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# SUPPORTING INFORMATION

## Synthesis of alkynyl/alkenyl-substituted pyridine derivatives *via* heterocyclization and Pd-mediated Sonogashira/Heck coupling process in one-pot: A new MCR strategy

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**General information:**

Melting points of various products obtained are determined (uncorrected). $^{1}H$ and $^{13}C$ NMR spectra are recorded on a Varian 400 MHz. Chemical shifts are reported in ppm with the internal TMS signal at 0.0 ppm as a standard. The data are reported as follows: chemical shift (ppm) and multiplicity (s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet or unresolved, br s = broad singlet), coupling constant(s) in Hz, integration assignment. High-resolution mass spectra (HRMS) and compound purity data are acquired on a Waters LCT premier XE TOF HRMS single quadrupole system equipped with electro spray ionization (ESI) source. Thin-layer chromatography is performed on 0.25 mm Merck silica gel plates and visualized with UV light. Column chromatography is performed on silica gel (200-300 mesh). Chemicals and solvents are purchased from Sigma Aldrich and Merck. Isolated compounds are characterized by physical and spectroscopic data.

**Typical experimental procedure for the preparation of 2-amino-4-(3-(3-hydroxyprop-1-ynyl)phenyl)-6-phenylnicotinonitrile (6a)**:

A mixture of 3-bromobenzaldehyde (**1**) [10.0 mmol], malononitrile (**2**) [11.0 mmol], acetophenone (**3**) [11.0 mmol] and $NH_4OAc$ (**4**) [20.0 mmol] in presence of pyrrolidine (5.0 mmol) in a mixture of $H_2O$-DME (1:4 ratio) (10 vol) is stirred at reflux for 1.0 hr. The first phase progress of the reaction is monitored by TLC. After the completion of the reaction, the reaction mixture is cooled to RT and then, prop-2-yn-1-ol **5a** [15.0 mmol], $PdCl_2(PPh_3)_2$ [0.002 mmol] and CuI [0.005 mmol] are added. Again the entire reaction mixture is kept under reflux conditions for 3.0 hrs in open air. Final stage progress is monitored by TLC. After the completion of the reaction, the whole reaction mixture is cooled to RT and the solvent is removed under reduced pressure. The obtained crude product is purified by column chromatography using silica gel and 1:9 ratio of EtOAc - Petroleum ether (PE) to obtain pure compound **6a**. The isolated yield of product **6a** is 91%. The same procedure is followed for the preparation of 2-amino-4-(3-(alkynyl)phenyl)-6-phenylnicotinonitrile derivatives (**6b-k**) listed in **Table-2.** All the

synthesised compounds (**6a-k**) gave satisfactory spectroscopic data in accordance with their proposed structures.

**Characterization data for 2-amino-4-(3-(3-hydroxyprop-1-ynyl)phenyl)-6-phenylnicotinonitrile (6a):**

Off-white solid; Yield = 91%; mp. 161–164°C.

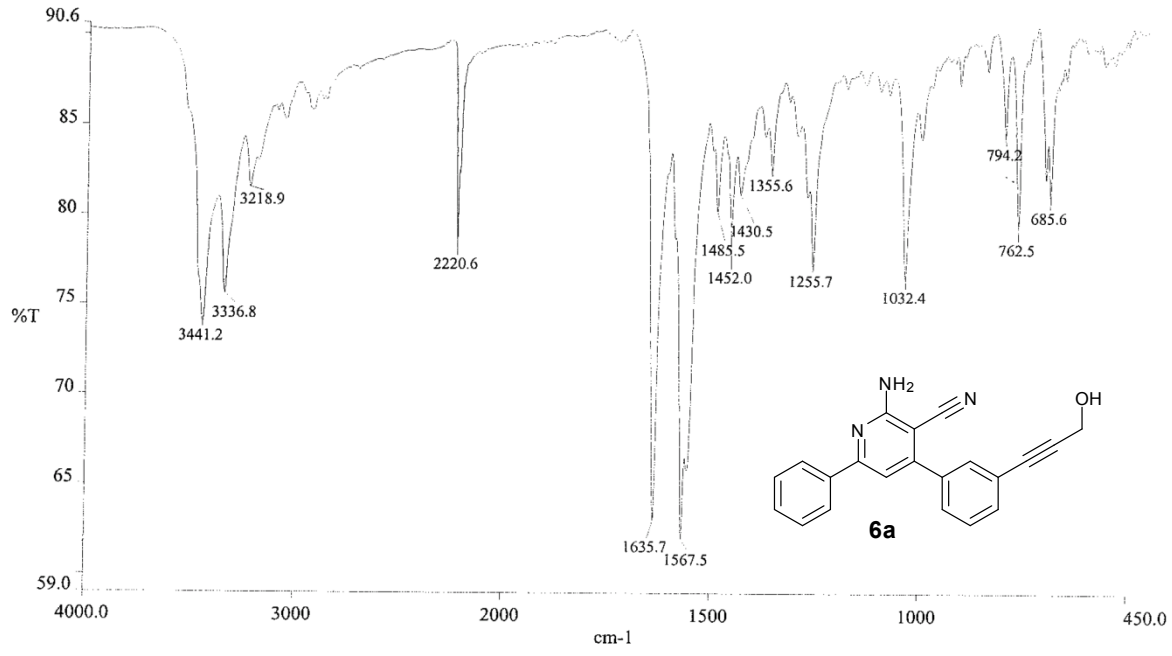
FT-IR (KBr, $cm^{-1}$): 3441.2, 3336.8, 3218.9, 1635.7, 1567.5

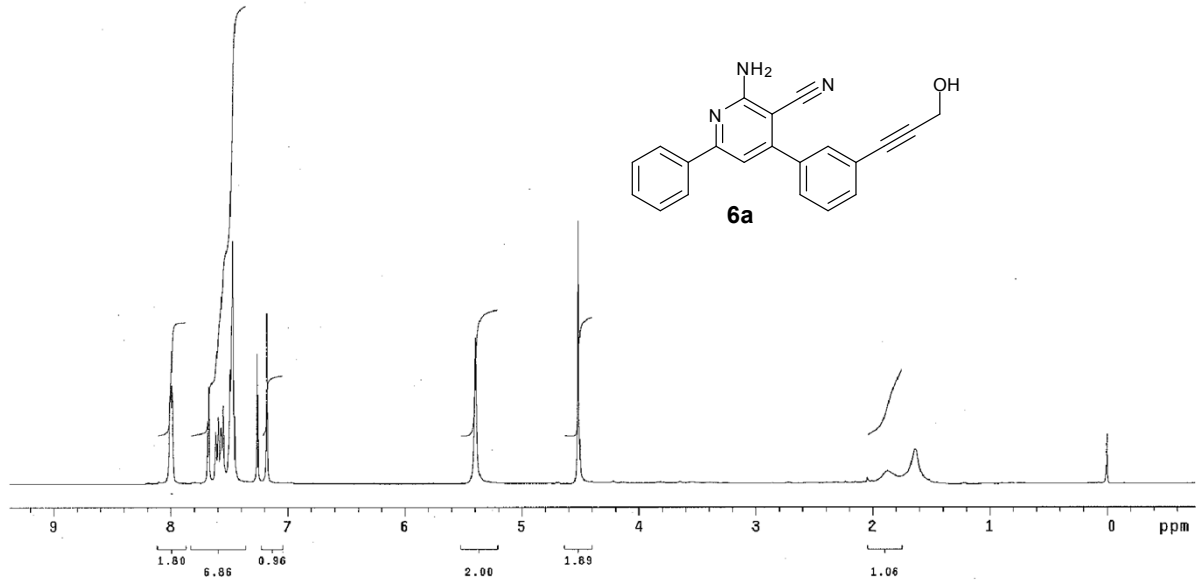
$^1$H NMR (400 MHz, $CDCl_3$) δ 8.0 (d, 2H, *J* =7.6 Hz, arom H), 7.68 (s, 1H, arom H), 7.61 - 7.55 (m, 2H, arom H), 7.49 - 7.46 (m, 4H, arom H), 7.18 (s, 1H, arom H), 5.4 (br s, 2H, $-NH_2$), 4.5 (s, 2H, $-OCH_2$), 1.87 (br, 1H, -OH).

$^{13}$C NMR (100 MHz, DMSO-$d_6$) δ 160.8, 158.7, 153.8, 137.44, 137.41, 132.2, 130.8, 130.1, 129.1, 128.5, 128.4, 127.2, 122.9, 116.8, 109.2, 90.7, 86.4, 83.0, 49.4.

HRMS (ESI): calcd for $C_{21}H_{16}N_3O$ $(M+H)^+$ 326.1293, found 326.1290.

**Copies of FTIR, $^1$H NMR and $^{13}$C NMR and HRMS for 2-amino-4-(3-(3-hydroxyprop-1-ynyl) phenyl)-6-phenylnicotinonitrile (6a):**

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N
OH
6a
9
8
7
6
5
4
3
2
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0
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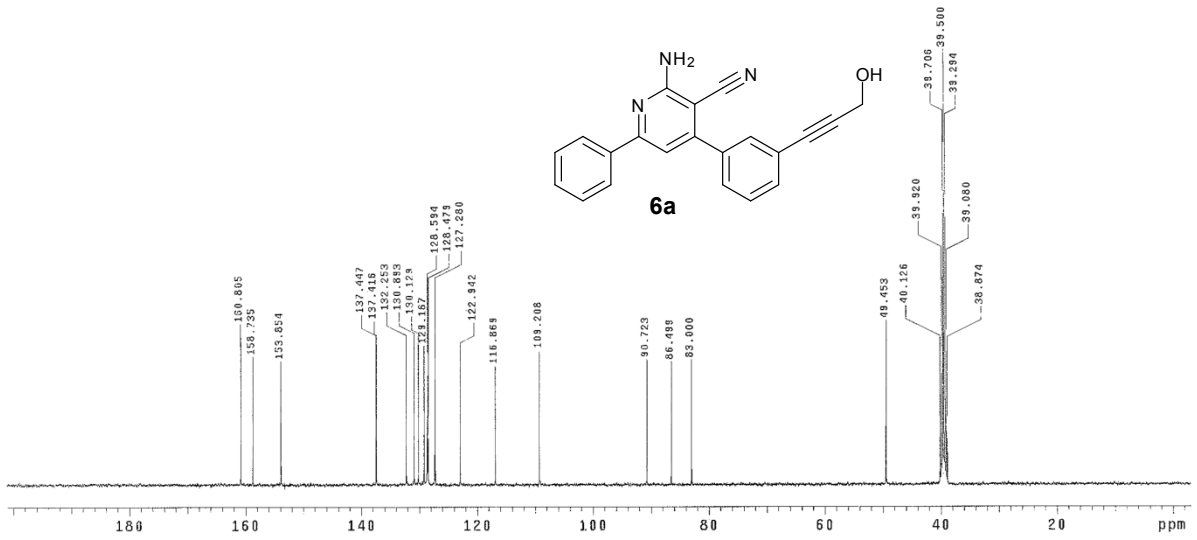
6.86
0.96
2.00
1.89
1.06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129.167
128.594
128.479
127.280
122.942
116.869
109.208
90.723
86.499
83.000
49.453
40.126
39.920
39.706
39.500
39.294
39.080
38.874
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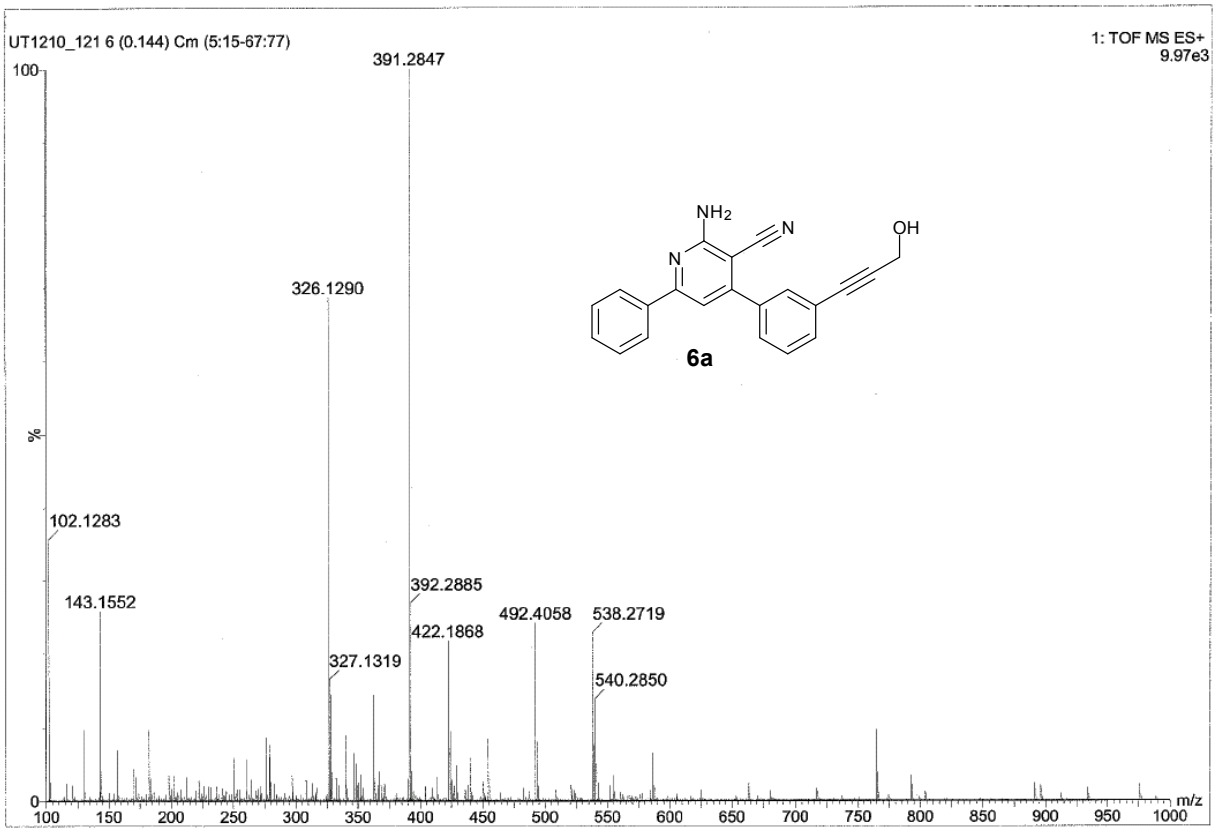
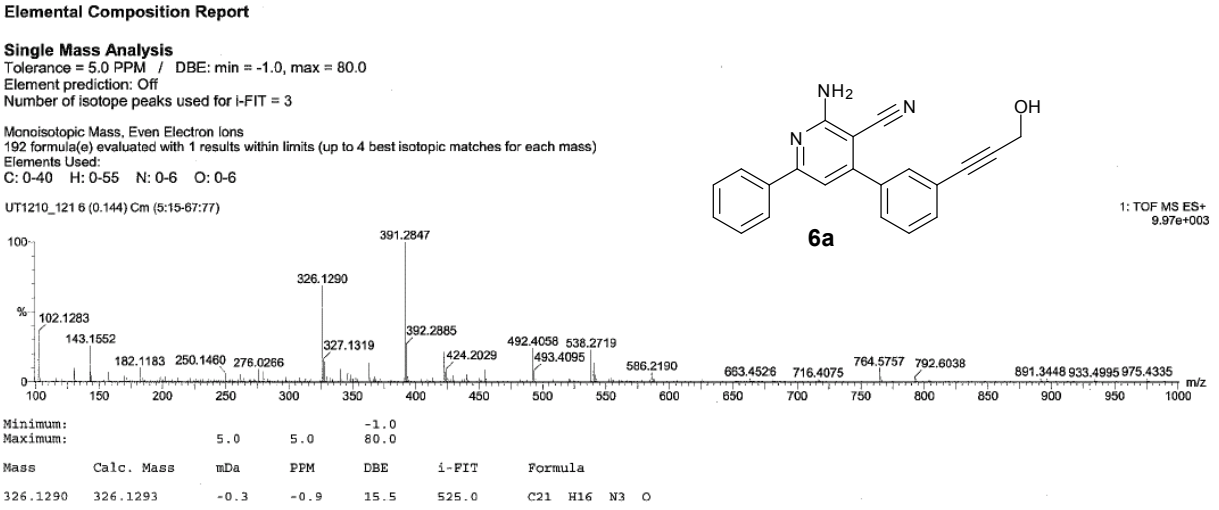
160
140
120
100
80
60
40
20
ppm




**Characterization data for 2-amino-4-(3-(4-hydroxybut-1-ynyl)phenyl)-6-phenyl nicotinonitrile (6b):**

Off-white solid; Yield = 89%; mp. 117–120°C.

