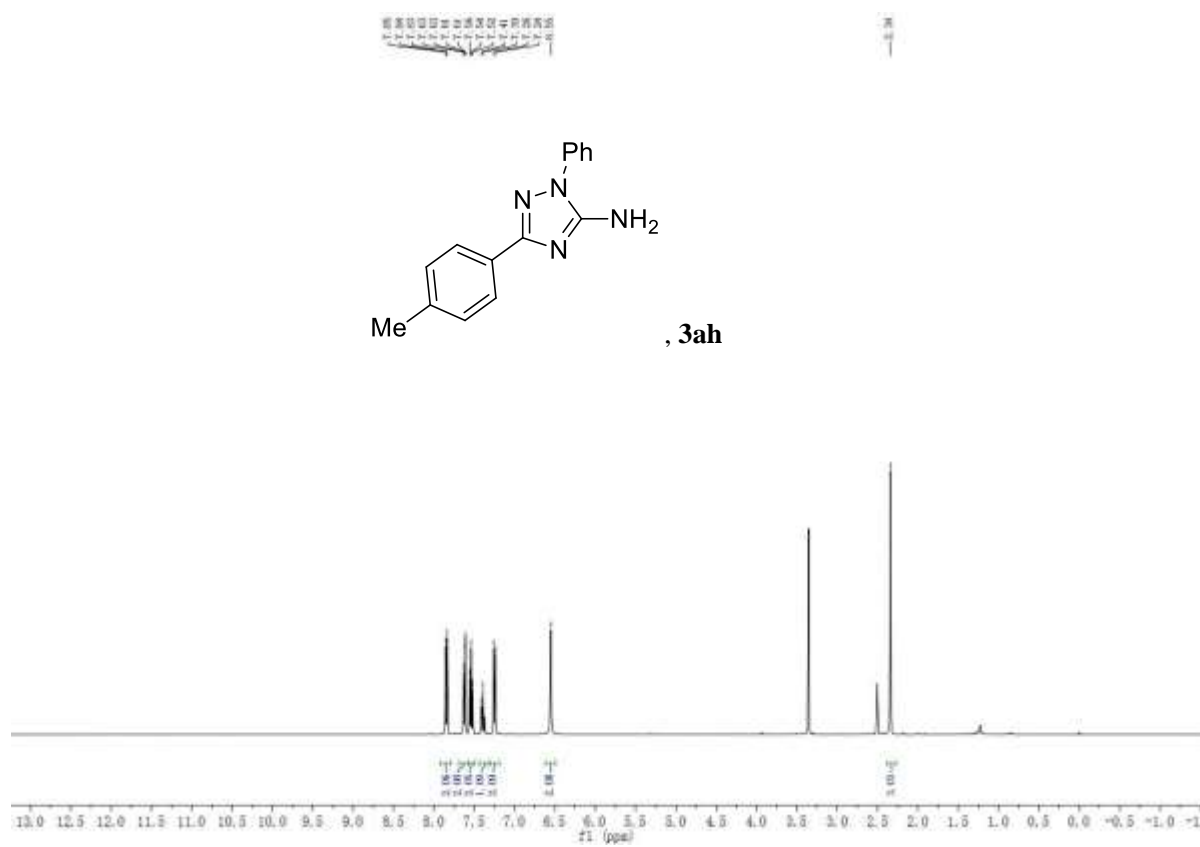
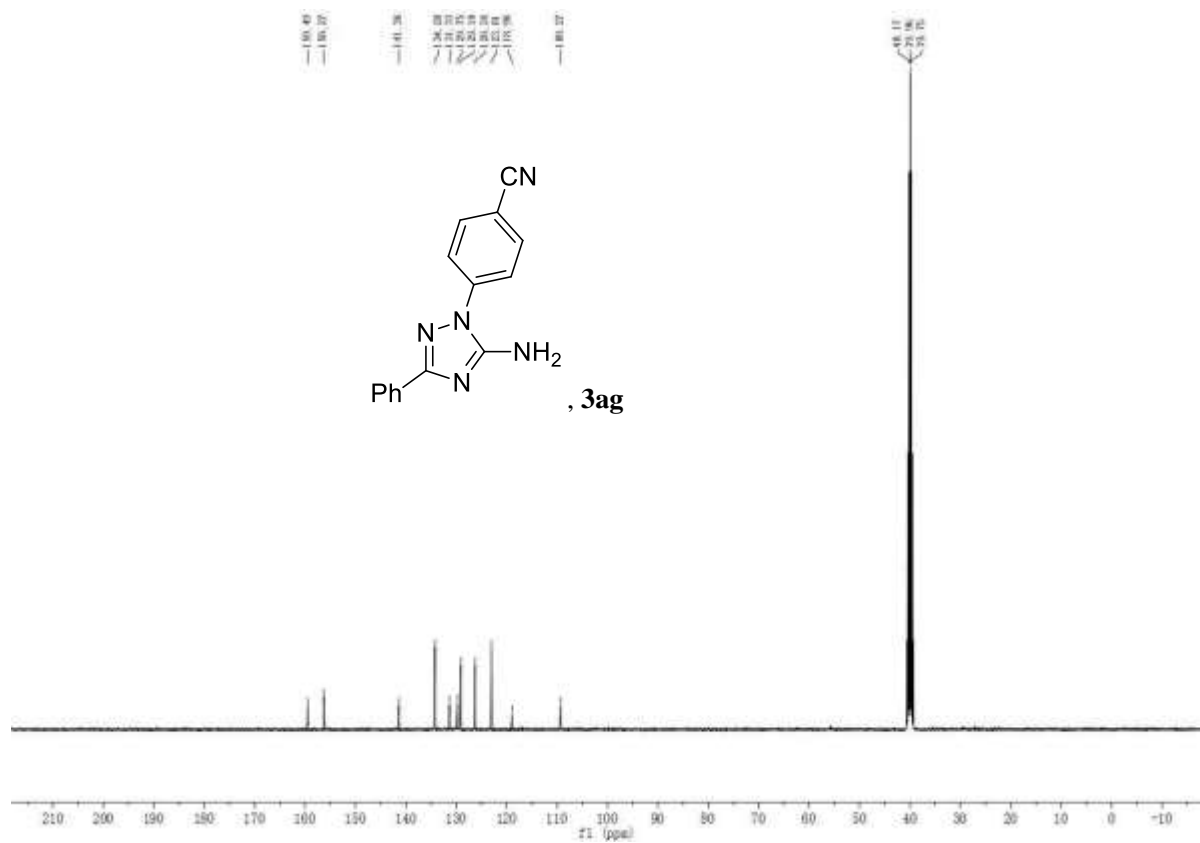








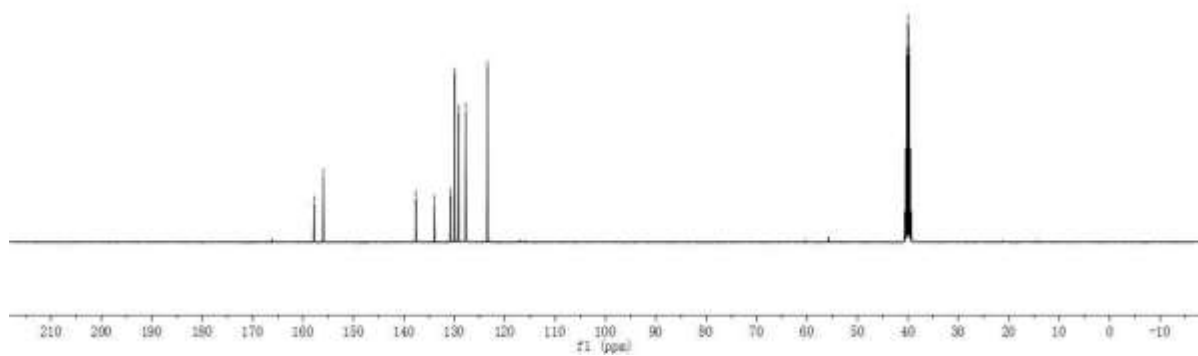
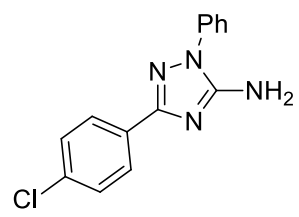