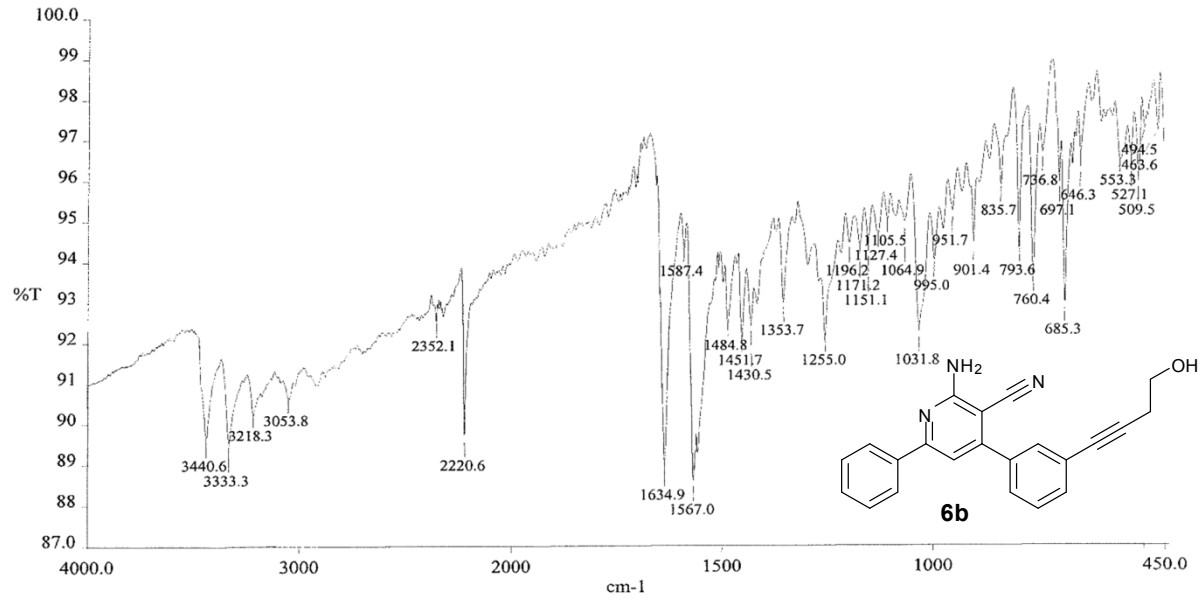
FT-IR (KBr, $cm^{-1}$): 3440.6, 3333.3, 3281.3, 3053.8, 2352.1, 2220.6, 1639.4,1567.0

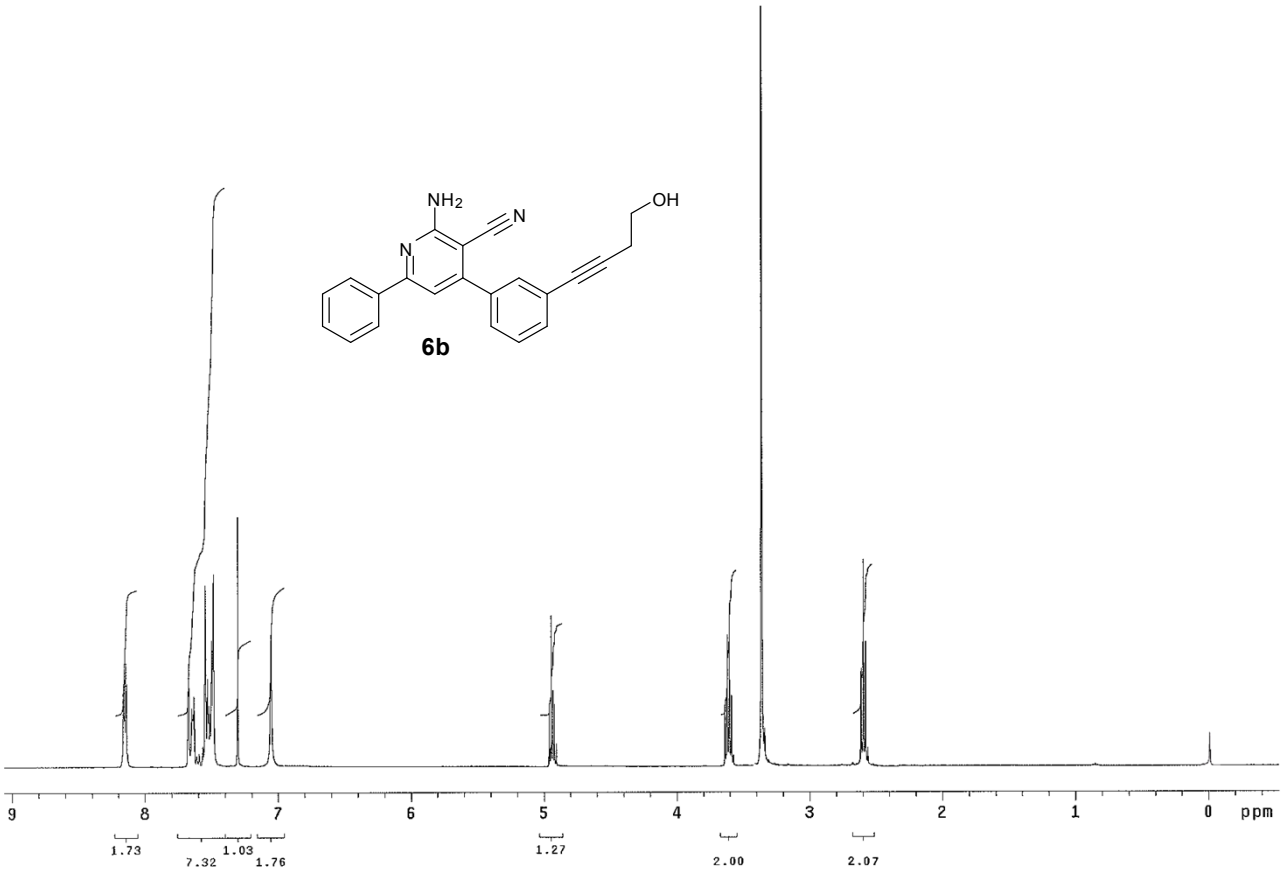
$^1$H NMR (400 MHz, DMSO-$d_6$) δ 8.13- 8.11 (m, 2H, arom H), 7.67-7.63 (m, 2H, arom H), 7.59–7.47 (m, 5H, arom H), 7.3 (s, 1H, arom H), 7.05 (s, 2H, -$NH_2$), 4.9 (t, 1H, $J$ = 6.0 Hz, -OH), 3.62 (q, 2H, $J$ = 6.8 Hz, -$CH_2$), 2.59 (t, 2H, $J$ = 6.4 Hz, -$CH_2$)

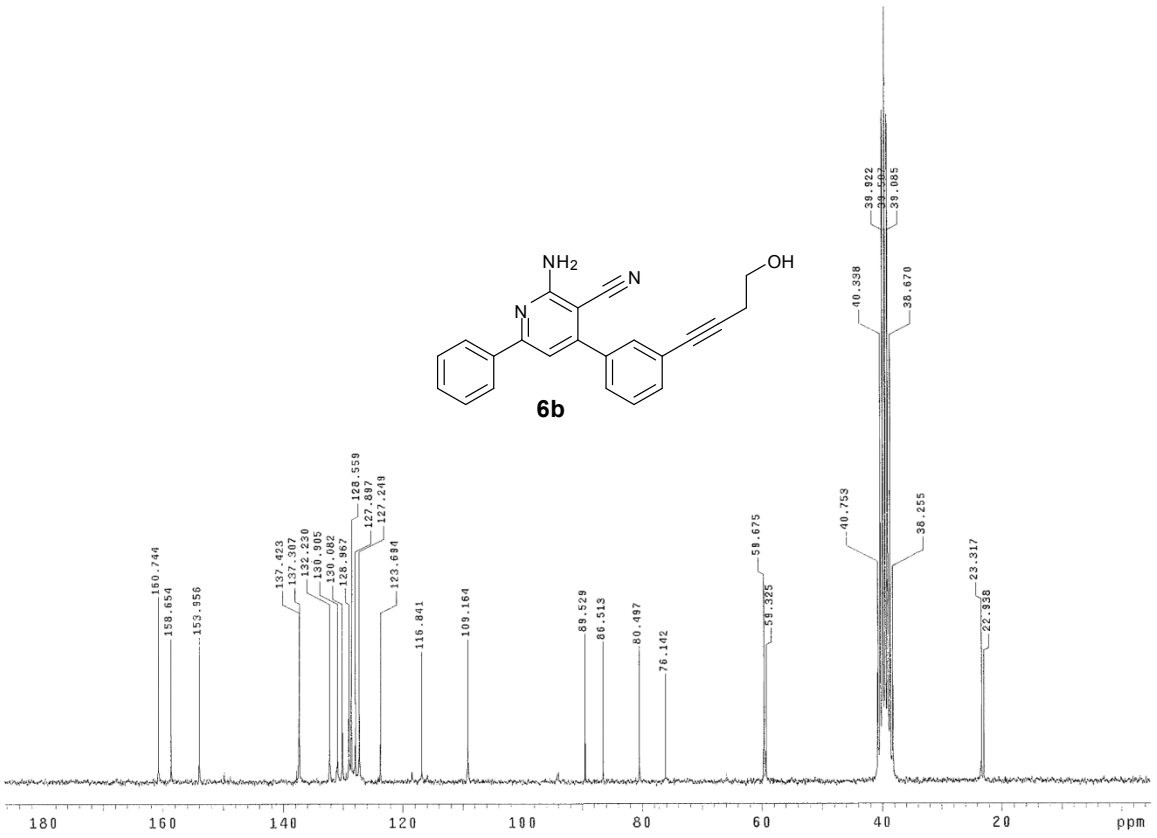
$^{13}$C NMR (100 MHz, DMSO-$d_6$) δ 160.7, 158.6, 153.9, 137.4, 137.3, 132.2, 130.9, 130.0, 128.9, 128.5, 127.8, 127.2, 123.6, 116.8, 109.1, 89.5, 86.5, 80.4, 59.6, 23.3

HRMS (ESI): calcd for $C_{22}H_{18}N_3O$ $(M+H)^+$ 340.1450, found 340.1442

**Copies of FTIR, $^1$H NMR and $^{13}$C NMR and HRMS 2-amino-4-(3-(4-hydroxybut-1-ynyl) phenyl)-6-phenylnicotinonitrile (6b):**

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OH
6b
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158.654
153.956
137.423
137.307
132.230
130.305
130.082
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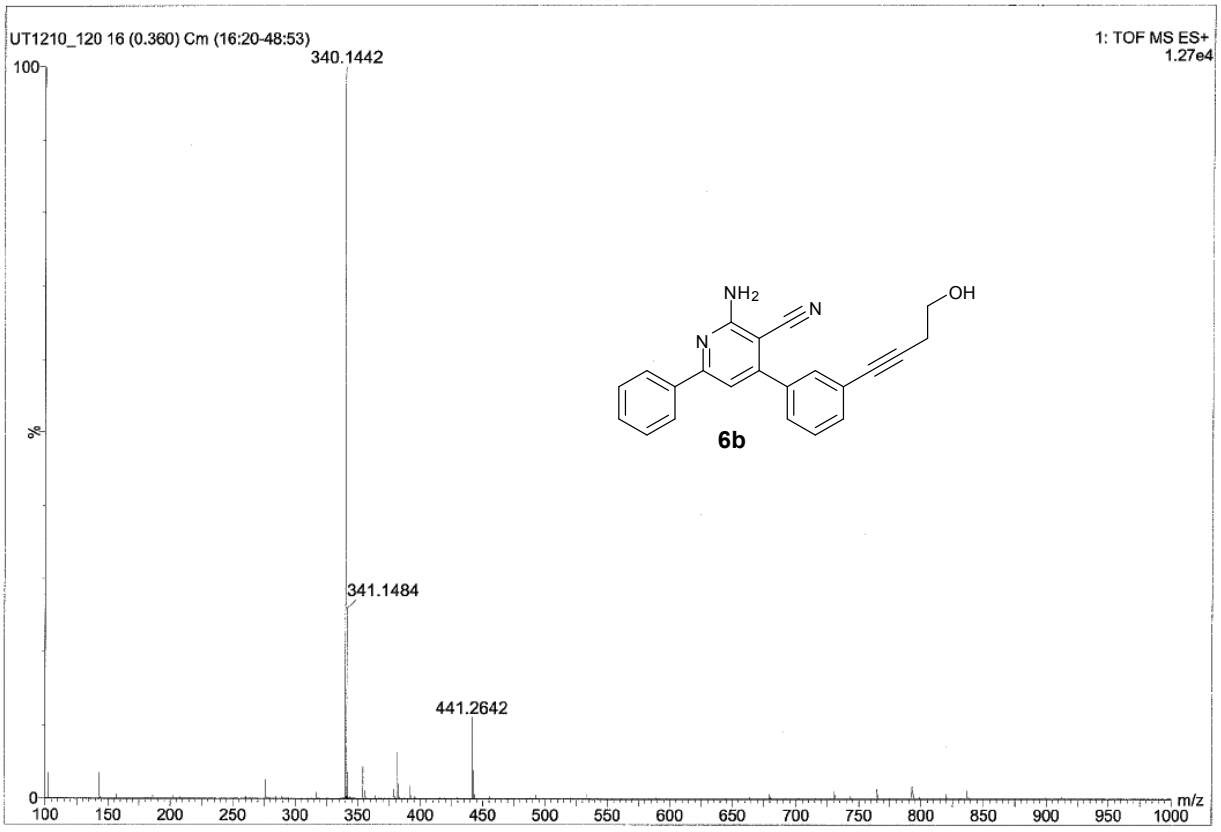
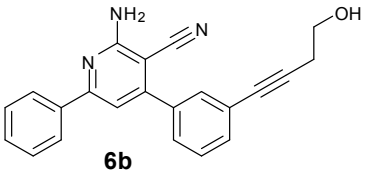
128.559
127.897
127.249
123.684
116.841
109.164
89.529
86.513
80.497
76.142
59.675
58.325
40.753
40.338
39.922
39.503
39.085
38.670
38.255
23.317
22.956
180
160
140
120
100
80
60
40
20
ppm


UT1210_120 16 (0.360) Cm (16:20-48:53)
1: TOF MS ES+
1.27e4
100
%
0
340.1442
341.1484
441.2642
NH2
N
N
OH
6b
100
150
200
250
300
350
400
450
500
550
600
650
700
750
800
850
900
950
1000
m/z

**Elemental Composition Report**

**Single Mass Analysis**
Tolerance = 5.0 PPM / DBE: min = -1.0, max = 80.0
Element prediction: Off
Number of isotope peaks used for i-FIT = 3

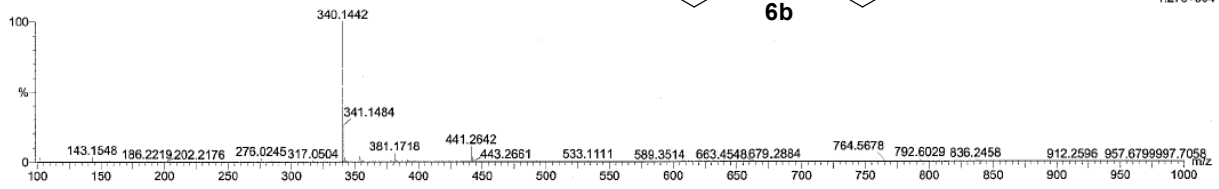
Monoisotopic Mass, Even Electron Ions
201 formula(e) evaluated with 1 results within limits (up to 4 best isotopic matches for each mass)
Elements Used:
C: 0-40 H: 0-55 N: 0-6 O: 0-6




**6b**

UT1210_120 16 (0.360) Cm (16:20-48:53)

1: TOF MS ES+
1.27e+004




| | | | | | | |
|---|---|---|---|---|---|---|
| Minimum: | | | | -1.0 | | |
| Maximum: | | 5.0 | 5.0 | 80.0 | | |
| Mass | Calc. Mass | mDa | PPM | DBE | i-FIT | Formula |
| 340.1442 | 340.1450 | -0.8 | -2.4 | 15.5 | 1.2 | C22 H18 N3 O |

**Characterization data for 2-amino-4-(3-(5-hydroxypent-1-ynyl)phenyl)-6-phenyl nicotinonitrile (6c):**

Off-white solid; Yield = 85%; mp. 112–115°C.

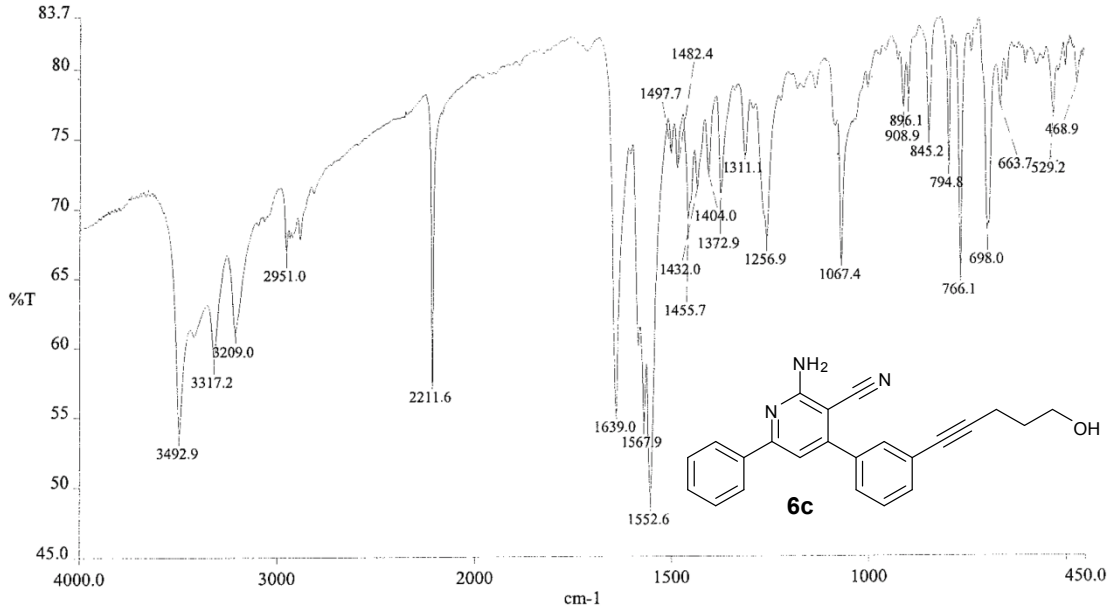
FT-IR (KBr, $cm^{-1}$): 3511.0, 3467.4, 3306.1, 3193.6, 2209.0, 1628.1, 1578.4.

$^1$H NMR (400 MHz, $CDCl_3$) δ 7.99 (d, 2H, *J* = 4.0 Hz, arom H), 7.62 (s, 1H, arom H), 7.56 – 7.42 (m, 6H, arom H), 7.18 (s, 1H, arom H), 5.38 (br, 2H, -$NH_2$), 3.83 (t, 2H, *J* = 6.4 Hz, -$CH_2$), 2.57 (t, 2H, *J* = 6.8 Hz, -$CH_2$), 1.88 (quintet, 2H, *J* = 6.4Hz, -$CH_2$), 1.6 (br, 1H, -OH).

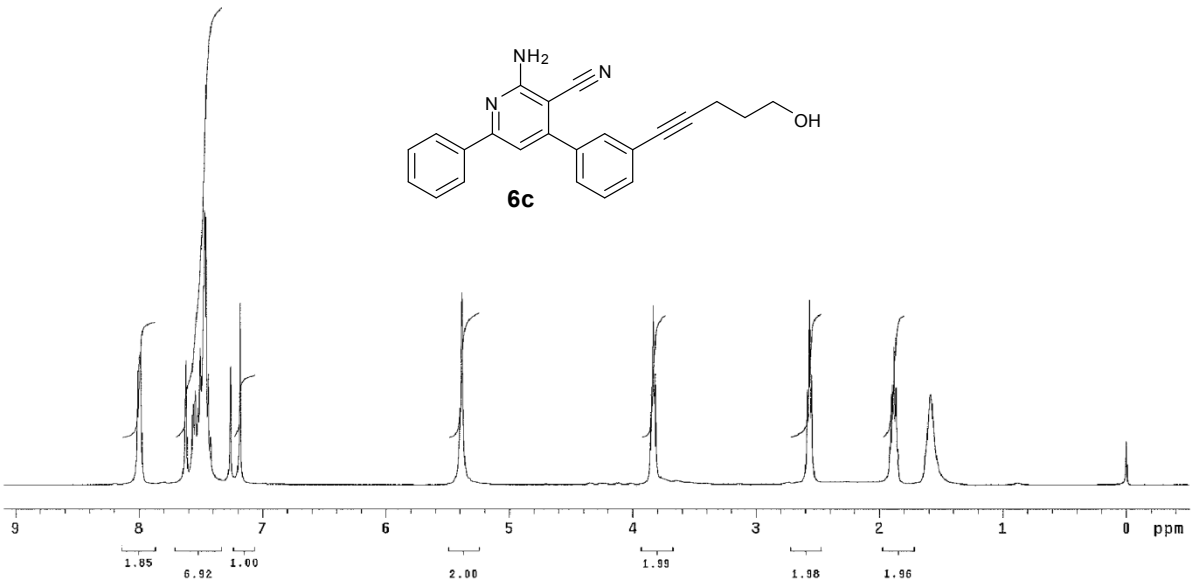
$^{13}$C NMR (100 MHz, DMSO-$d_6$) δ 160.7, 158.6, 153.9, 137.4, 137.3, 132.2, 130.8, 130.1, 128.9, 128.5, 127.8, 127.2, 123.7, 116.8, 109.1, 91.5, 86.5, 79.8 59.4, 31.4, 15.3.

HRMS (ESI): calcd for $C_{23}H_{20}N_3O$ $(M+H)^+$ 354.1606, found 354.1608.

**Copies of FTIR, $^1$H NMR and $^{13}$C NMR and HRMS 2-amino-4-(3-(5-hydroxypent-1-ynyl)phenyl)-6-phenylnicotinonitrile (6c):**




**6c**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N
N
OH
6c
9
8
7
6
5
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3
2
1
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ppm
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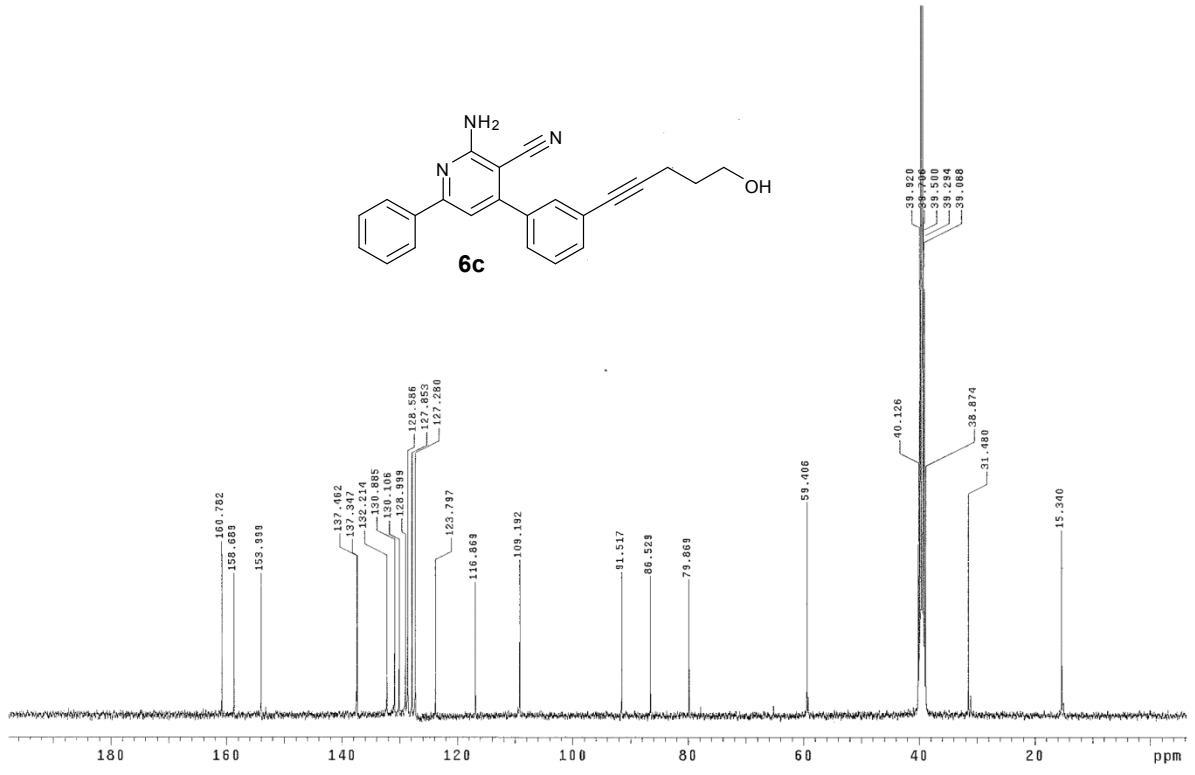
1.99
1.98
1.96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128.586
127.853
127.280
123.797
116.869
109.192
91.517
86.529
79.869
59.406
40.126
39.920
39.708
39.500
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140
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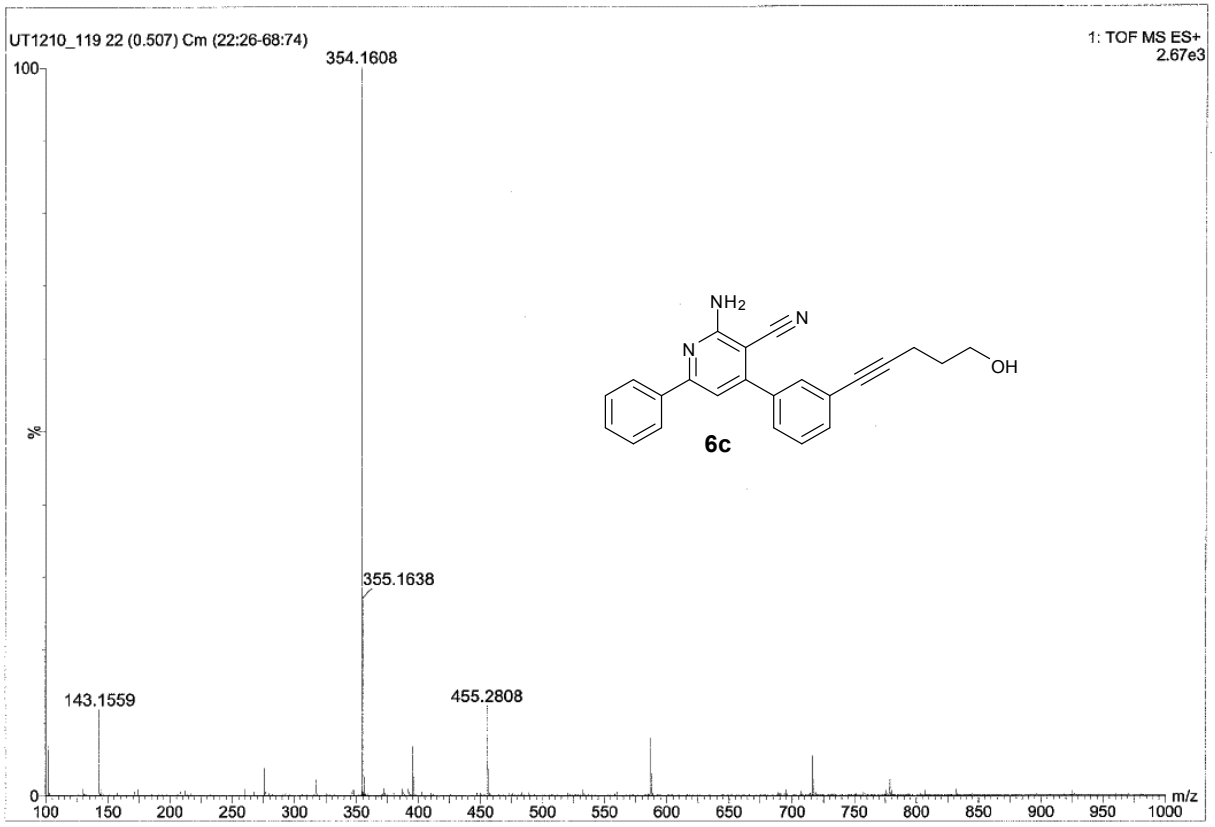
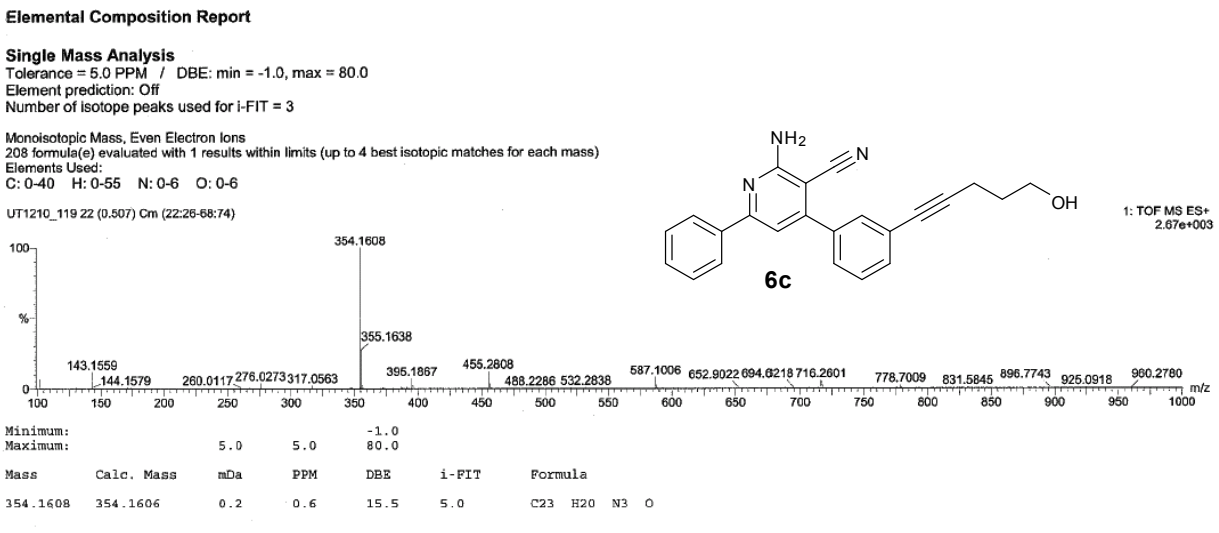
80
60
40
20
ppm




**Characterization data for 2-amino-4-(3-(5-chloropent-1-ynyl)phenyl)-6-phenyl nicotinonitrile (6d):**

Off-white solid; Yield = 87%; mp. 117–118°C.

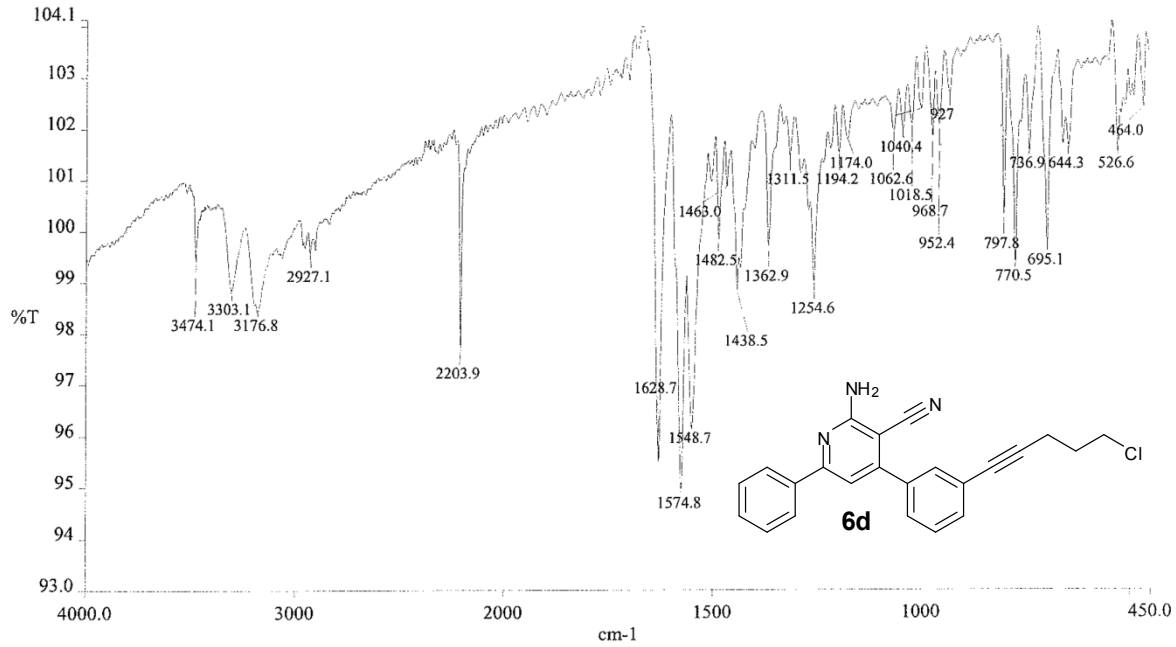
FT-IR (KBr, $cm^{-1}$): 3474.1, 3303.1, 3176.8, 2927.1, 2203.9, 1628.7, 1574.8,1548.7.

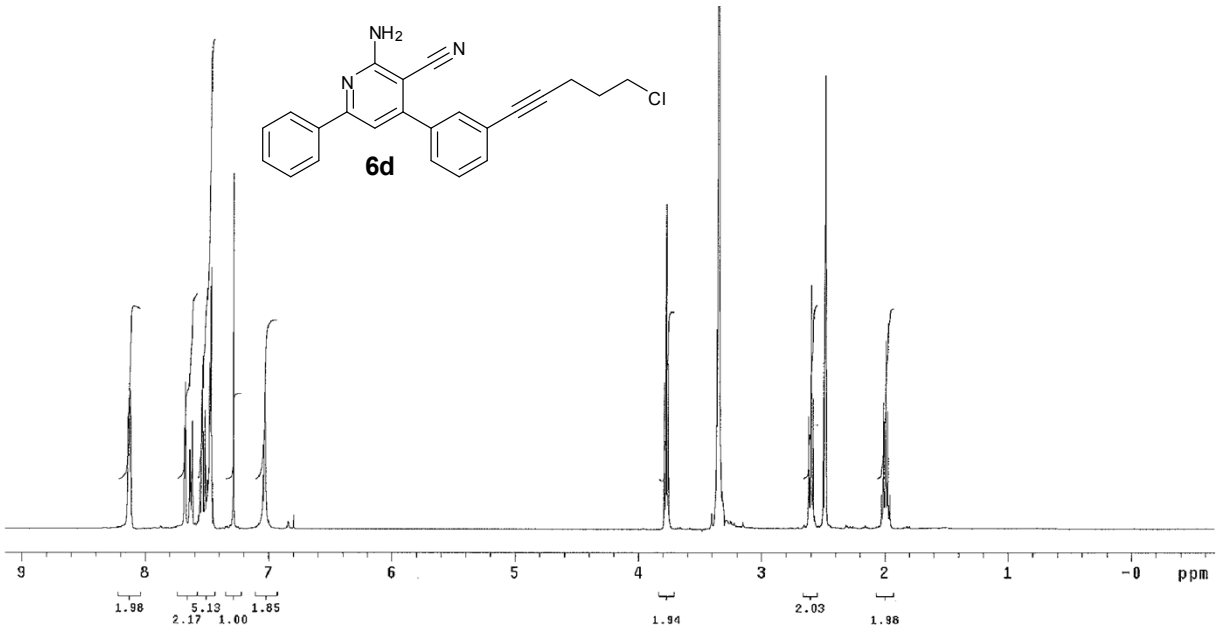
$^{1}H$ NMR (400 MHz, DMSO-$d_6$) δ 8.13 (d, 2H, $J$ = 8.0 Hz, arom H), 7.67 (d, 1H, $J$ = 1.6 Hz, arom H), 7.63 (d, 1H, $J$ = 7.2Hz, arom H), 7.61 - 7.45 (m, 5H, arom H), 7.28 (s, 1H, arom H), 7.03 (br, 2H, $-NH_2$), 3.77 (t, 2H, $J$ = 6.4 Hz, $-CH_2$), 2.59 (t, 2H, $J$ = 7.6 Hz, $-CH_2$), 1.99 (quintet, 2H, $J$ = 6.8 Hz, $-CH_2$).

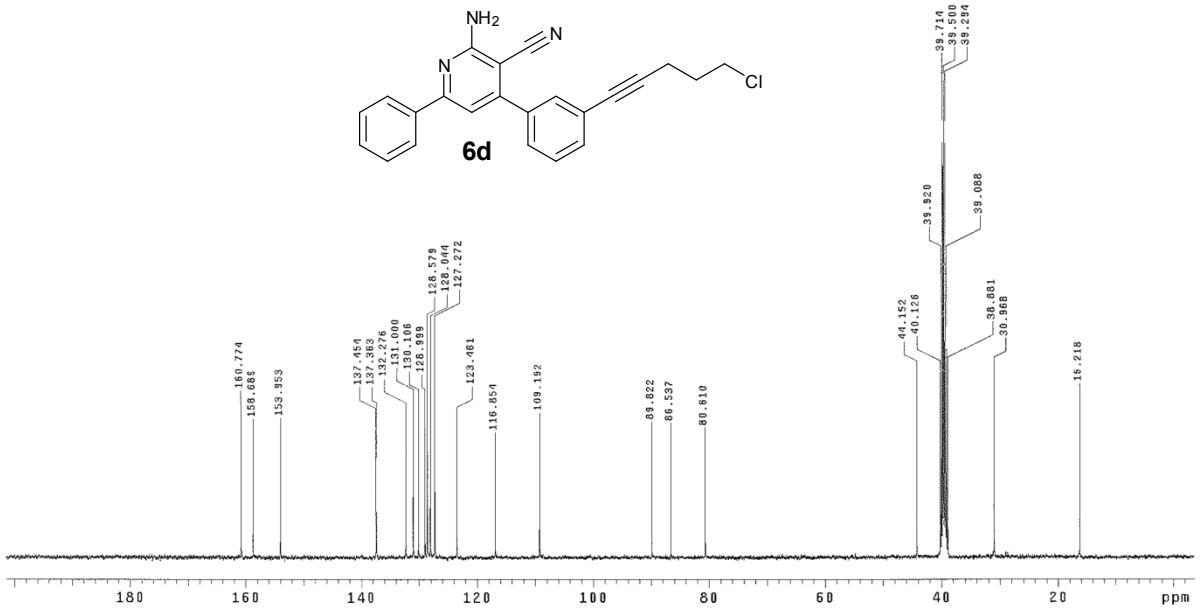
$^{13}C$ NMR (100 MHz, DMSO-$d_6$) δ 160.7, 158.6, 153.9, 137.4, 137.3, 132.2, 131.0, 130.1, 128.9, 128.5, 128.0, 127.2, 123.4, 116.8, 109.1, 89.8, 86.5, 80.6, 44.1, 30.9, 16.2.

HRMS (ESI): calcd for $C_{23}H_{19}N_3Cl$ $(M+H)^+$ 372.1268, found 372.1270.