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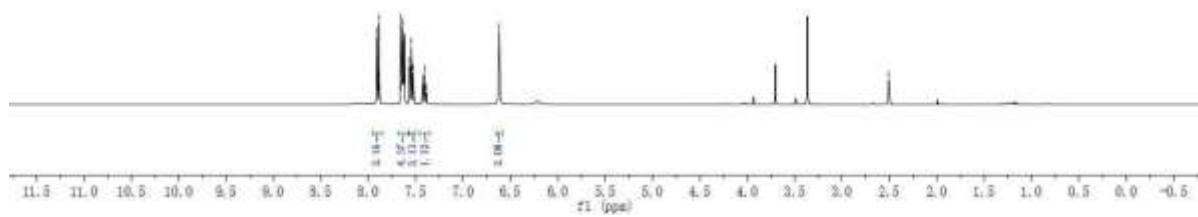
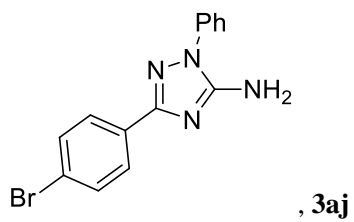
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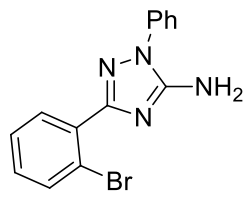
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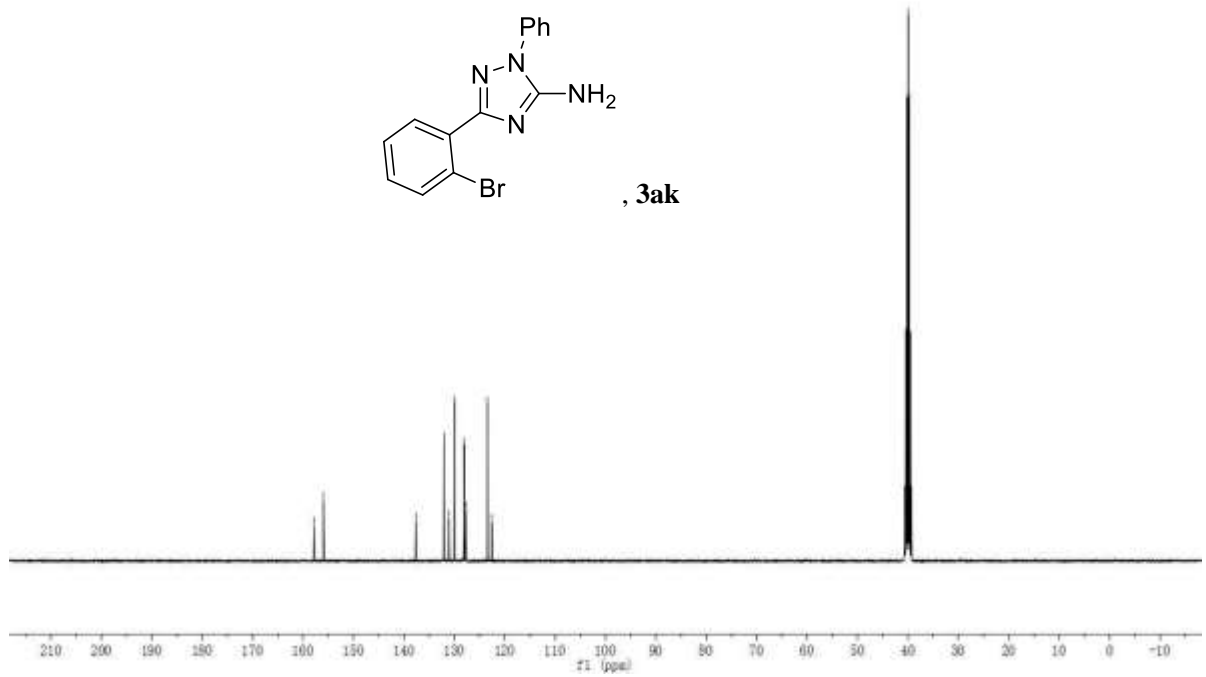
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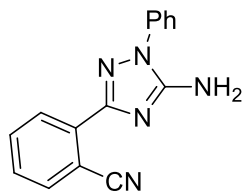


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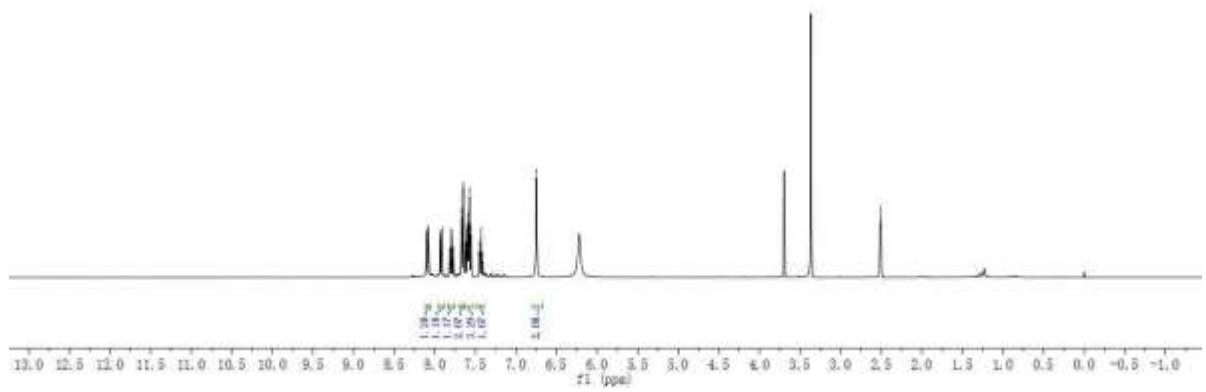


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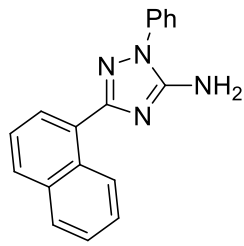
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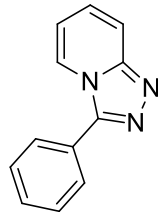
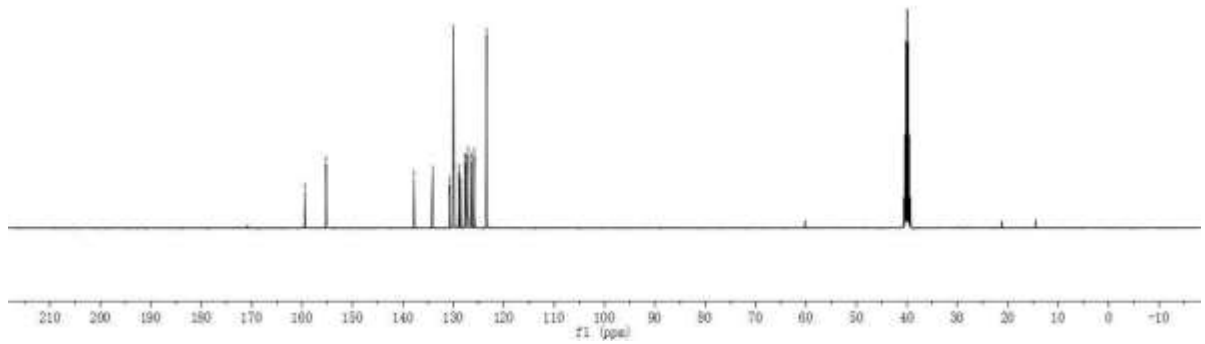
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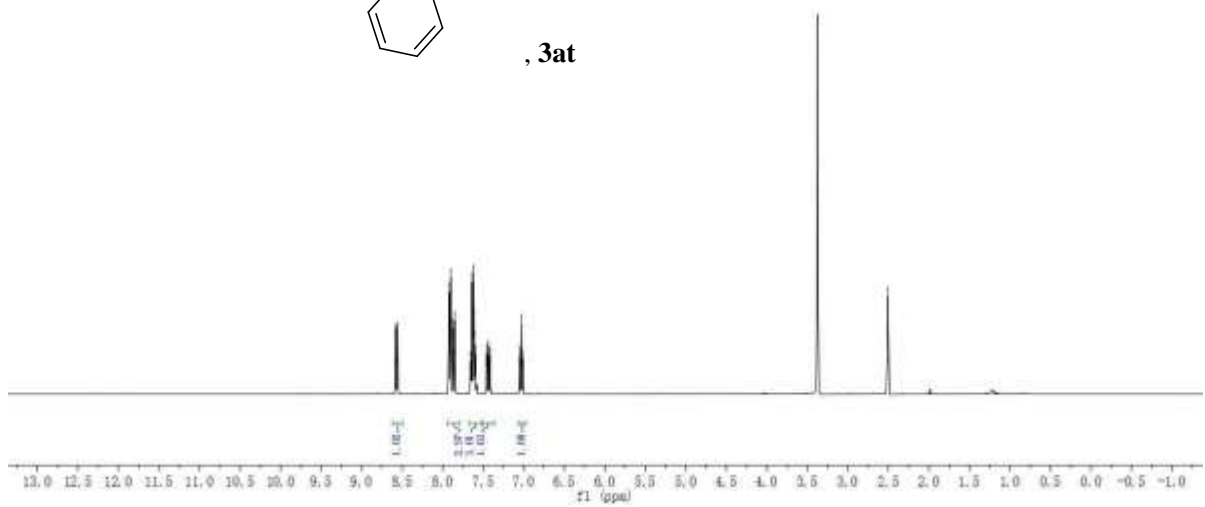
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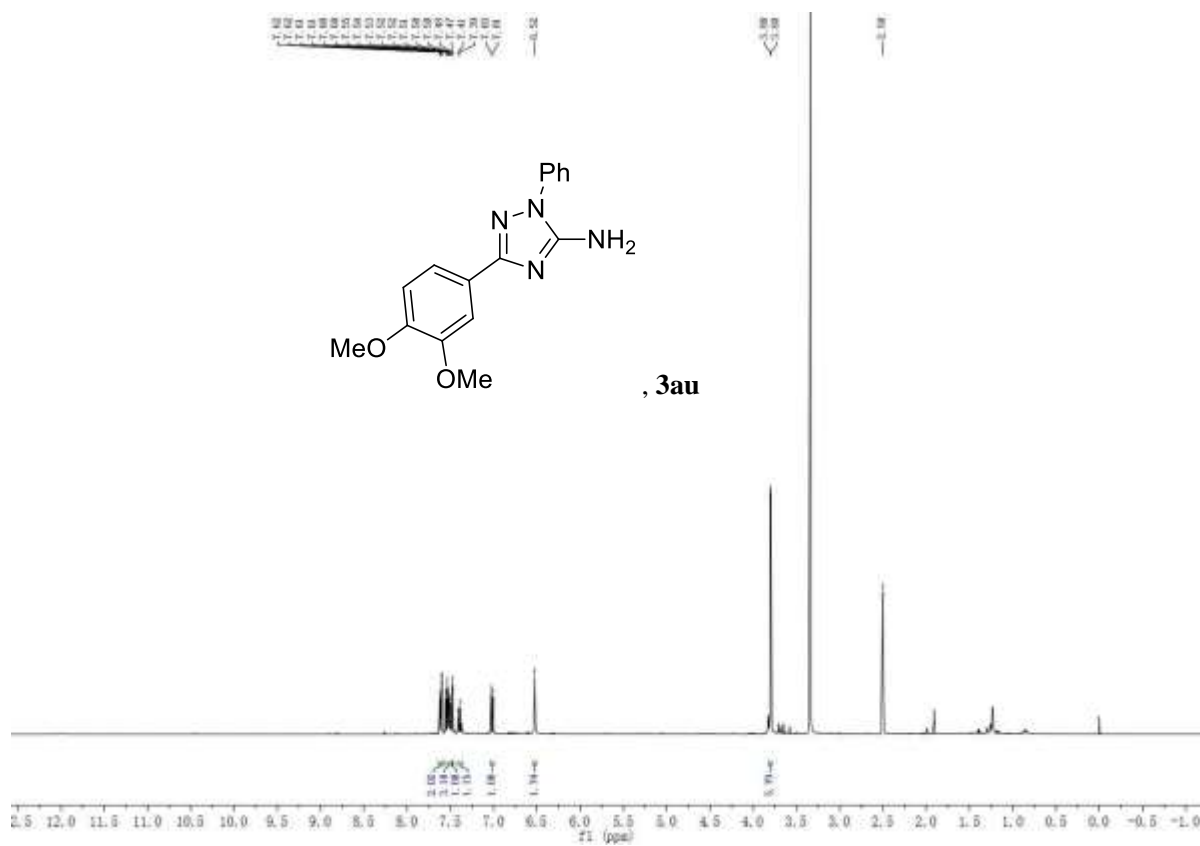
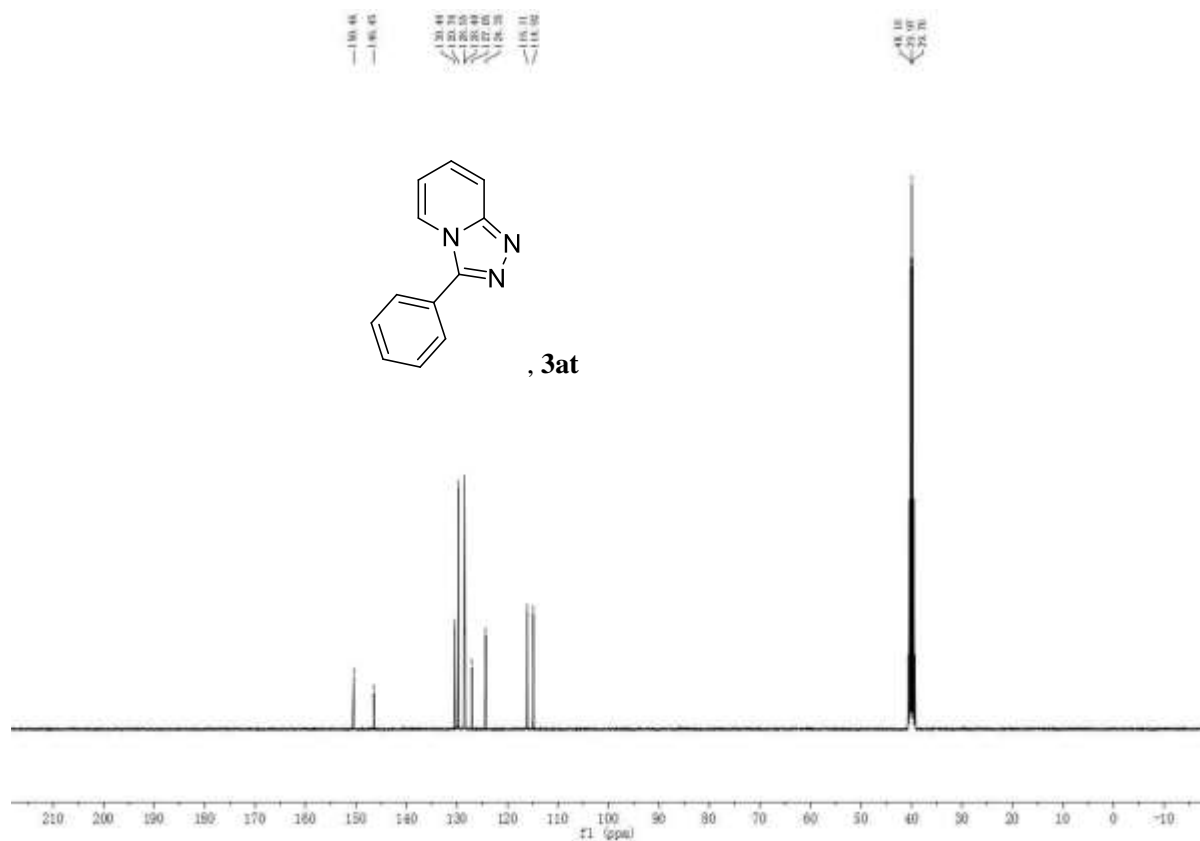