**Copies of FTIR, $^{1}H$ NMR and $^{13}C$ NMR and HRMS for 2-amino-4-(3-(5-chloropent-1-ynyl) phenyl)-6-phenylnicotinonitrile (6d):**

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153.953
137.454
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127.272
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80
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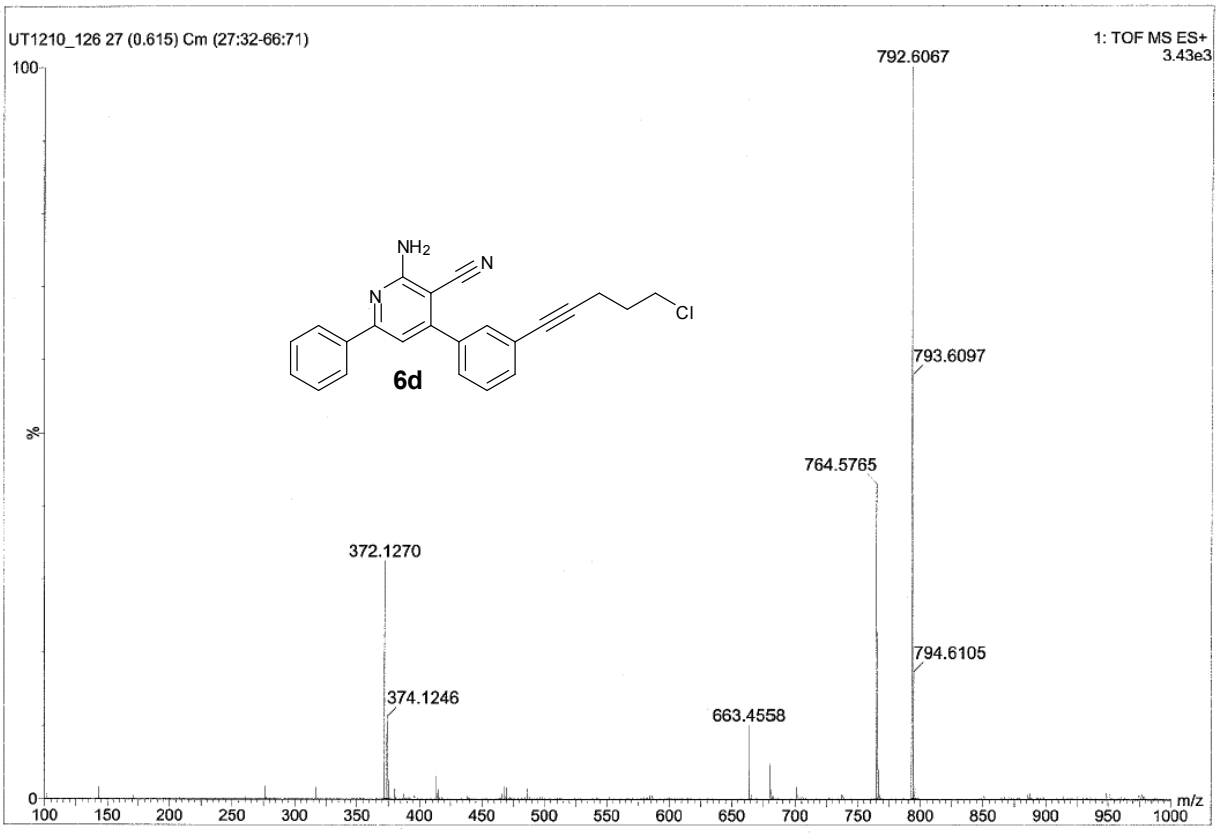
40
20
ppm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%
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793.6097
764.5765
372.1270
794.6105
374.1246
663.4558
NH2
N
N
Cl
6d
100
150
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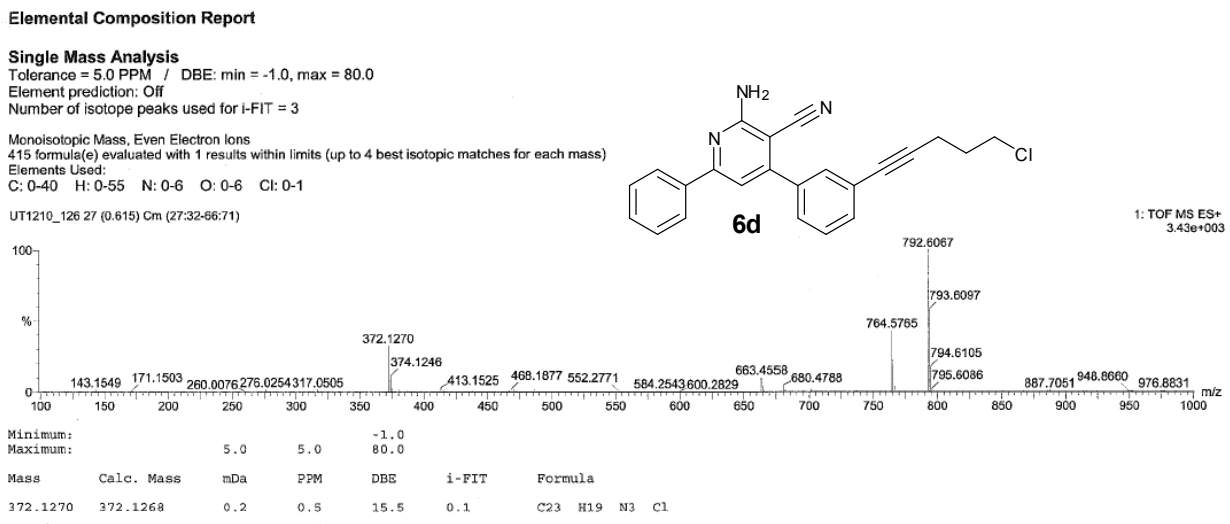
600
650
700
750
800
850
900
950
1000
m/z




**Characterization data for 2-amino-4-(3-(4-hydroxypent-1-ynyl)phenyl)-6-phenyl nicotinonitrile (6e):**

Off-white solid, Yield = 89%; mp. 173–175°C.

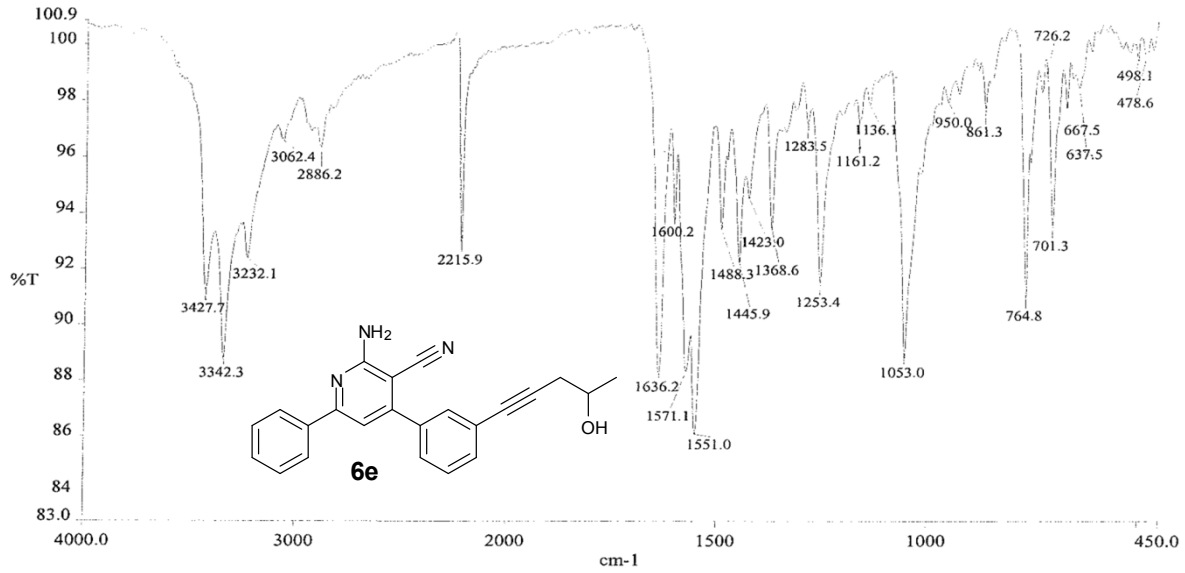
FT-IR (KBr, $cm^{-1}$): 3427.7, 3342.3, 3232.1, 3062.4, 2886.2, 2215.9, 1636.2, 1571.1, 1551.0.

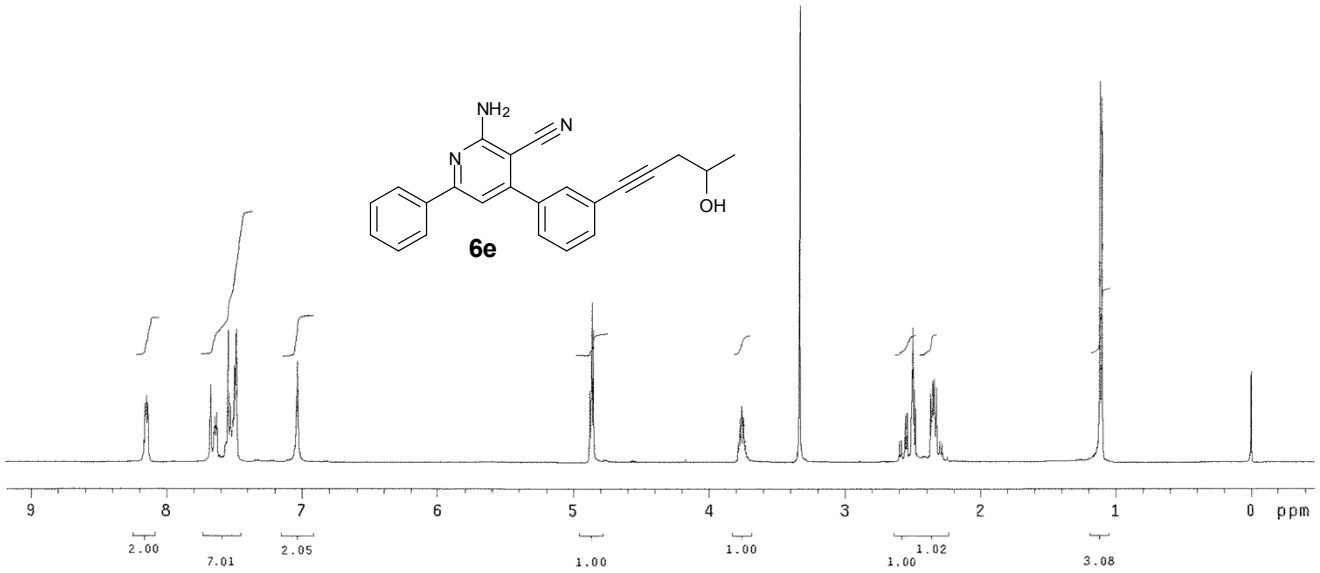
$^1$H NMR (400 MHz, DMSO-$d_6$) δ 8.15 (dd, 2H, $J$ = 7.2 Hz, $J$ = 3.6 Hz, arom H), 7.67 (s, 1H, arom H), 7.65 – 7.62 (m, 2H, arom H), 7.56 - 7.48 (m, 4H, arom H), 7.04 (s, 2H, -$NH_2$), 4.86 (d, 1H, $J$ = 5.2 Hz, -OH), 3.78-3.73 (m, 1H, -CH)2.60-2.41 (m, 1H, -CH), 2.37-2.29 (m, 1H, -CH), 1.11 (d, 3H, $J$ = 5.6 Hz, -$CH_3$).

$^{13}$C NMR (100 MHz, DMSO-$d_6$) δ 160.7, 158.6, 154.0, 137.4, 137.3, 132.2, 130.9, 130.1, 129.0, 128.6, 127.8, 127.2, 123.8, 116.8, 109.1, 89.3, 86.5, 81.0, 75.4, 29.3, 22.7.

HRMS (ESI): calculated for $C_{23}H_{20}N_3O$ $(M+H)^+$ 354.1606, found 354.1604.

**Copies of FTIR, $^1$H NMR and HRMS for 2-amino-4-(3-(4-hydroxypent-1-ynyl) phenyl)-6-phenylnicotinonitrile (6e):**

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N
N
OH
6e
9
8
7
6
5
4
3
2
1
0
ppm
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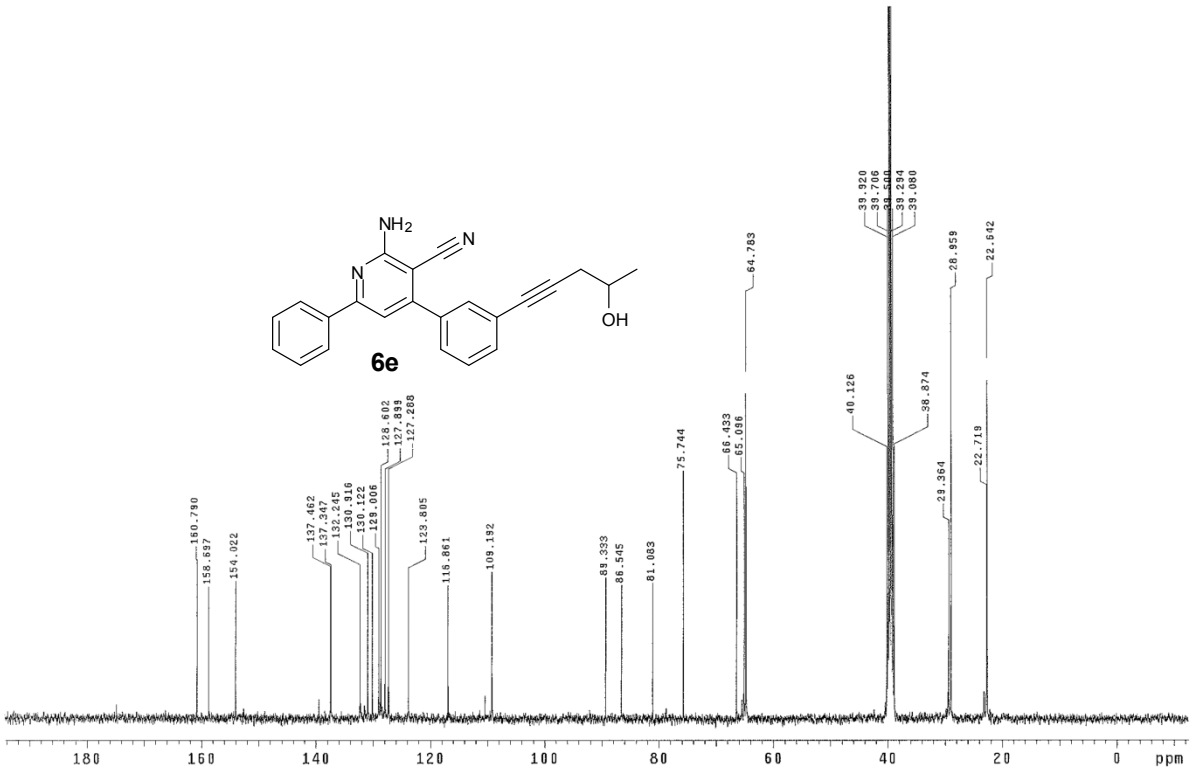
7.01
2.05
1.00
1.00
1.02
1.00
3.08


NH2
N
N
OH
6e
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158.697
154.022
137.462
137.347
133.241
130.816
130.122
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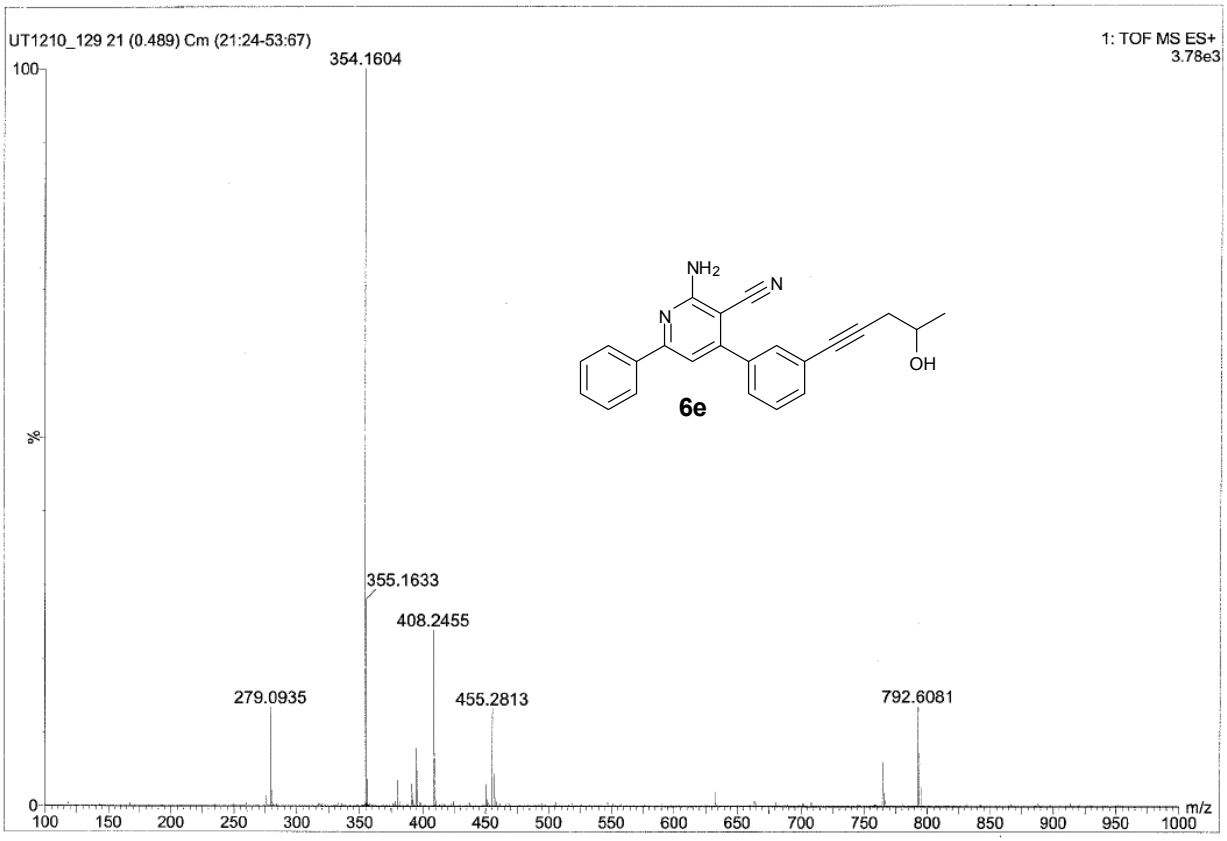
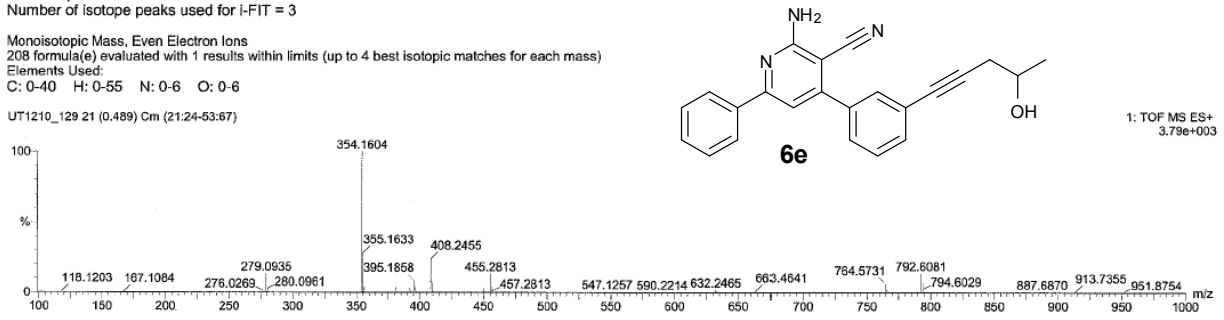
128.602
127.899
127.288
123.805
116.861
109.192
89.333
86.545
81.083
75.744
66.433
65.056
64.783
40.126
39.920
39.706
39.500
39.294
39.080
38.874
29.364
28.959
22.719
22.642
180
160
140
120
100
80
60
40
20
0
ppm




**Elemental Composition Report**

**Single Mass Analysis**
Tolerance = 5.0 PPM / DBE: min = -1.0, max = 80.0
Element prediction: Off
Number of isotope peaks used for i-FIT = 3

Monoisotopic Mass, Even Electron Ions
208 formula(e) evaluated with 1 results within limits (up to 4 best isotopic matches for each mass)
Elements Used:
C: 0-40 H: 0-55 N: 0-6 O: 0-6




| | | | | | | |
|---|---|---|---|---|---|---|
| Minimum: | | 5.0 | 5.0 | -1.0 | | |
| Maximum: | | | | 80.0 | | |
| Mass | Calc. Mass | mDa | PPM | DBE | i-FIT | Formula |
| 354.1604 | 354.1606 | -0.2 | -0.6 | 15.5 | 0.7 | C23 H20 N3 O |

**Characterization data for 2-amino-4-(3-(3-hydroxy-3-methylbut-1-ynyl) phenyl)-6-phenyl nicotinonitrile (6f):**

Off-white solid; Yield = 85%; mp 172–174°C.

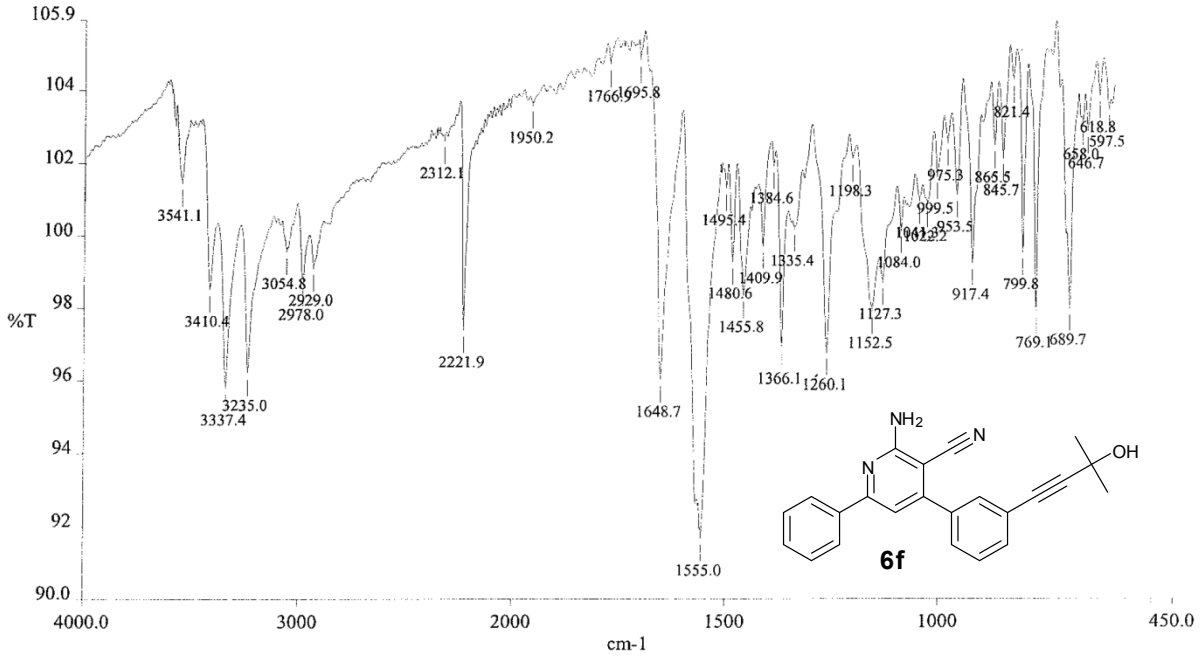
FT-IR (KBr, $cm^{-1}$): 3410.4, 3337.4, 3235.0, 3054.8, 2312.1, 2221.9, 1648.7, 1555.0

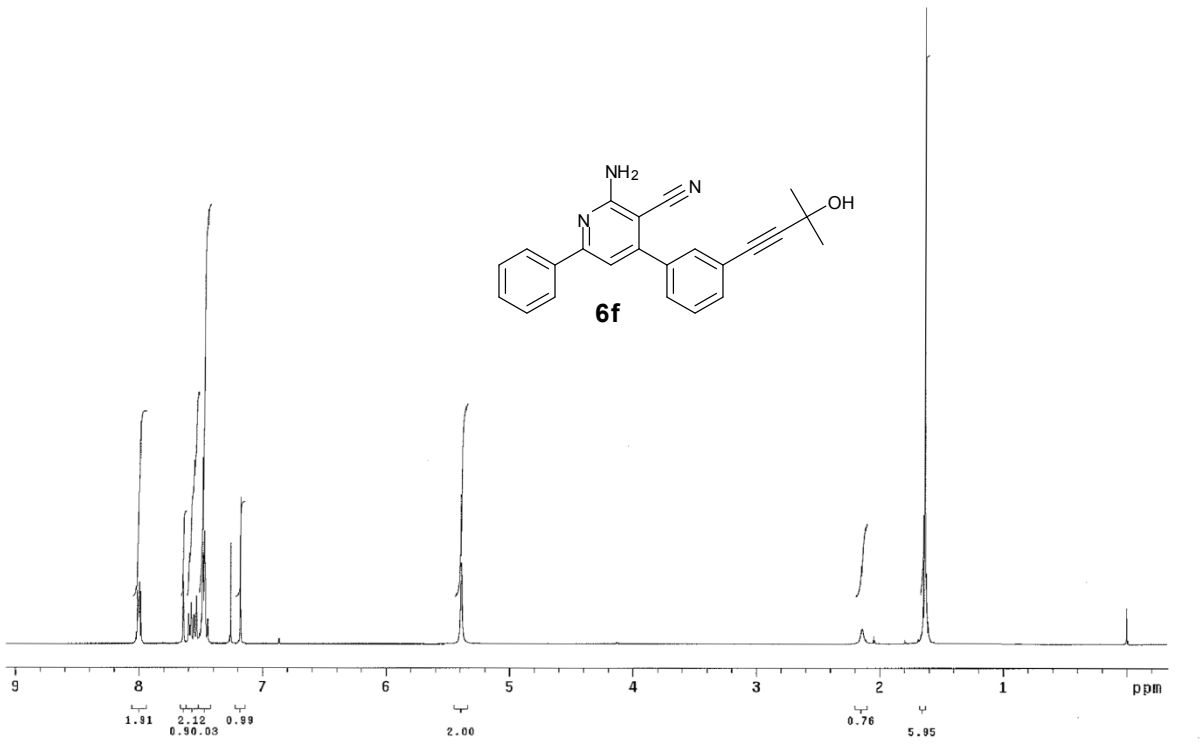
$^1$H NMR (400 MHz, $CDCl_3$): δ 8.0 (dd, 2H, *J* = 8.0 Hz, *J* = 3.2 Hz, arom H), 7.64 (s, 1H, arom H), 7.63 - 7.53 (m, 2H, arom H), 7.50 - 7.44 (m, 4H, arom H), 7.18 (s, 1H, arom H), 5.39 (s, 2H, $-NH_2$), 2.14 (br, 1H, -OH), 1.63 (s, 6H, $-2CH_3$).

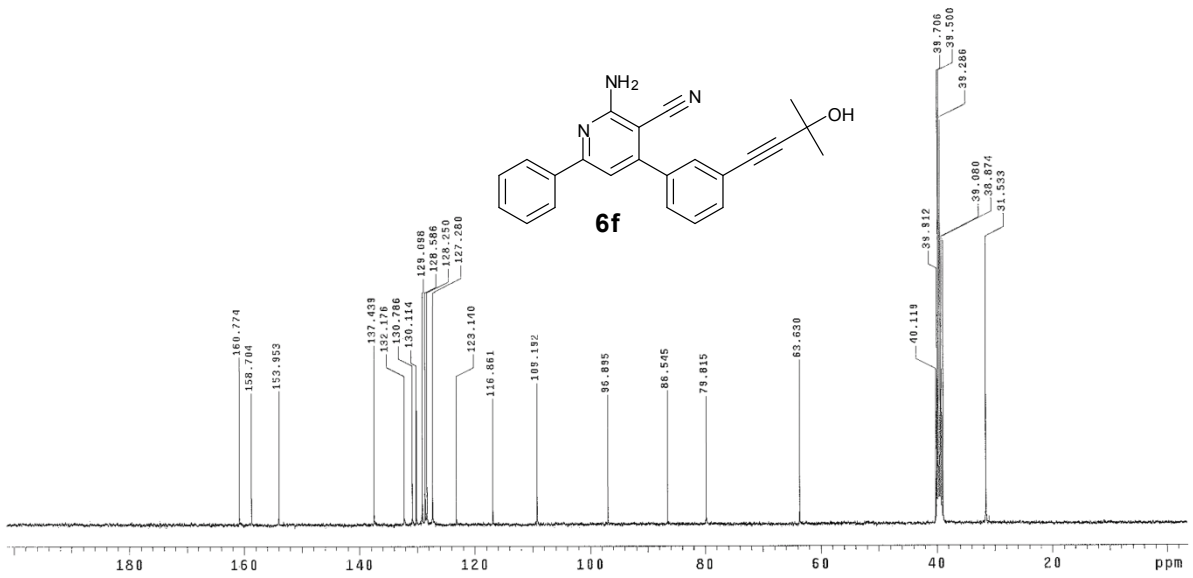
$^{13}$C NMR (100 MHz, DMSO-$d_6$) δ 160.7, 158.7, 153.9, 137.4, 132.1, 130.7, 130.1, 129.0, 128.5, 128.2, 127.2, 123.1, 116.8, 109.1, 96.8, 86.5, 79.8, 63.6, 31.5.

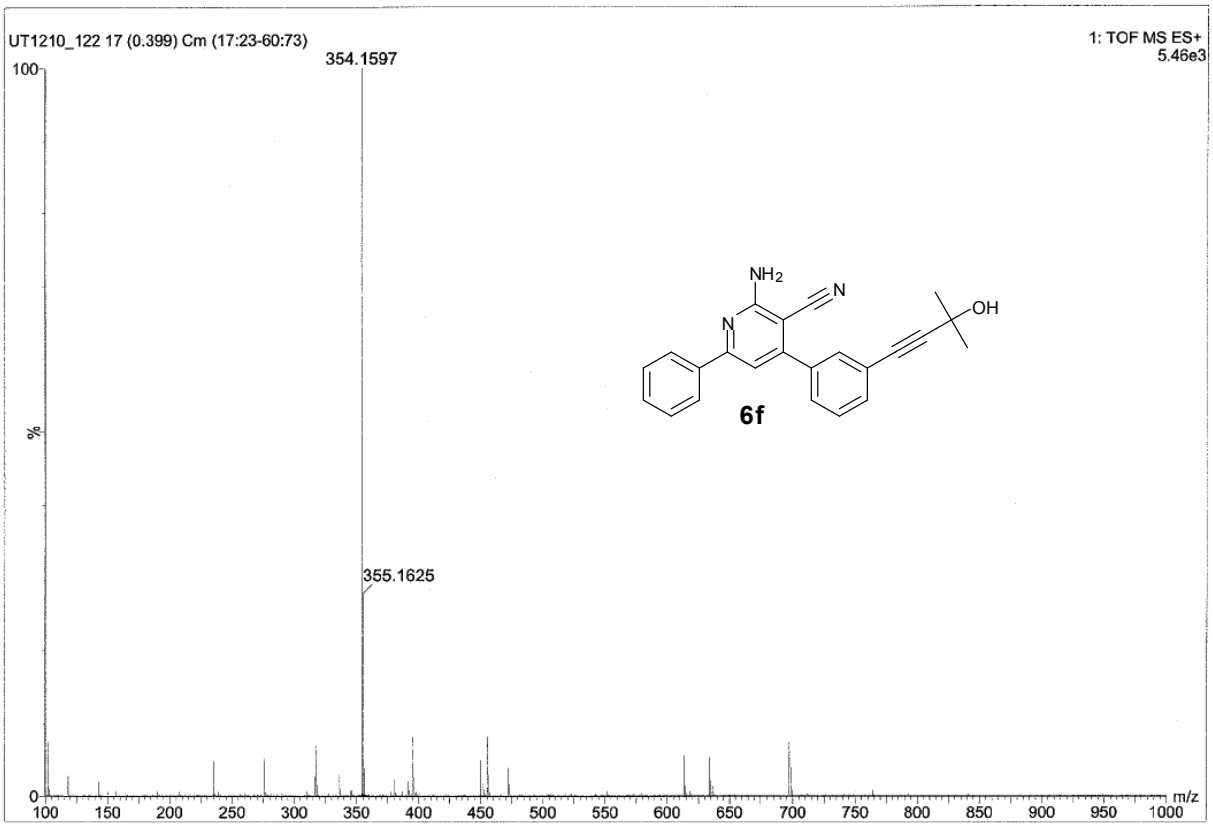
HRMS (ESI): calcd for $C_{23}H_{20}N_3O$ $(M+H)^+$ 354.1606, found 354.1597.

**Copies of FTIR, $^{1}H$ NMR and $^{13}C$ NMR and HRMS for 2-amino-4-(3-(3-hydroxy-3-methylbut-1-ynyl) phenyl)-6-phenylnicotinonitrile (6f):**



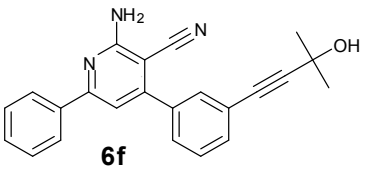

NH2
N
N
OH
6f
160.774
158.704
153.953
137.439
132.176
130.786
130.114
129.098
128.586
128.250
127.280
123.140
116.861
109.192
96.895
86.545
79.815
63.630
40.119
39.912
39.706
39.500
39.286
39.080
38.874
31.533
180
160
140
120
100
80
60
40
20
ppm


UT1210_122 17 (0.399) Cm (17:23-60:73)
1: TOF MS ES+
5.46e3
354.1597
355.1625
100
%
0
NH2
N
N
OH
6f
100
150
200
250
300
350
400
450
500
550
600
650
700
750
800
850
900
950
1000
m/z

**Elemental Composition Report**

**Single Mass Analysis**
Tolerance = 5.0 PPM / DBE: min = -1.0, max = 80.0
Element prediction: Off
Number of isotope peaks used for i-FIT = 3

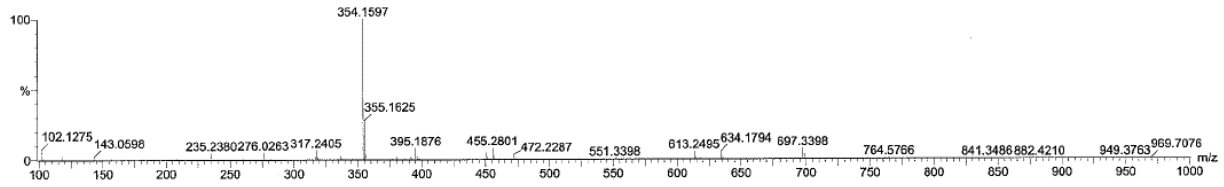
Monoisotopic Mass, Even Electron Ions
208 formula(e) evaluated with 1 results within limits (up to 4 best isotopic matches for each mass)
Elements Used:
C: 0-40 H: 0-55 N: 0-6 O: 0-6




**6f**

UT1210_122 17 (0.399) Cm (17:23-60:73)

1: TOF MS ES+
5.46e+003




| | | | | | | |
|---|---|---|---|---|---|---|
| Minimum: | | | | -1.0 | | |
| Maximum: | | 5.0 | 5.0 | 80.0 | | |
| Mass | Calc. Mass | mDa | PPM | DBE | i-FIT | Formula |
| 354.1597 | 354.1606 | -0.9 | -2.5 | 15.5 | 0.9 | C23 H20 N3 O |

**Characterization data for 2-amino-4-(3-(hex-1-ynyl)phenyl)-6-phenyl nicotinonitrile (6g):**

Off-white solid; Yield = 92%; mp. 99–102°C

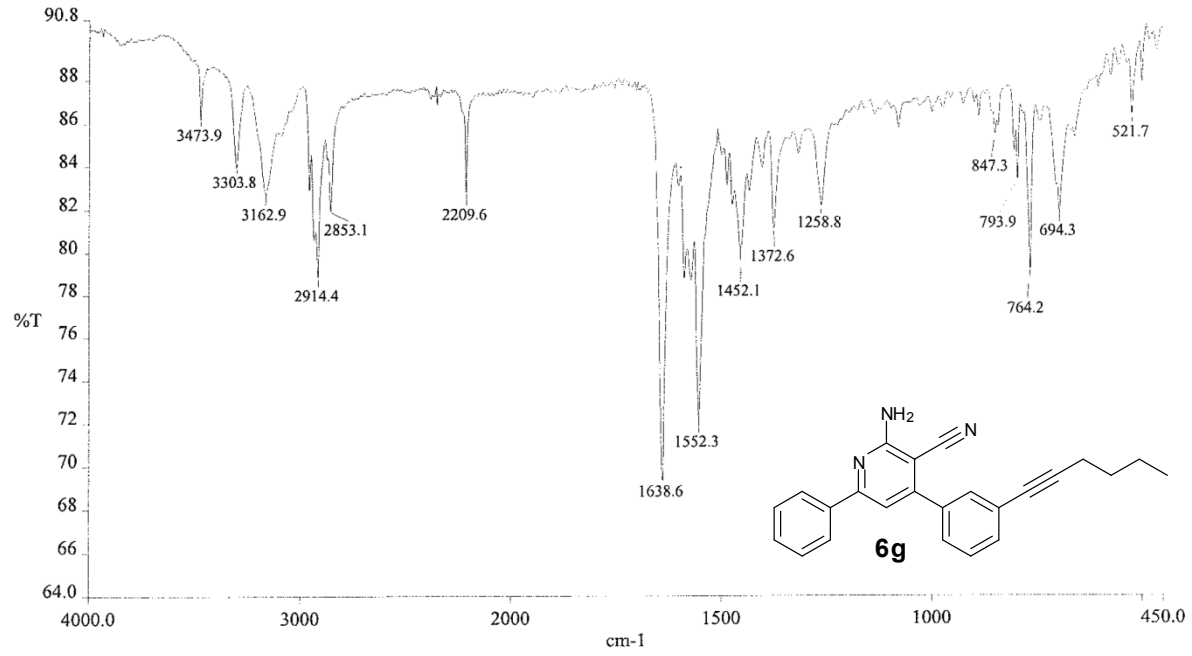
FT-IR (KBr, $cm^{-1}$): 3473.9, 3303.8, 3162.9, 2914.4, 2209.6, 1638.6, 1552.3

$^1H$ NMR (400 MHz, $CDCl_3$) δ 7.99 (d, 2H, $J$ = 4.4 Hz, arom H), 7.74 – 7.61 (m, 1H, arom H), 7.65-7.38 (br, m, 7H, arom H), 7.18 (s, 1H, arom H), 5.38 (br, 2H, $-NH_2$), 2.43 (t, 2H, $J$ = 6.8 Hz, $-CH_2$), 1.62-1.58 (m, 2H, $-CH_2$), 1.50 (quintet, 2H, $J$ = 7.6 Hz, $-CH_2$), 0.956 (t, 3H, $J$ = 6.8 Hz, $-CH_3$).