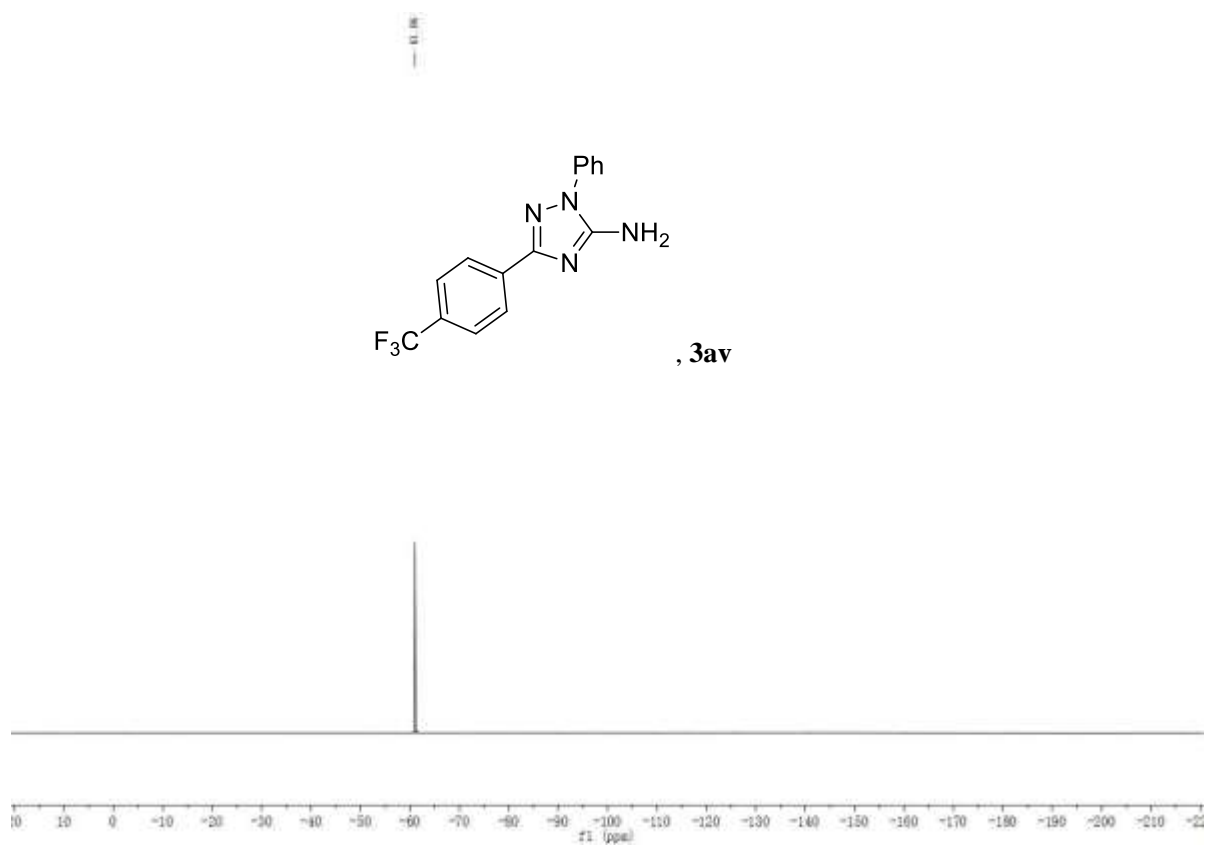
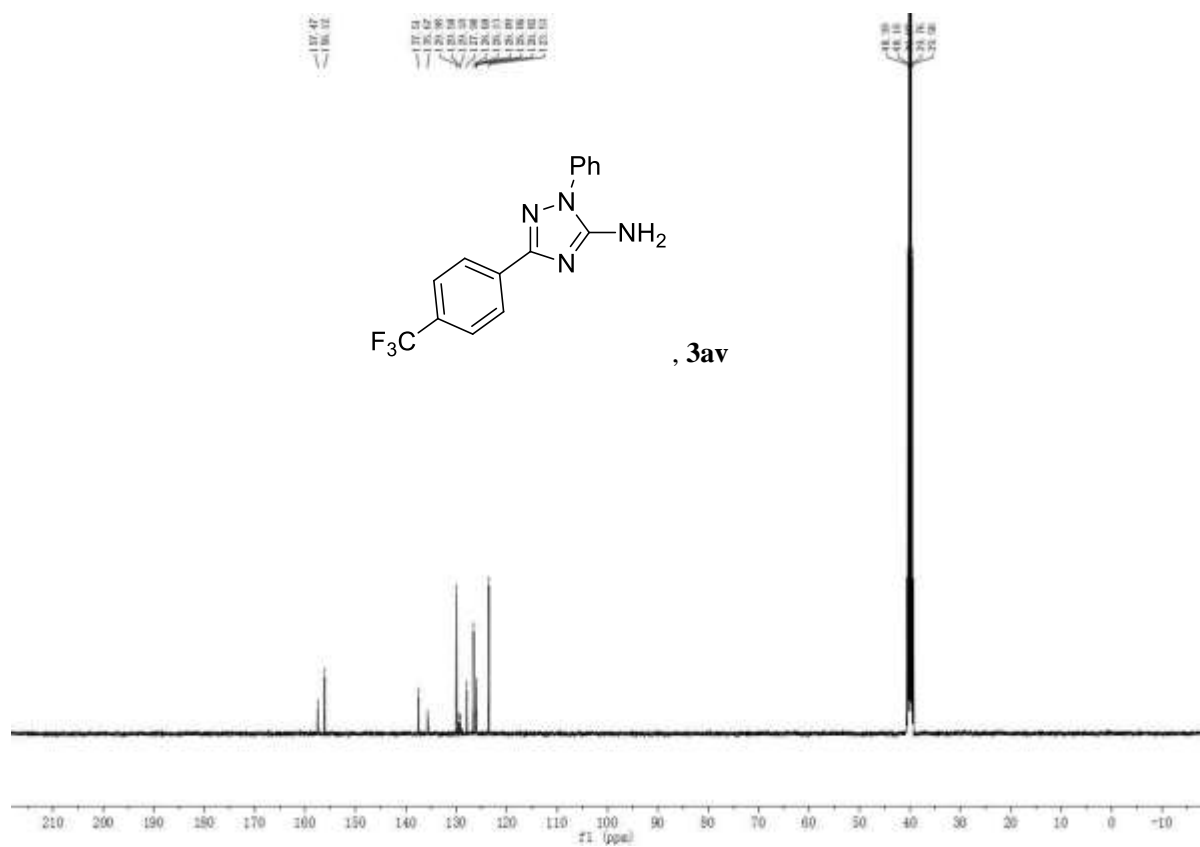
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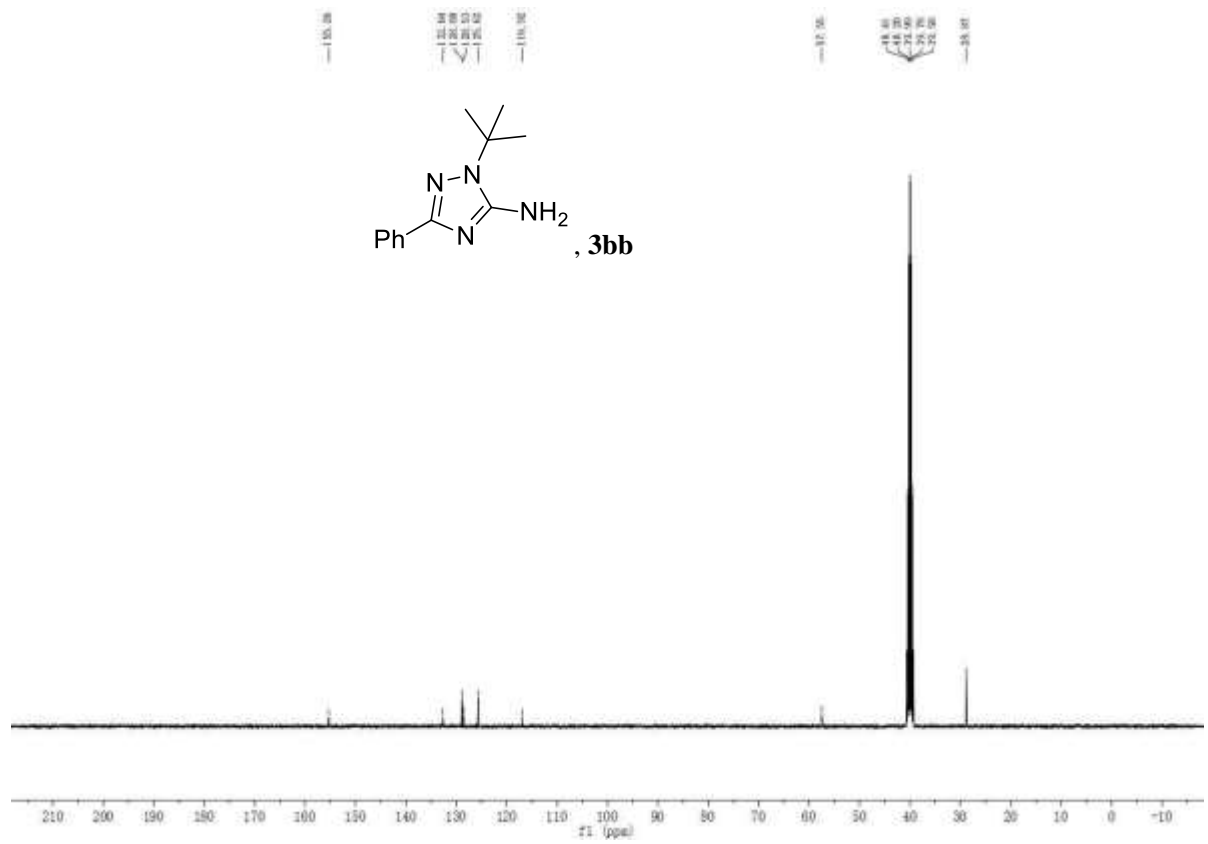
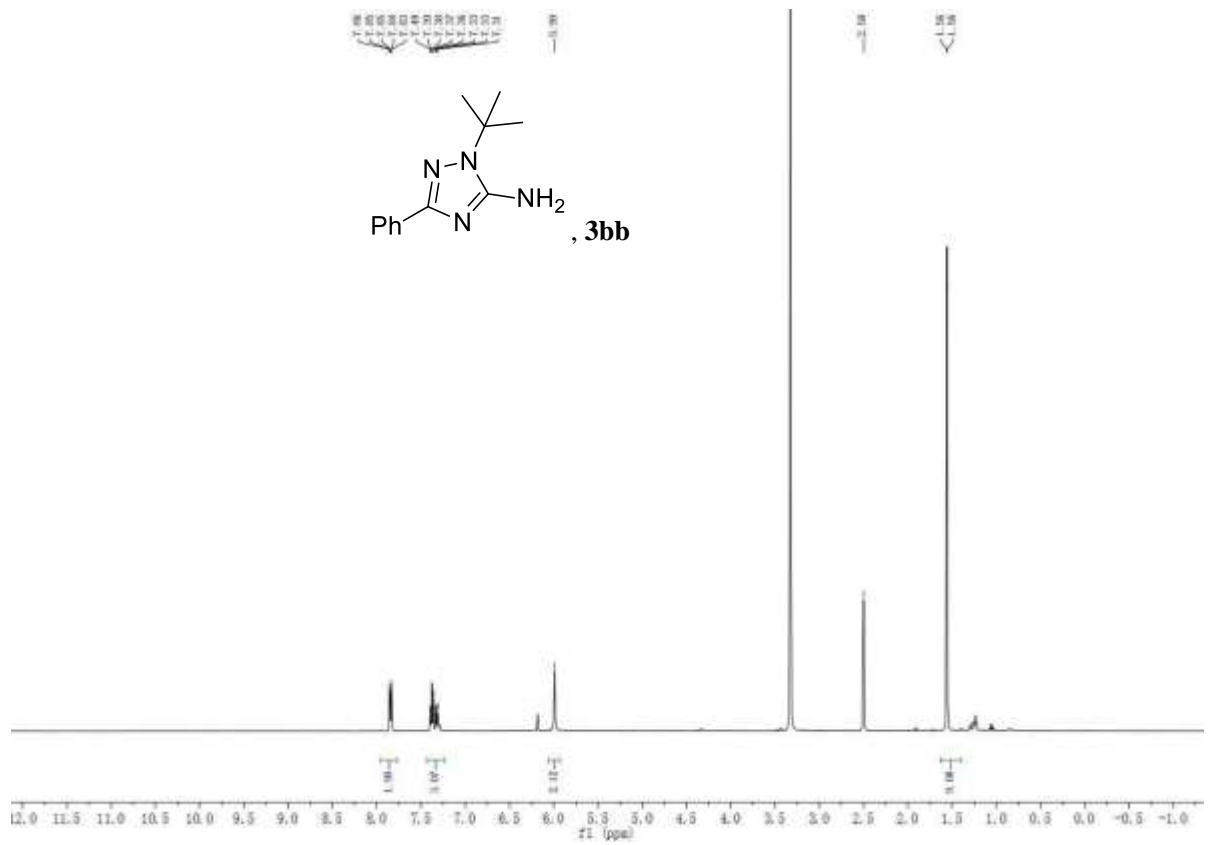