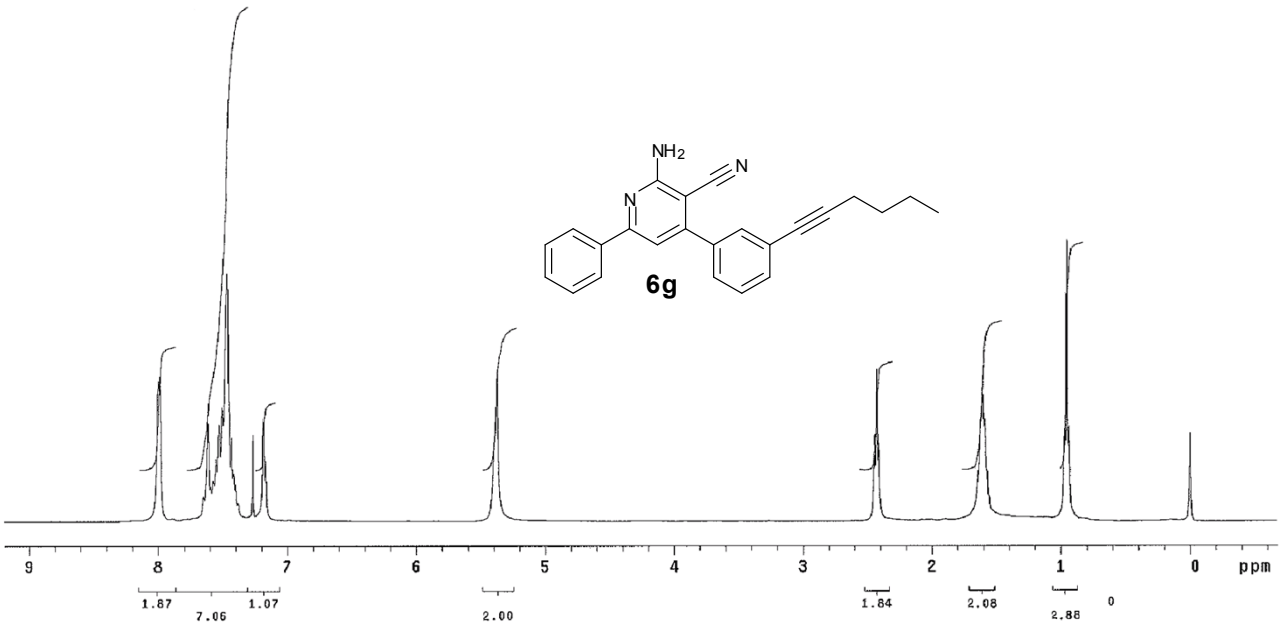
$^{13}C$ NMR (100 MHz, DMSO-$d_6$) δ 160.7, 158.6, 153.9, 137.4, 137.3, 132.1, 130.8, 130.0, 128.5, 127.8, 127.4, 127.2, 123.7, 116.8, 109.1, 91.5, 86.5, 79.9, 30.1, 21.4, 18.3, 13.4

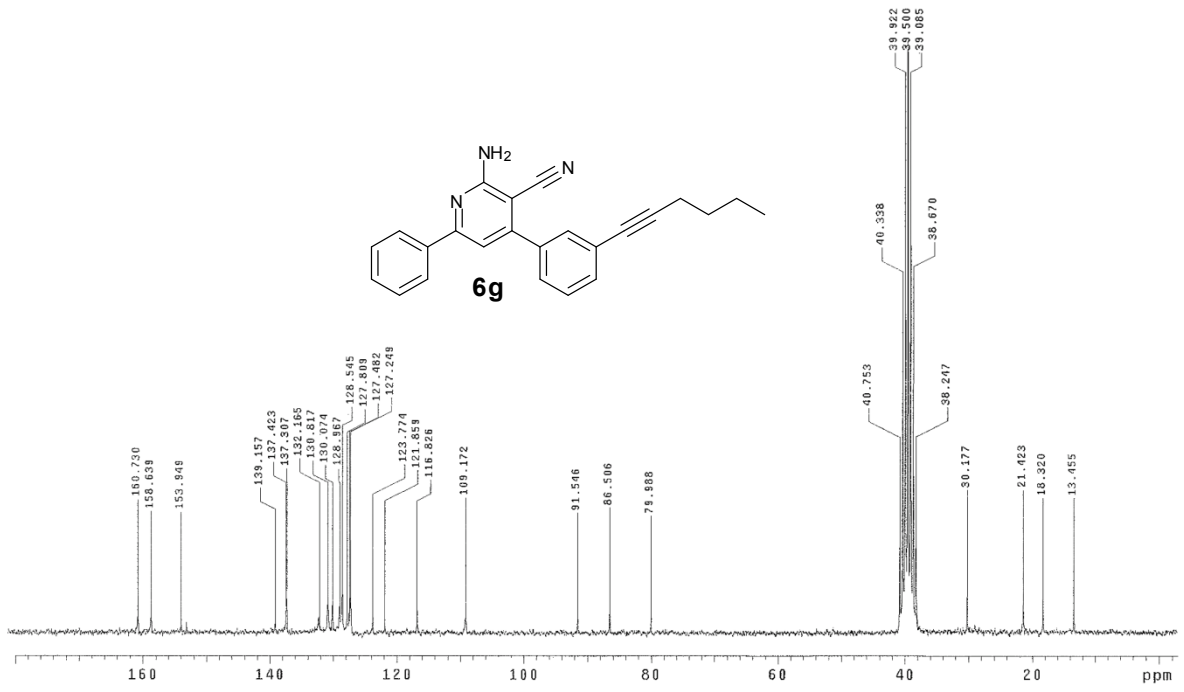
HRMS (ESI): calcd for $C_{24}H_{22}N_3$ $(M+H)^+$ 352.1814, found 352.1812

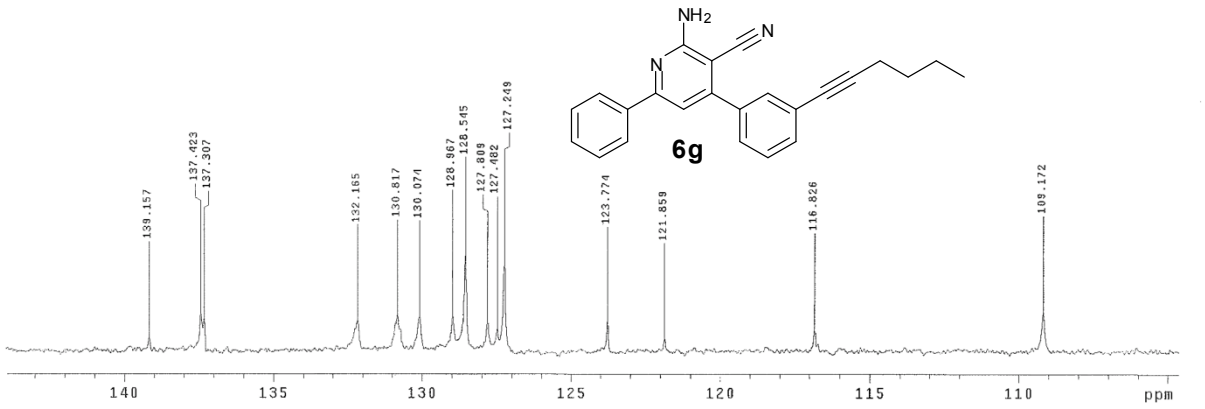
**Copies of FTIR, $^1H$ NMR and $^{13}C$ NMR and HRMS for 2-amino-4-(3-(hex-1-ynyl) phenyl)-6-phenylnicotinonitrile (6g):**

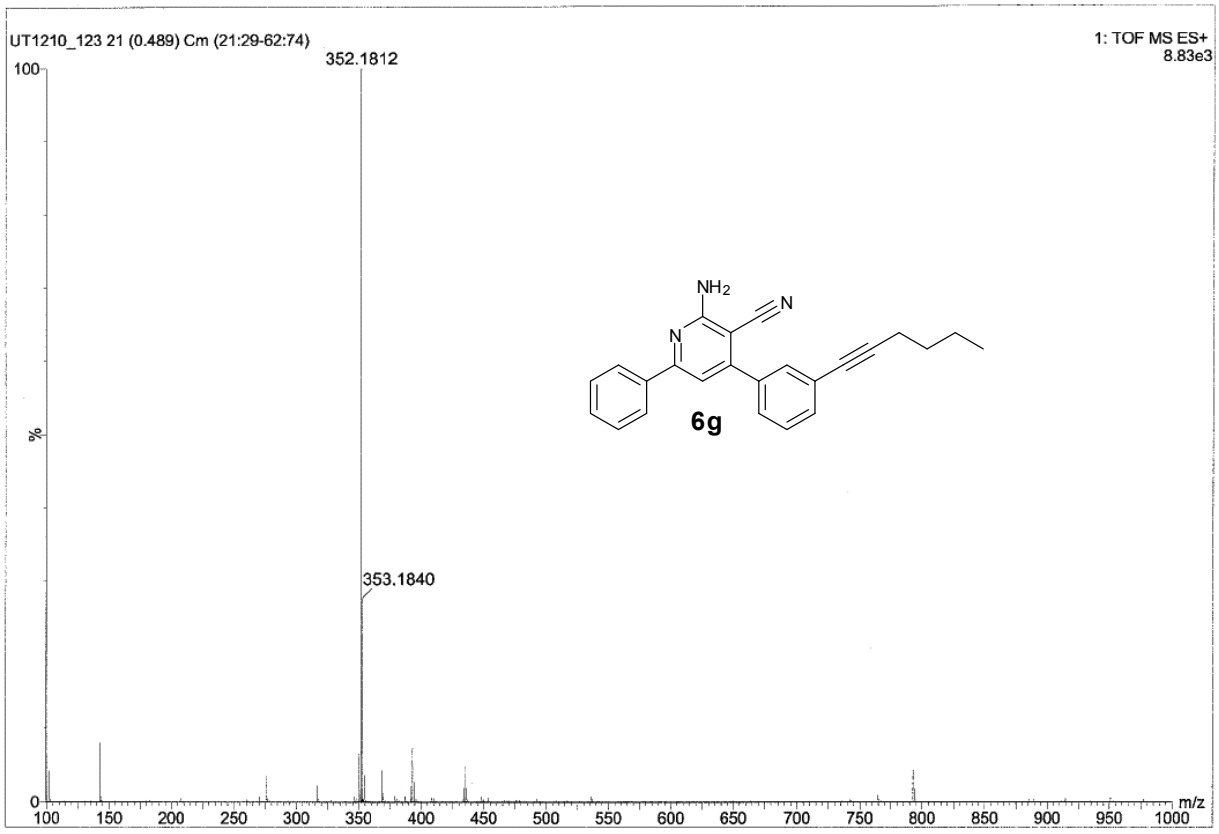


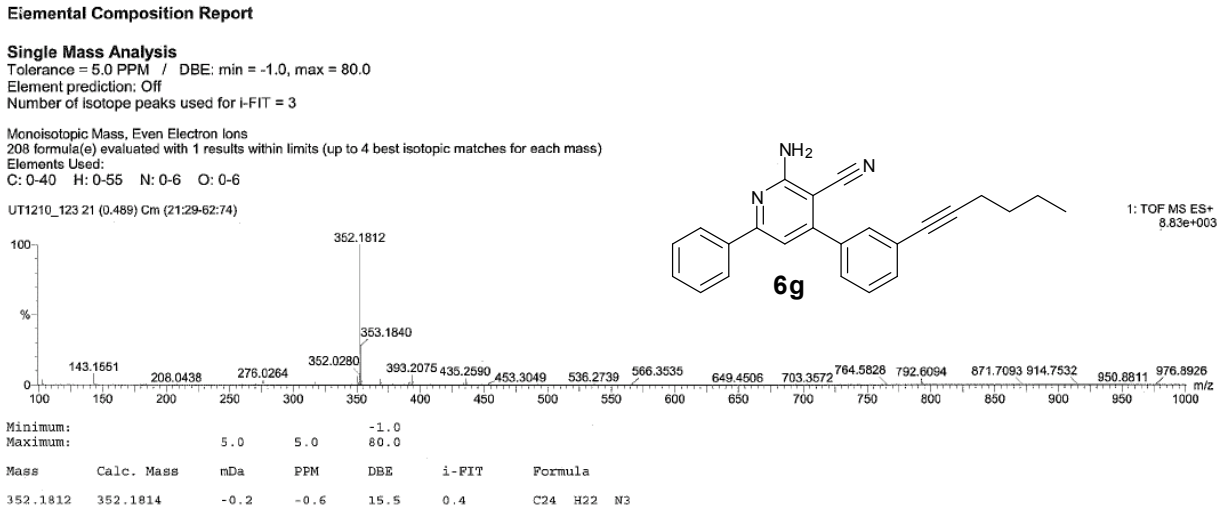

**6g**


NH2
N
N
6g
9
8
7
6
5
4
3
2
1
0
ppm
1.87
7.06
1.07
2.00
1.84
2.08
2.88
0


NH2
N
N
6g
39.922
39.500
39.085
40.338
38.670
40.753
38.247
160.730
158.639
153.849
139.157
137.423
137.307
132.165
130.817
130.074
128.367
128.545
127.809
127.482
127.249
123.774
121.859
116.826
109.172
91.546
86.506
79.588
30.177
21.423
18.320
13.455
160
140
120
100
80
60
40
20
ppm


NH2
N
N
6g
139.157
137.423
137.307
132.165
130.817
130.074
128.967
128.545
127.809
127.482
127.249
123.774
121.859
116.826
109.172
140
135
130
125
120
115
110
ppm


UT1210_123 21 (0.489) Cm (21:29-62:74)
1: TOF MS ES+
8.83e3
352.1812
353.1840
100
%
0
NH2
N
N
6g
100
150
200
250
300
350
400
450
500
550
600
650
700
750
800
850
900
950
1000
m/z




**Characterization data for 2-amino-4-(3-(hept-1-ynyl)phenyl)-6-phenyl nicotinonitrile (6h):**

Off-white solid; Yield = 90%; mp. 86–89°C.

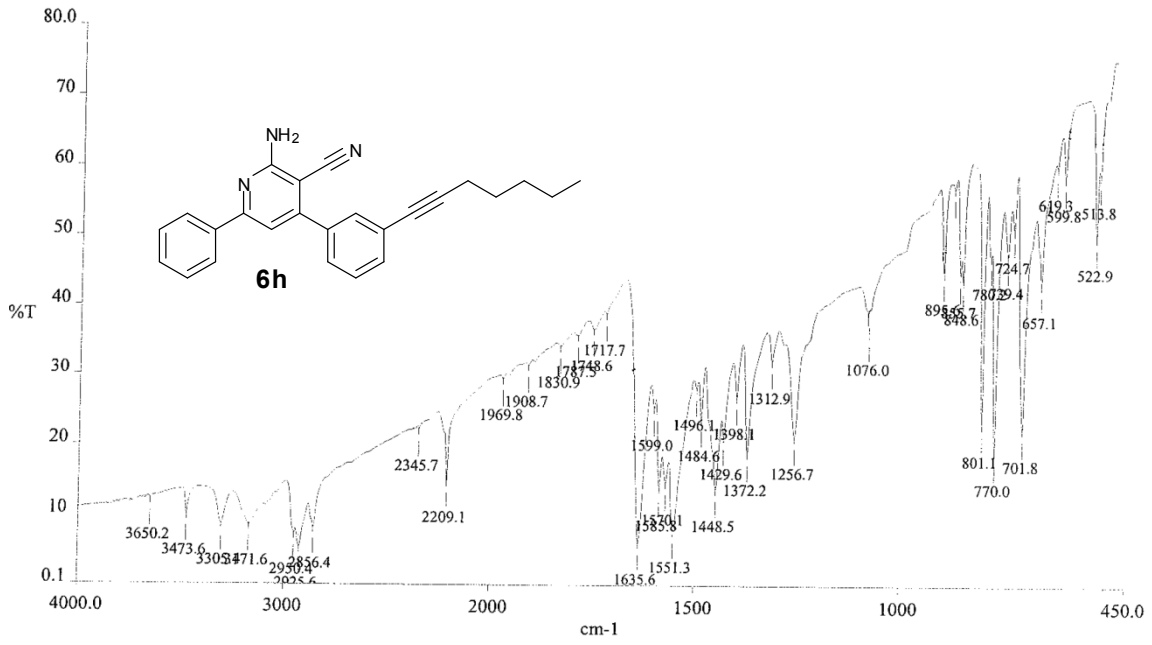
FT-IR (KBr, $cm^{-1}$): 3473.6, 3305.4, 2345.7, 2209.1, 1635.6, 1551.3.

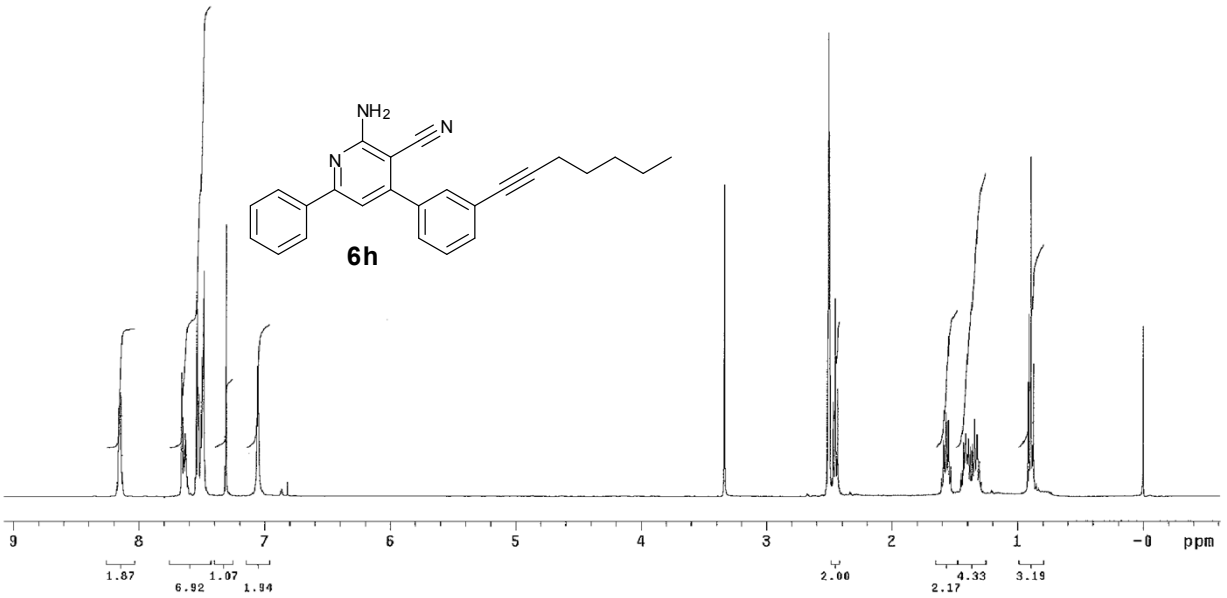
$^1$H NMR (400 MHz, DMSO-$d_6$) δ 8.16 (d, 2H, $J$ = 4.4 Hz, arom H), 7.66 - 7.61 (m, 2H, arom H), 7.55 - 7.47 (m, 5H, arom H), 7.30 (s, 1H, arom H), 7.05 (br, 2H, -$NH_2$), 2.45 (t, 2H, $J$ = 7.2 Hz, -$CH_2$), 1.57 (quintet, 2H, $J$ = 7.2 Hz, -$CH_2$), 1.44 – 1.28 (m, 4H, -2$CH_2$), 0.89 (t, 3H, $J$ = 7.2 Hz, -$CH_3$).

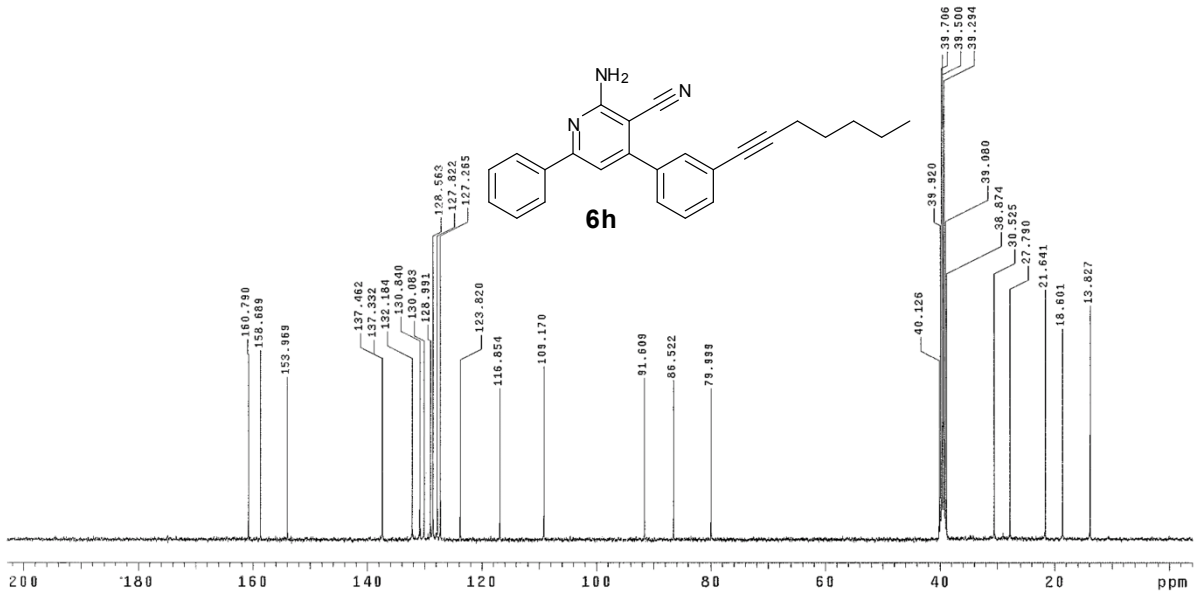
$^{13}$C NMR (100 MHz, DMSO-$d_6$) δ 160.7, 158.6, 153.9, 137.4, 137.3, 132.1, 130.8, 130.0, 128.9, 128.5, 127.8, 127.2, 123.8, 116.8, 109.1, 91.6, 86.5, 79.9, 30.5, 27.7, 21.6, 18.6, 13.8.

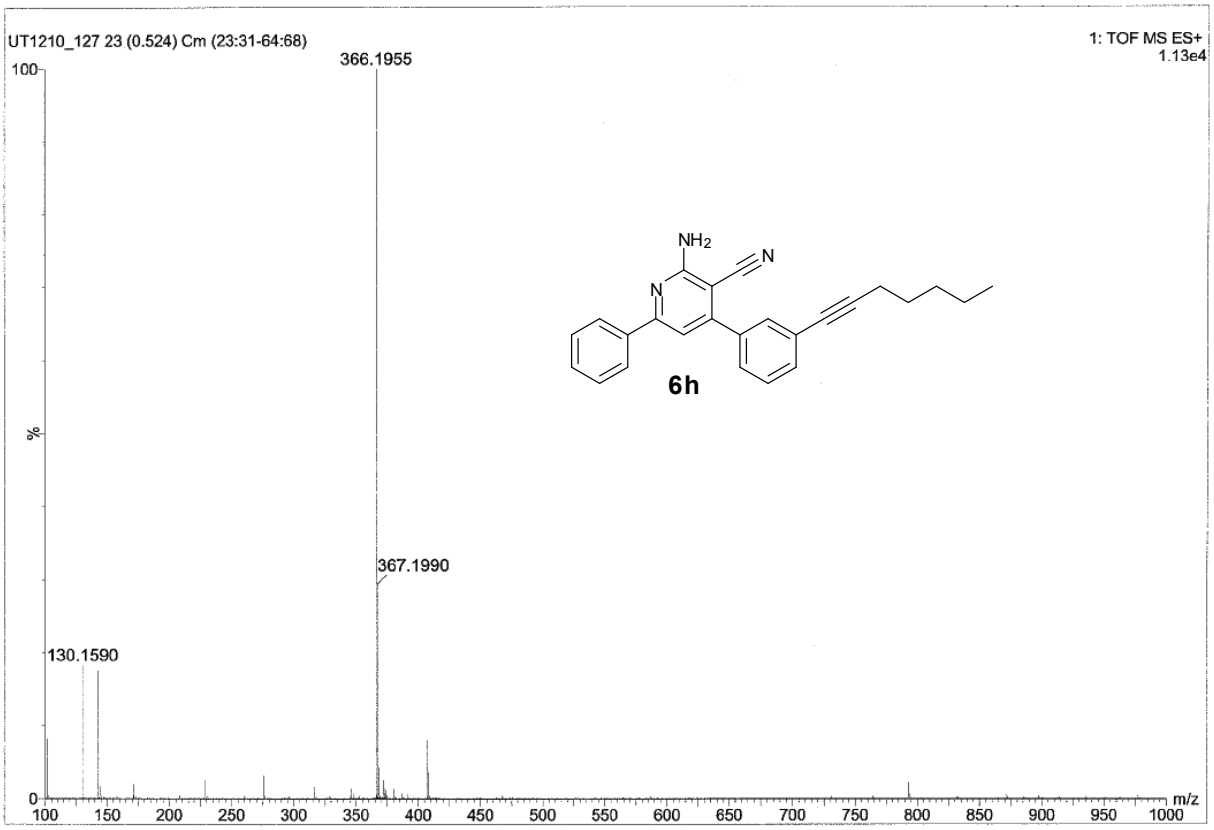
HRMS (ESI): calcd for $C_{25}H_{24}N_3$ $(M+H)^+$ 366.1970, found 366.1955

**Copies of FTIR, $^1$H NMR and $^{13}$C NMR and HRMS for 2-amino-4-(3-(hept-1-ynyl)phenyl)-6-phenylnicotinonitrile (6h):**




NH2
N
N
6h
9
8
7
6
5
4
3
2
1
-0
ppm
1.87
6.92
1.07
1.94
2.00
2.17
4.33
3.19

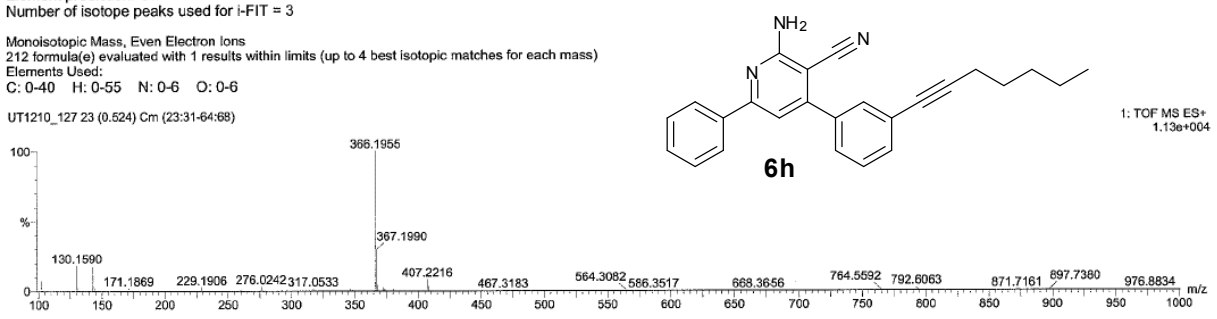

NH2
N
N
6h
160.790
158.689
153.969
137.462
137.332
132.184
130.840
130.063
128.991
128.562
127.822
127.265
123.820
116.854
109.170
91.609
86.522
79.998
40.126
39.920
39.706
39.500
39.294
39.080
38.874
30.525
27.790
21.641
18.601
13.827
200
180
160
140
120
100
80
60
40
20
ppm




**Elemental Composition Report**

**Single Mass Analysis**
Tolerance = 5.0 PPM / DBE: min = -1.0, max = 80.0
Element prediction: Off
Number of isotope peaks used for i-FIT = 3

Monoisotopic Mass, Even Electron Ions
212 formula(e) evaluated with 1 results within limits (up to 4 best isotopic matches for each mass)
Elements Used:
C: 0-40 H: 0-55 N: 0-6 O: 0-6




| | | | | | | |
|---|---|---|---|---|---|---|
| Minimum: | | | | -1.0 | | |
| Maximum: | | 5.0 | 5.0 | 80.0 | | |
| Mass | Calc. Mass | mDa | PPM | DBE | i-FIT | Formula |
| 366.1955 | 366.1970 | -1.5 | -4.1 | 15.5 | 1.3 | C25 H24 N3 |

**Characterization data for 2-amino-4-(3-(oct-1-ynyl)phenyl)-6-phenylnicotinonitrile (6i):**

Off-white solid; Yield = 91%; mp. 89–91°C.

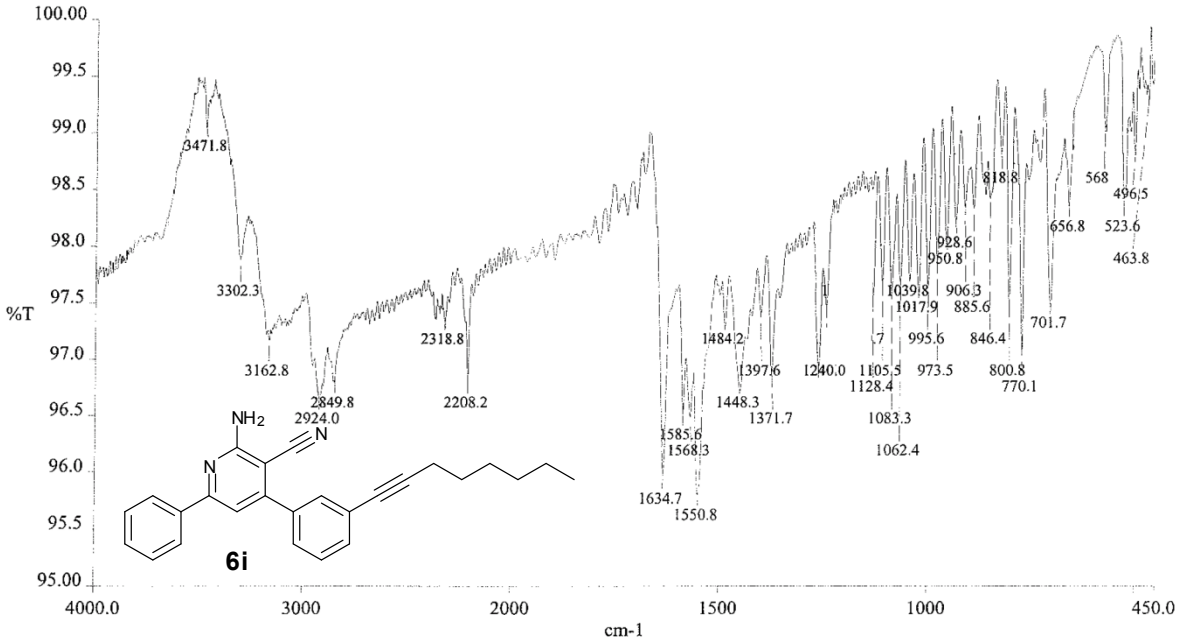
FT-IR (KBr, $cm^{-1}$): 3471.8, 3302.3, 3162.8, 2924.0, 2318.8, 2208.2, 1634.7, 1550.8.

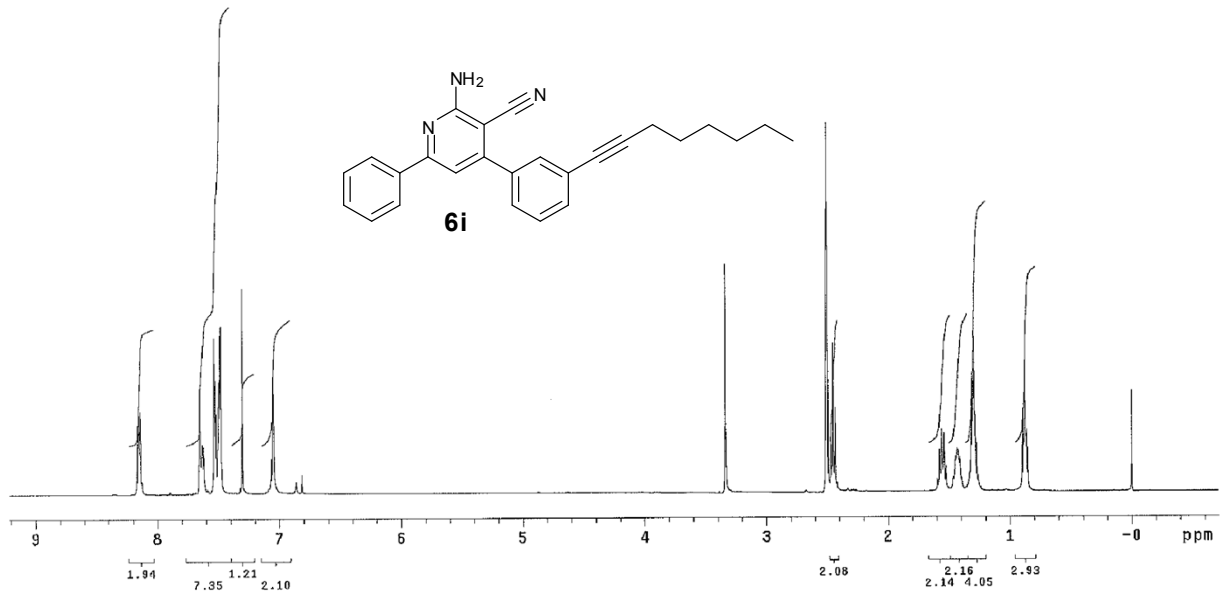
$^1$H NMR (400 MHz, DMSO-$d_6$) δ 8.14 (d, 2H, $J$ = 4.0 Hz, arom H), 7.66 - 7.62 (m, 2H, arom H), 7.54 - 7.47 (m, 6H, arom H), 7.3 (s, 1H, arom H), 7.05 (br, 2H, -$NH_2$), 2.45 (t, 2H, $J$ = 7.2 Hz, -$CH_2$), 1.56 (quintet, 2H, $J$ = 6.8 Hz, -$CH_2$), 1.43 (sextet, 2H, $J$ = 7.2 Hz, -$CH_2$), 1.33 – 1.23 (m, 4H, -2$CH_2$), 0.87 (t, 3H, $J$ = 6.8 Hz, -$CH_3$).

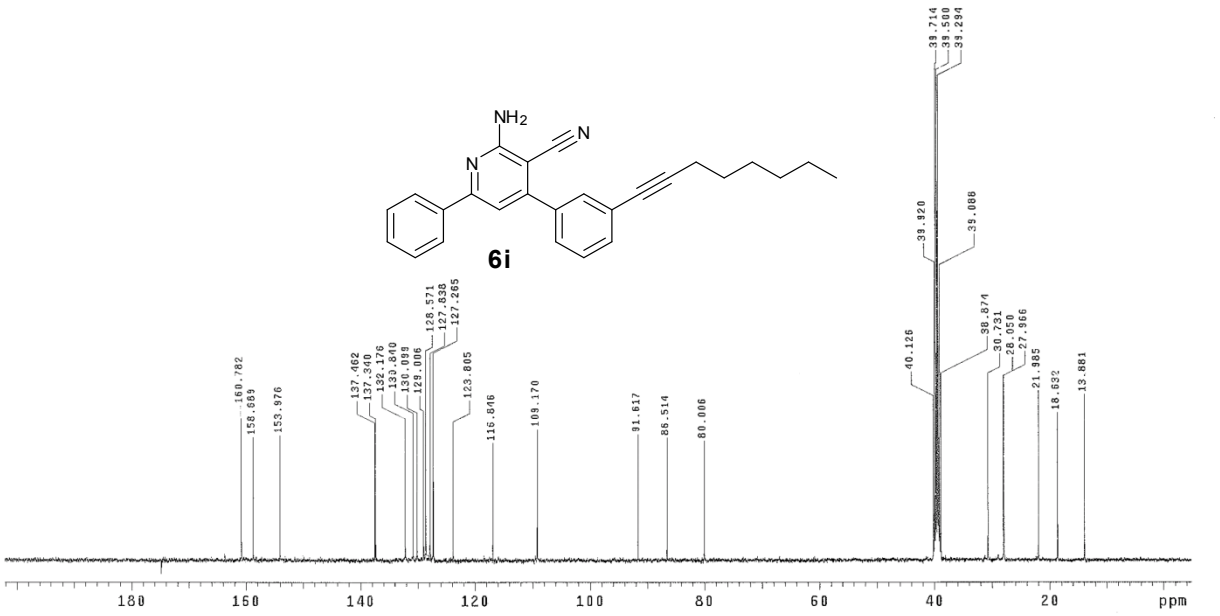
$^{13}$C NMR (100 MHz, DMSO-$d_6$) δ 160.7, 158.6, 153.9, 137.4, 137.3, 132.1, 130.8, 130.0, 129.0, 128.5, 127.8, 127.2, 123.8, 116.8, 109.1, 91.6, 86.5, 80.0, 30.7, 28.0, 27.9, 21.9, 18.6, 13.8.

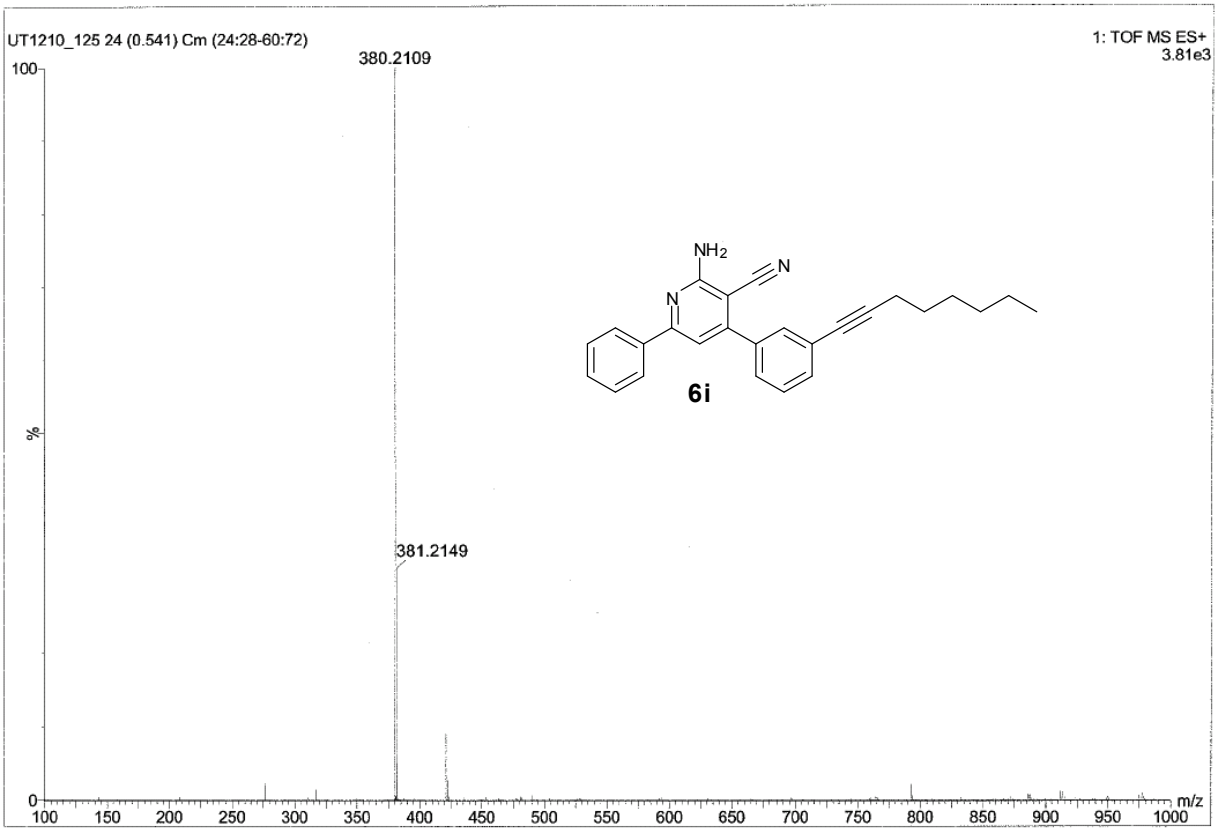
HRMS (ESI): calcd for $C_{26}H_{26}N_3$ $(M+H)^+$ 380.2127, found 380.2109.