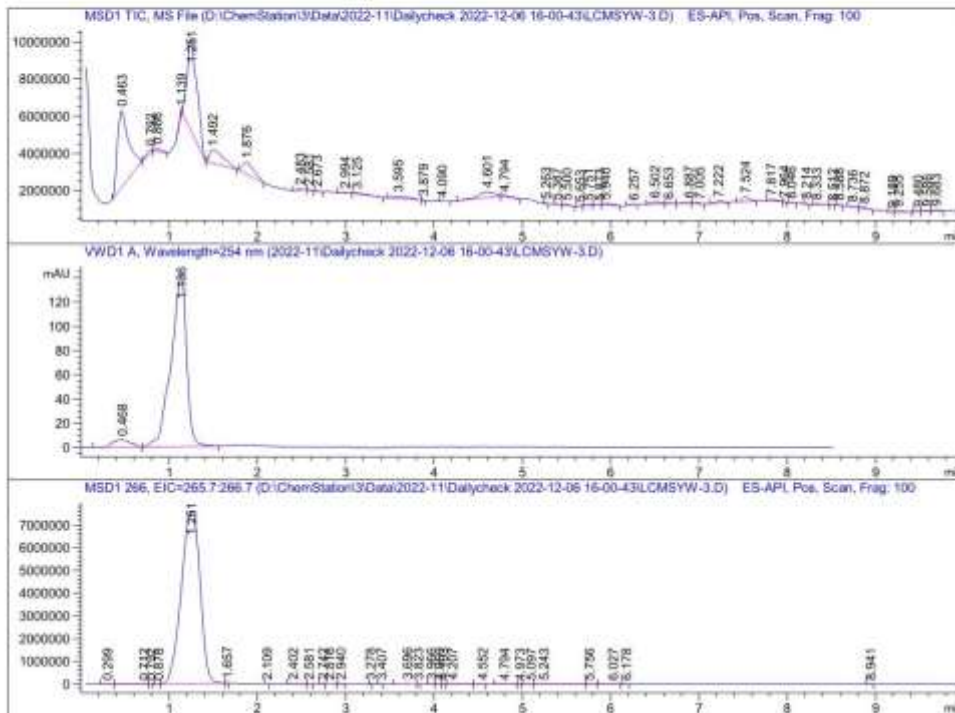
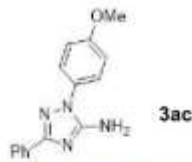
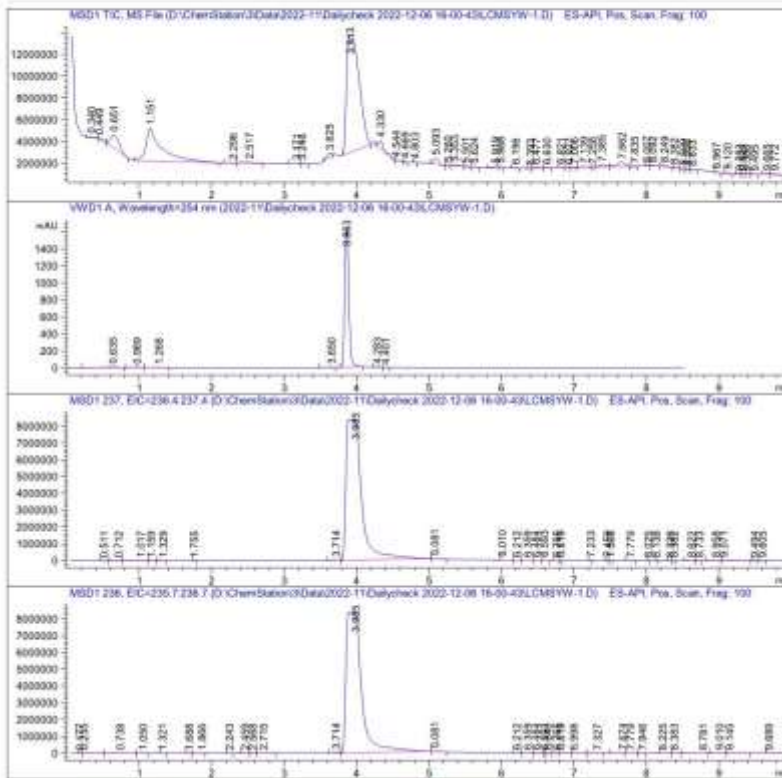
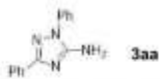
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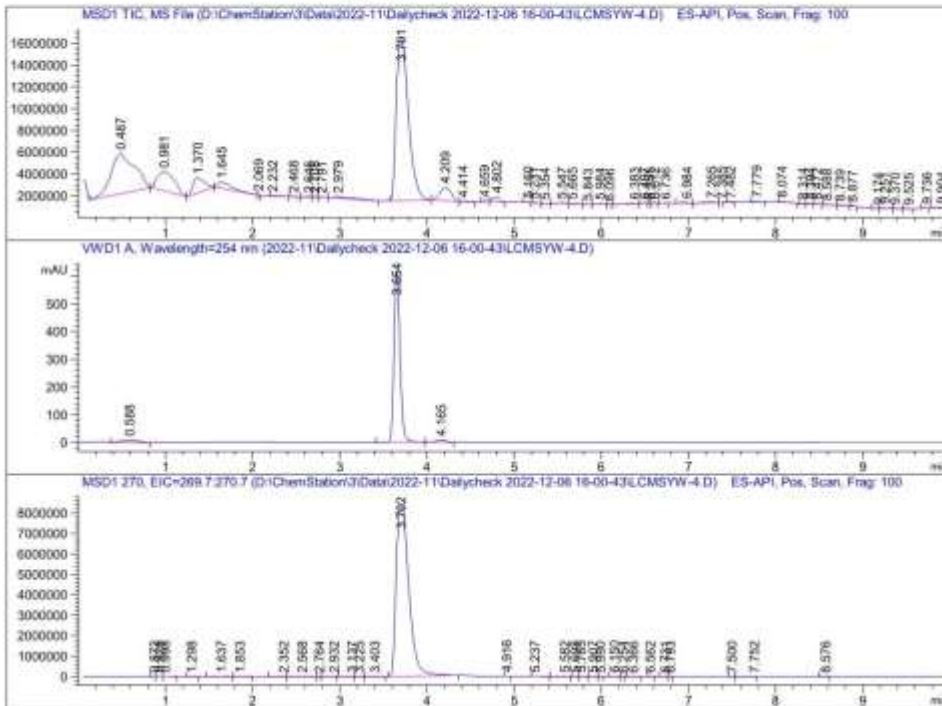
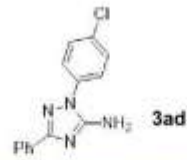
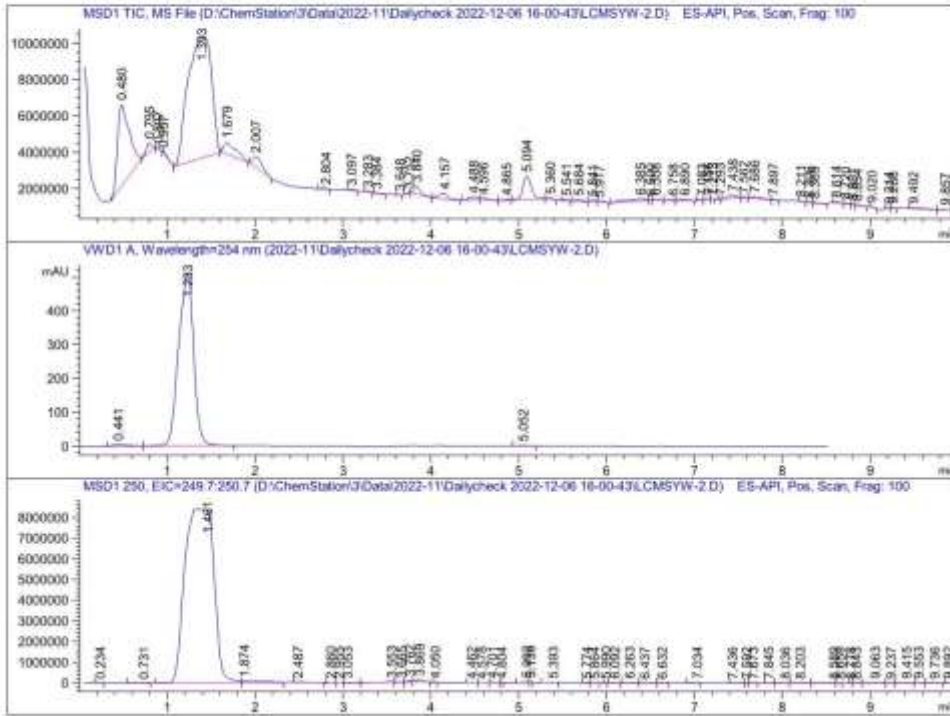
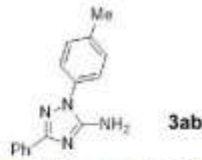


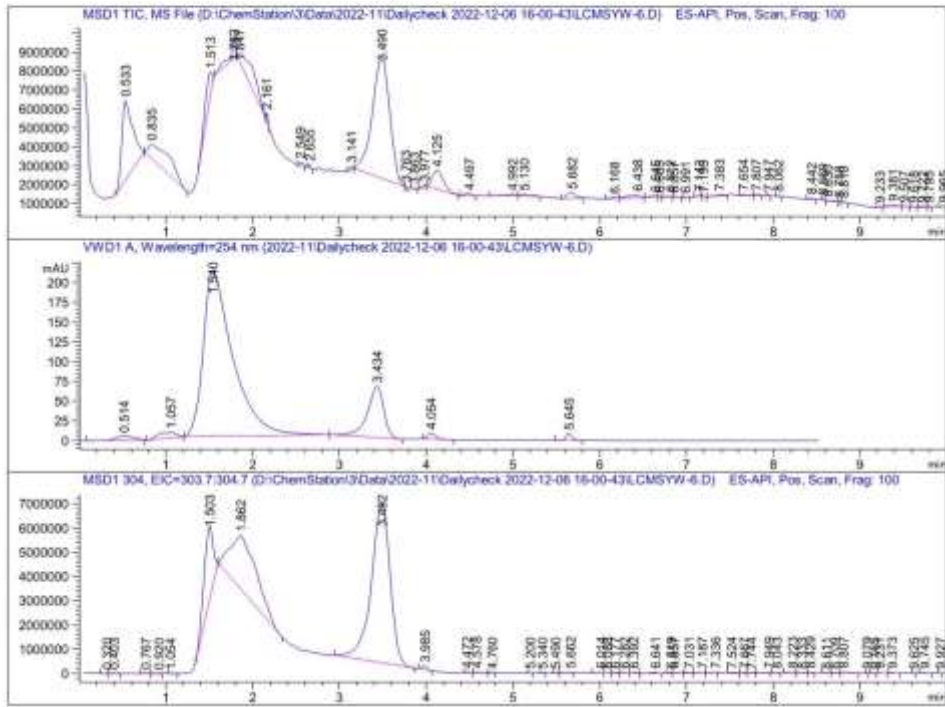
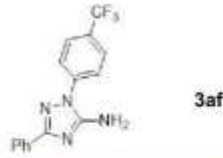
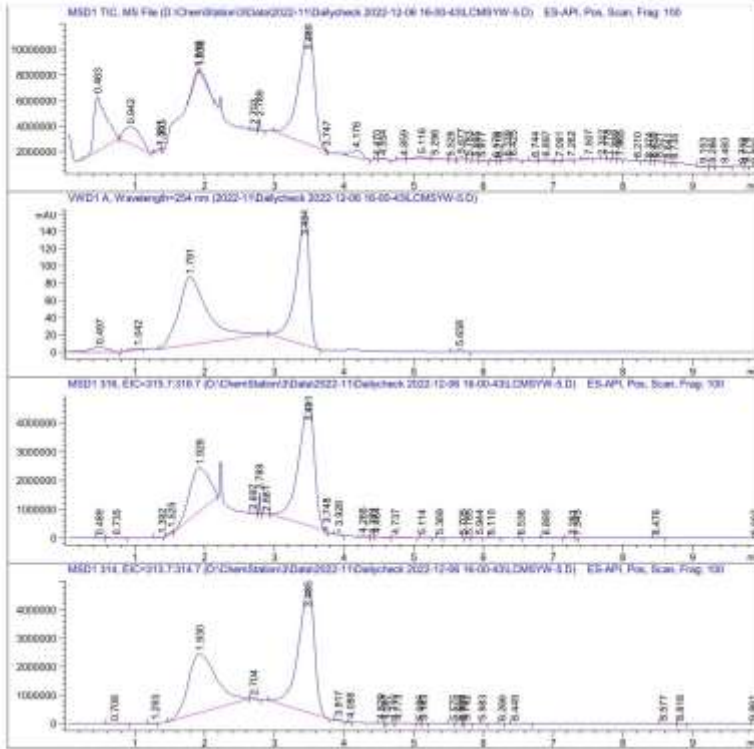
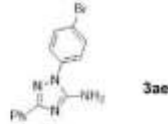


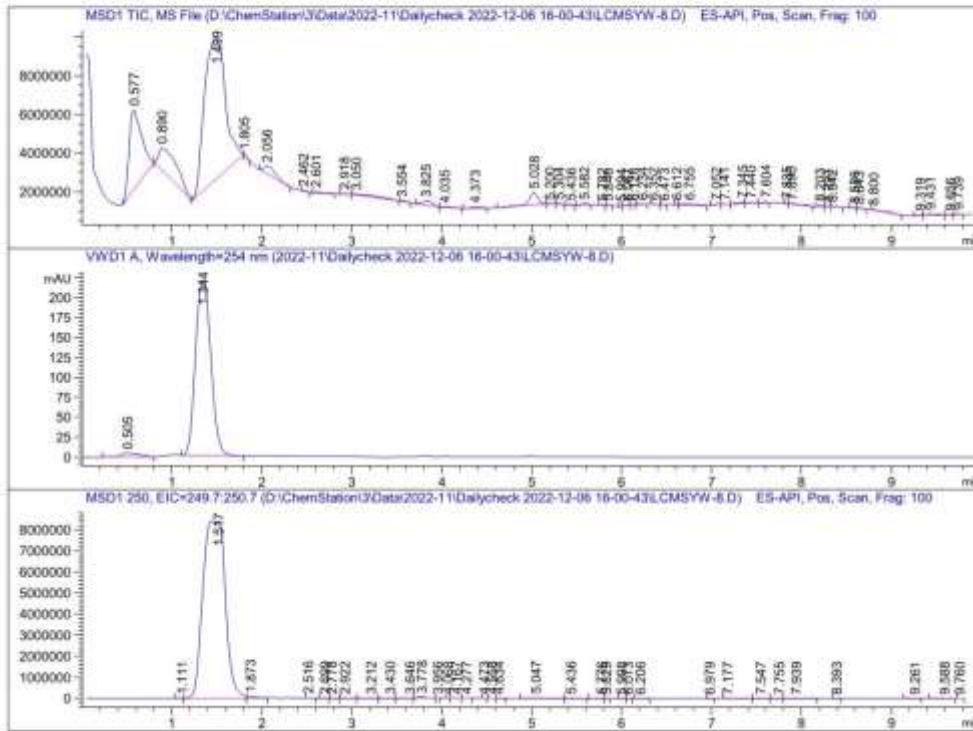
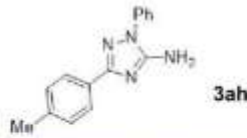
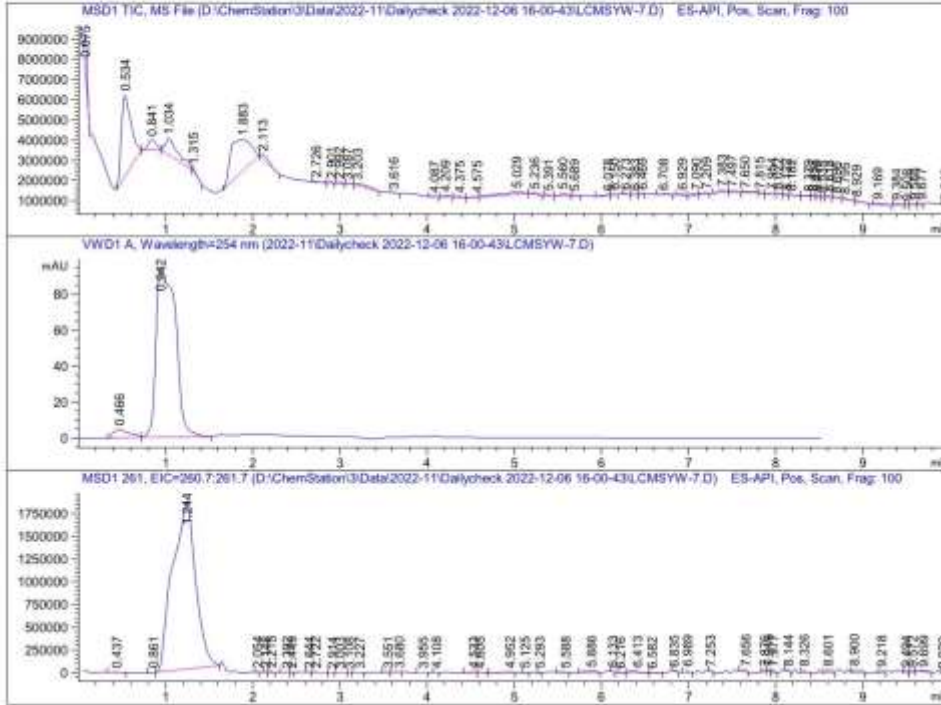
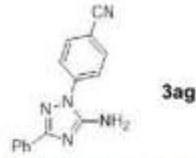


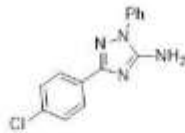




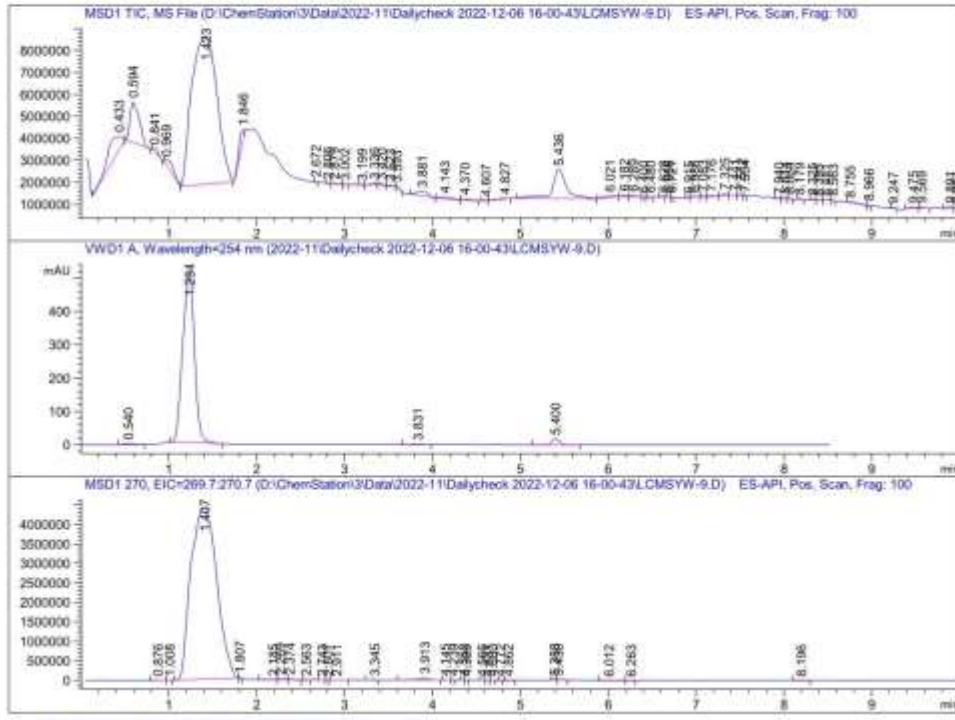


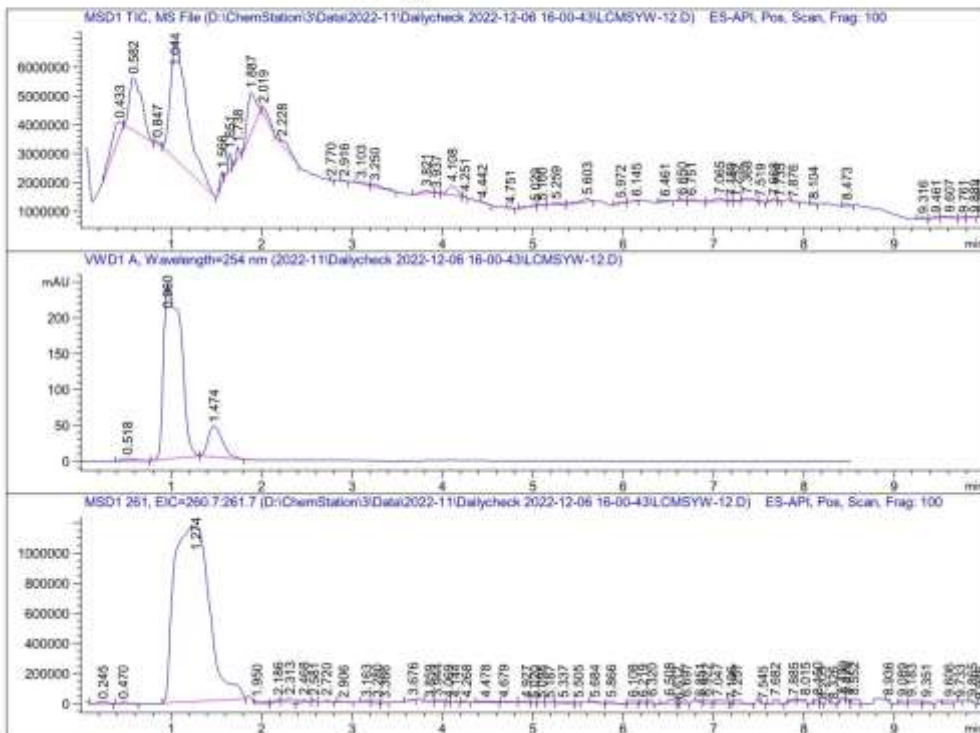
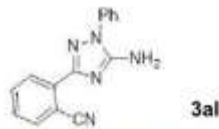
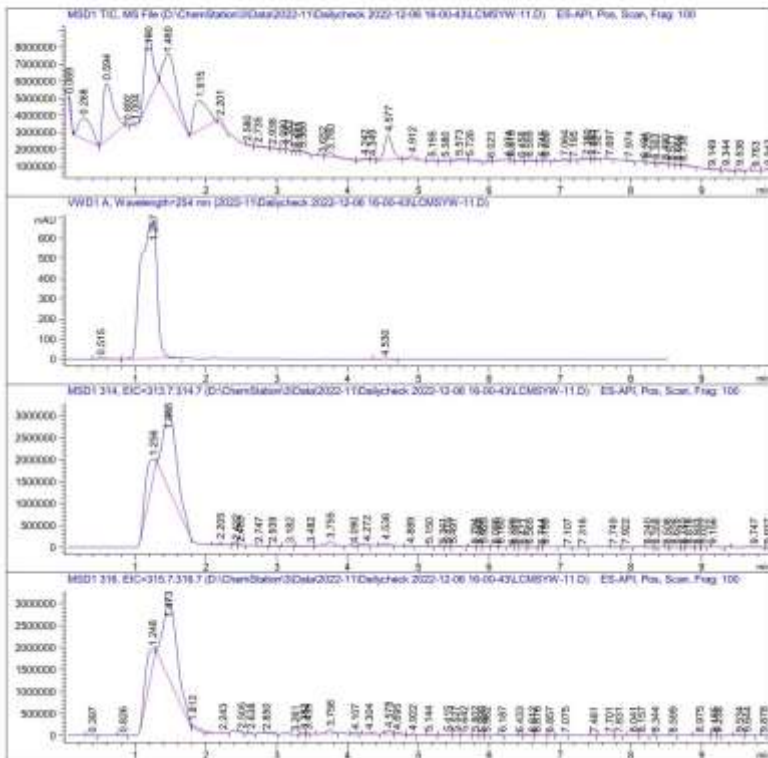
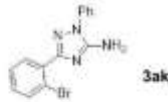


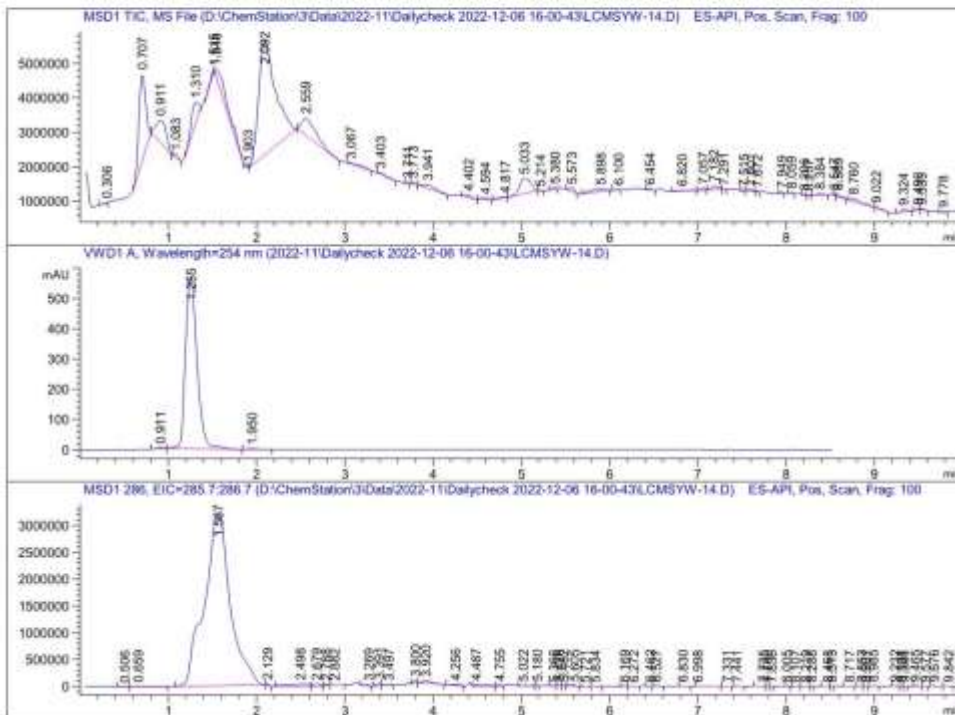
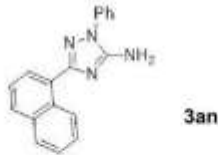
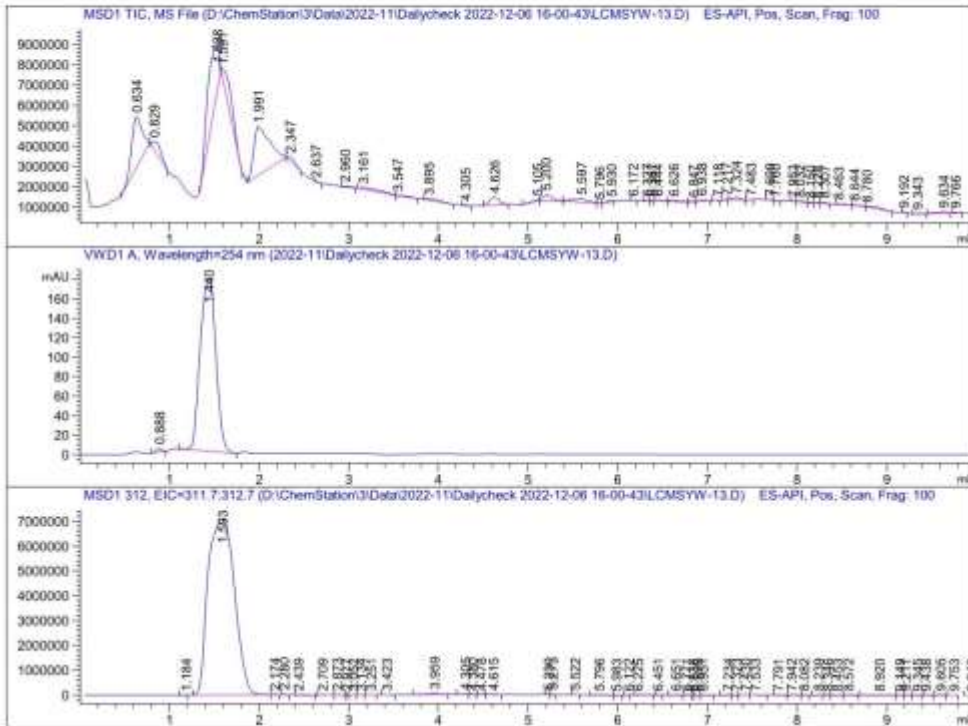
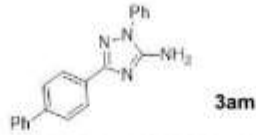


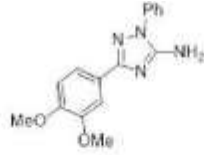


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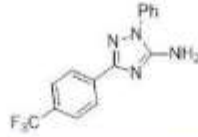
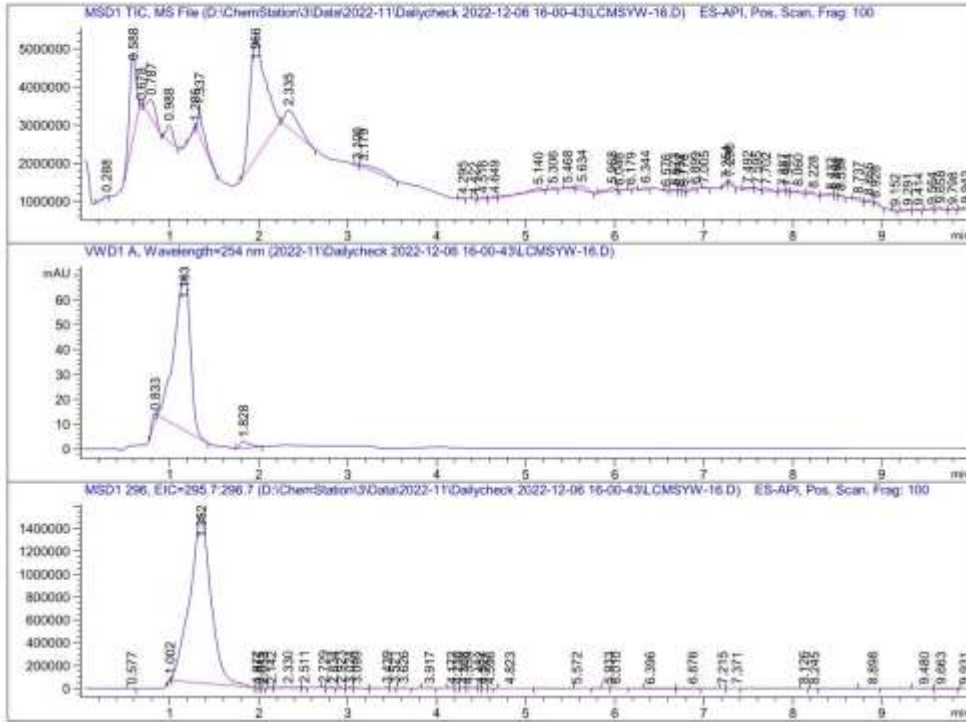




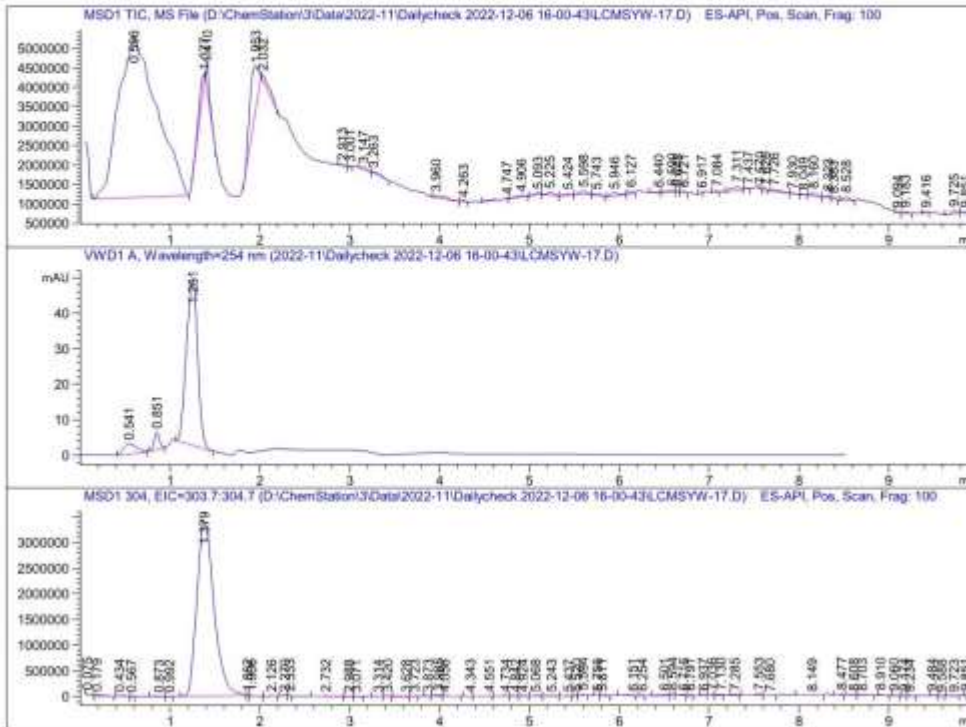


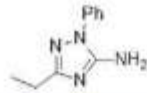


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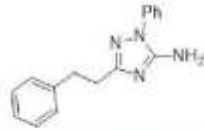
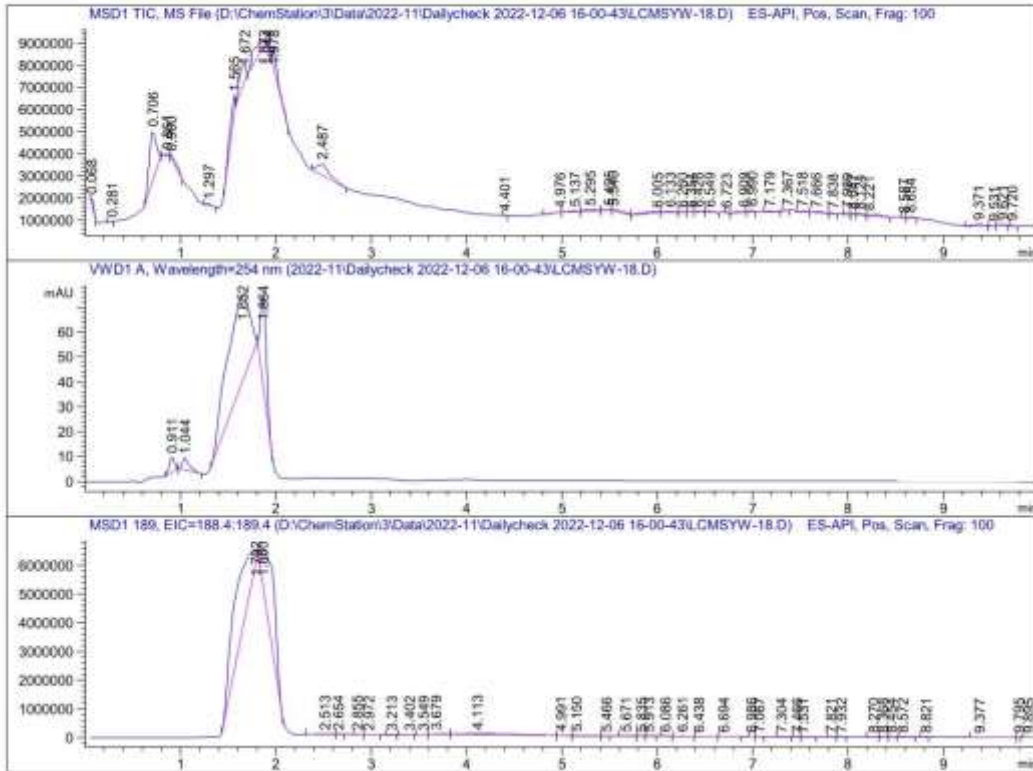


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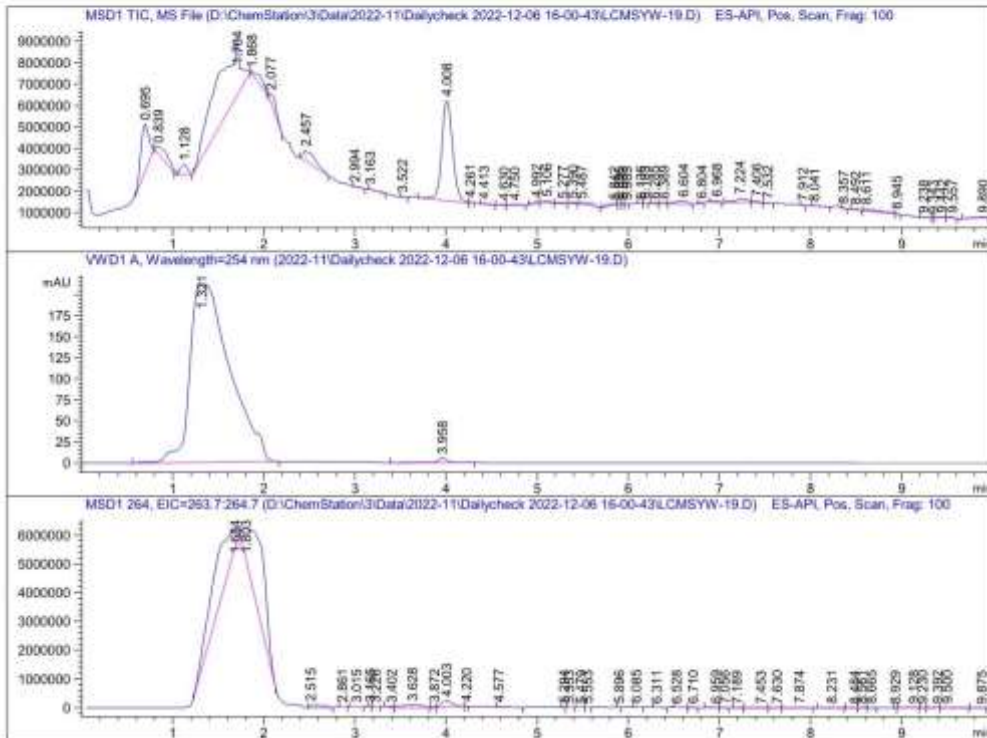


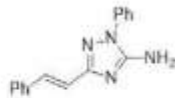


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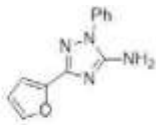
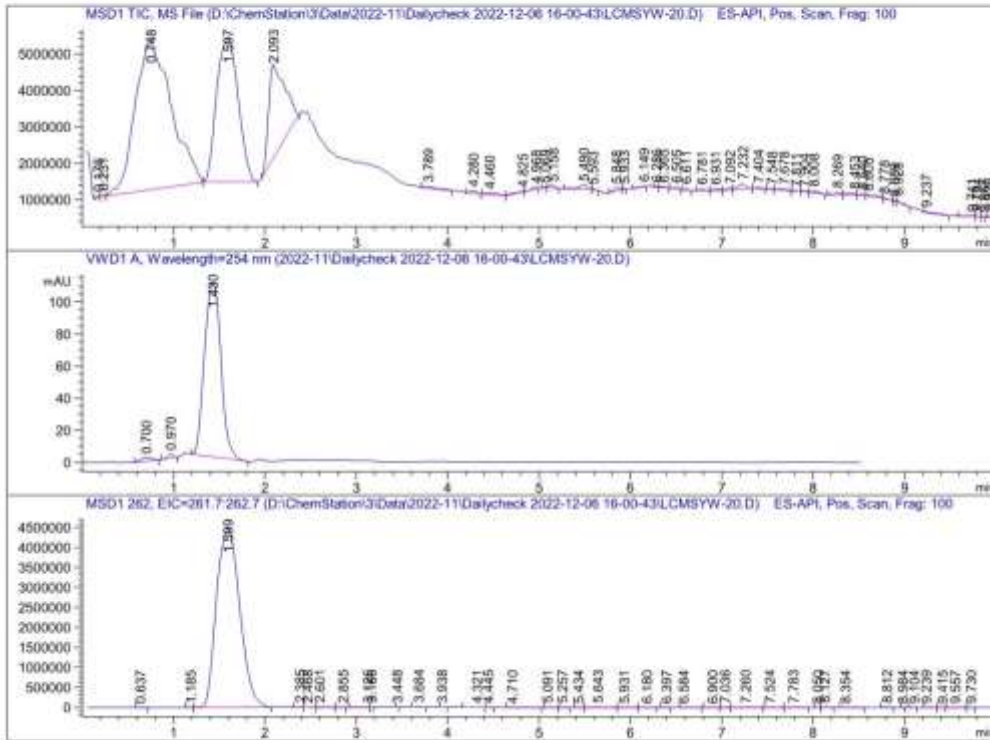


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