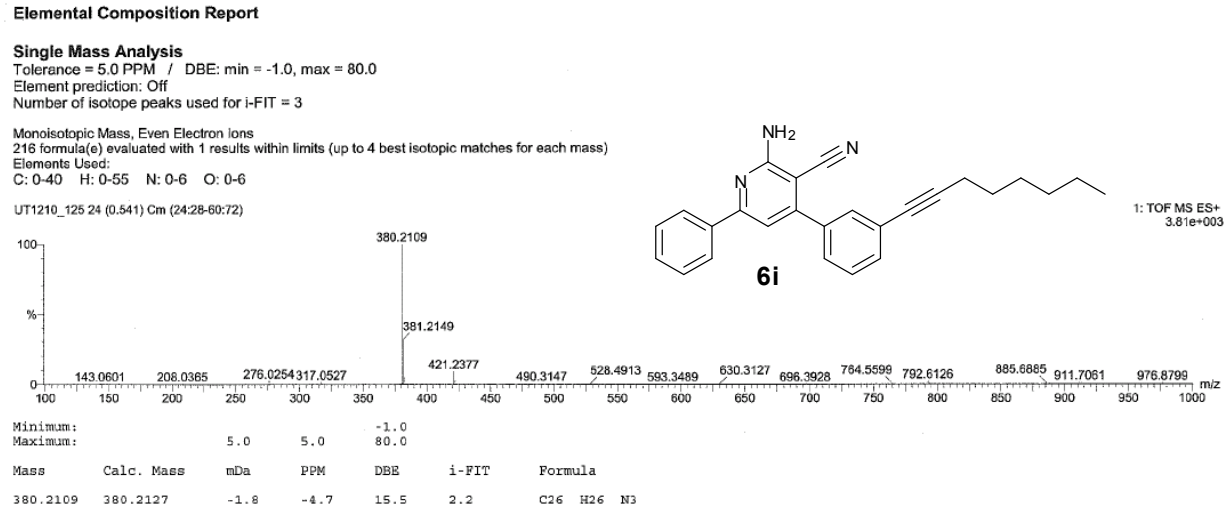
**Copies of FTIR, $^1$H NMR and $^{13}$C NMR and HRMS for 2-amino-4-(3-(oct-1-ynyl)phenyl)-6-phenylnicotinonitrile (6i):**




NH2
N
N
6i
160.782
158.689
153.976
137.462
137.340
132.176
130.840
130.099
129.006
128.571
127.838
127.285
123.865
116.846
109.170
91.617
86.514
80.006
40.126
39.920
39.714
39.500
39.294
39.088
30.874
30.731
28.050
27.966
21.985
18.632
13.881
180
160
140
120
100
80
60
40
20
ppm


UT1210_125 24 (0.541) Cm (24:28-60:72)
1: TOF MS ES+
3.81e3
380.2109
381.2149
100
%
0
NH2
N
N
6i
100
150
200
250
300
350
400
450
500
550
600
650
700
750
800
850
900
950
1000
m/z




**Characterization data for 2-amino-4-(3-(dec-1-ynyl)phenyl)-6-phenyl nicotinonitrile (6j):**

Off-white solid; Yield = 91%; mp. 82–83°C.

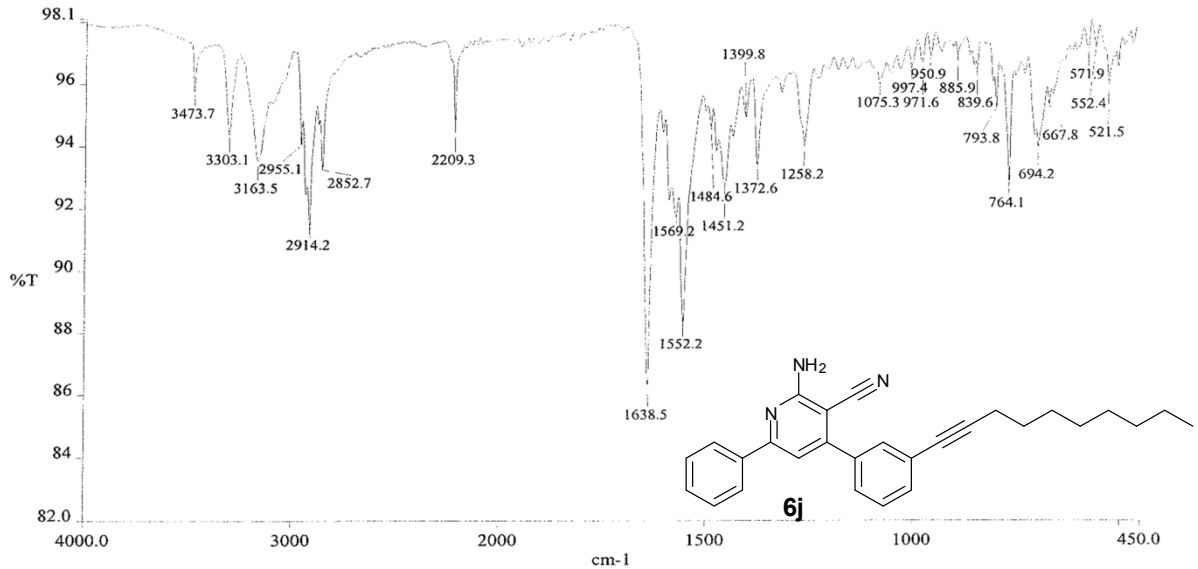
FT-IR (KBr, $cm^{-1}$): 3473.7, 3303.1, 3163.5, 2955.1, 2209.3, 1638.5, 1552.2.

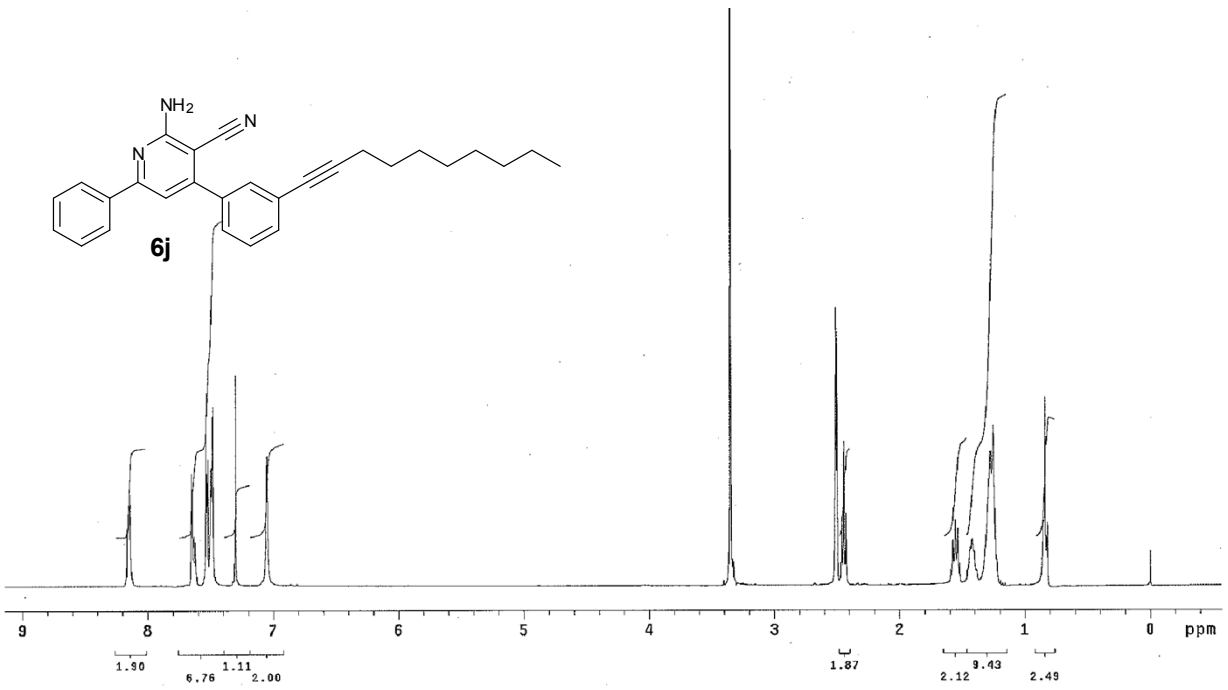
$^1$H NMR (400 MHz, DMSO-$d_6$) δ 8.15 (dd, 2H, $J$ = 8.0 Hz , $J$ = 4.4 Hz, arom H), 7.65 - 7.61 (m, 2H, arom H), 7.53 - 7.47 (m, 5H, arom H), 7.30 (s, 1H, arom H), 7.05 (br, 2H, -$NH_2$), 2.44 (t, 2H, $J$ = 6.8 Hz, -$CH_2$), 1.55 (quintet, 2H, $J$ = 7.0 Hz, -$CH_2$), 1.44-1.39 (m, 2H, -$CH_2$), 1.29 – 1.22 (m, 8H, -$CH_2$), 0.84 (t, 3H, $J$ = 6.4 Hz, -$CH_3$).

$^{13}$C NMR (100 MHz, DMSO-$d_6$) δ 160.7, 158.6, 153.9, 137.4, 137.3, 132.1, 130.8, 130.0, 128.9, 128.5, 127.8, 127.2, 123.8, 116.8, 109.1, 91.6, 86.5, 80.0, 31.2, 28.5, 28.4, 28.2, 28.0, 22.0, 18.6, 13.9.

HRMS (ESI): calcd for $C_{28}H_{30}N_3$ $(M+H)^+$ 408.2440, found 408.2440

**Copies of FTIR, $^1$H NMR and $^{13}$C NMR and HRMS for 2-amino-4-(3-(dec-1-ynyl)phenyl)-6-phenylnicotinonitrile (6j):**

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6j
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6
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2.00
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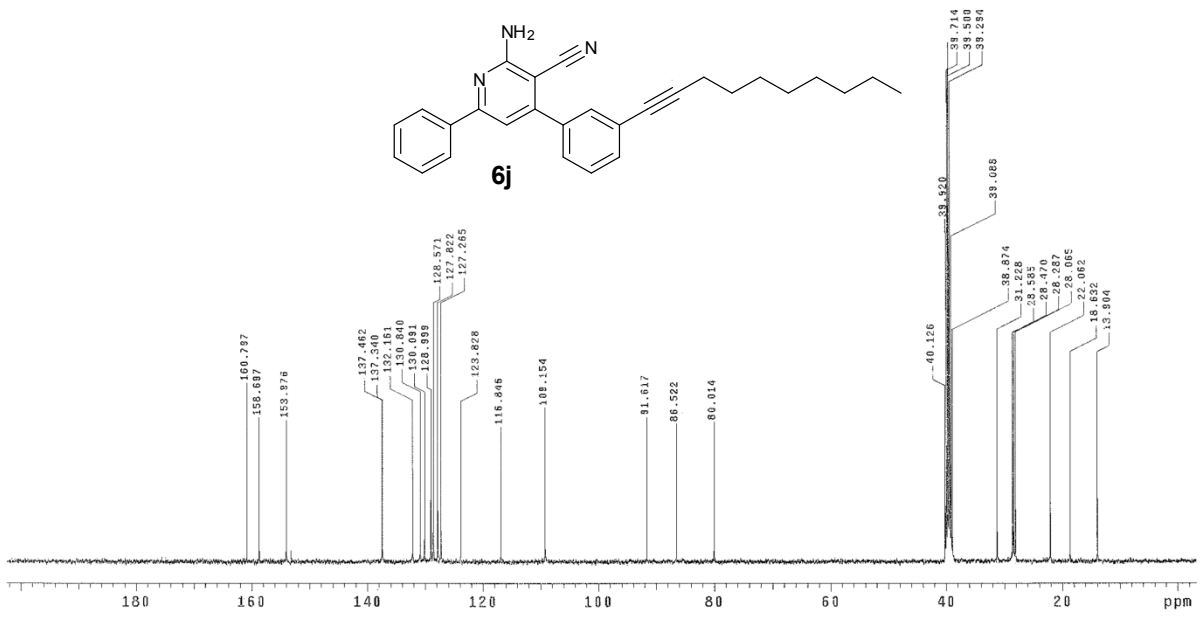
2.12
9.43
2.49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91.617
86.522
80.014
39.714
39.500
39.294
39.088
38.920
38.874
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28.470
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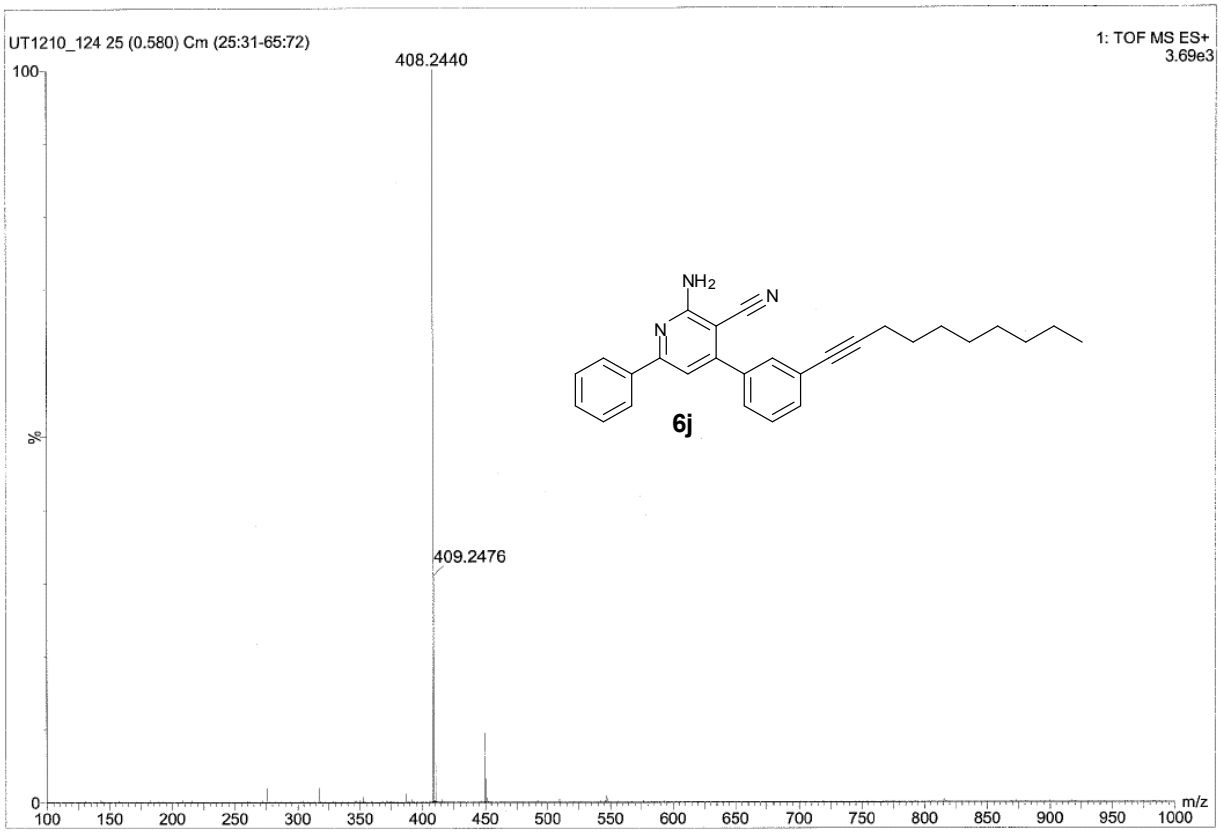
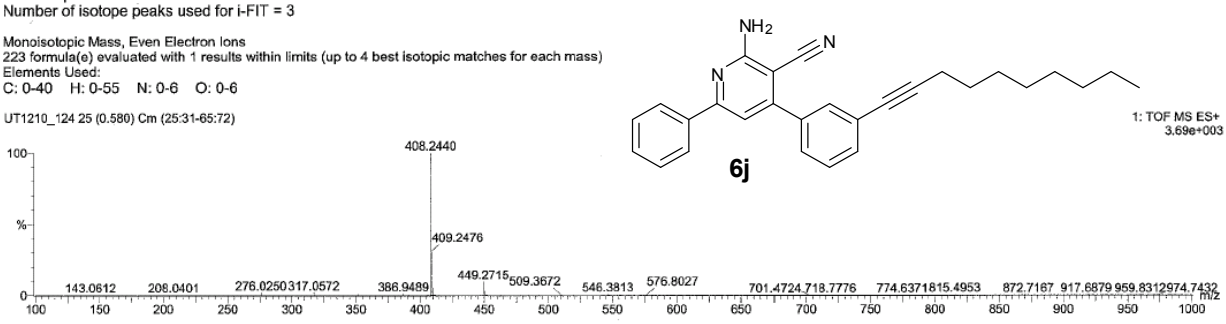



**Elemental Composition Report**

**Single Mass Analysis**
Tolerance = 5.0 PPM / DBE: min = -1.0, max = 80.0
Element prediction: Off
Number of isotope peaks used for i-FIT = 3

Monoisotopic Mass, Even Electron Ions
223 formula(e) evaluated with 1 results within limits (up to 4 best isotopic matches for each mass)
Elements Used:
C: 0-40 H: 0-55 N: 0-6 O: 0-6




| | | | | | | |
|---|---|---|---|---|---|---|
| Minimum: | | 5.0 | 5.0 | -1.0 | | |
| Maximum: | | | | 80.0 | | |
| Mass | Calc. Mass | mDa | PPM | DBE | i-FIT | Formula |
| 408.2440 | 408.2440 | 0.0 | 0.0 | 15.5 | 2.0 | C28 H30 N3 |

**Characterization data for 2-amino-4-(3-((1-hydroxycyclohexyl)ethynyl)phenyl)-6-phenyl nicotinonitrile (6k):**

Off-white solid; Yield = 85%; mp. 86.7–89.8°C.

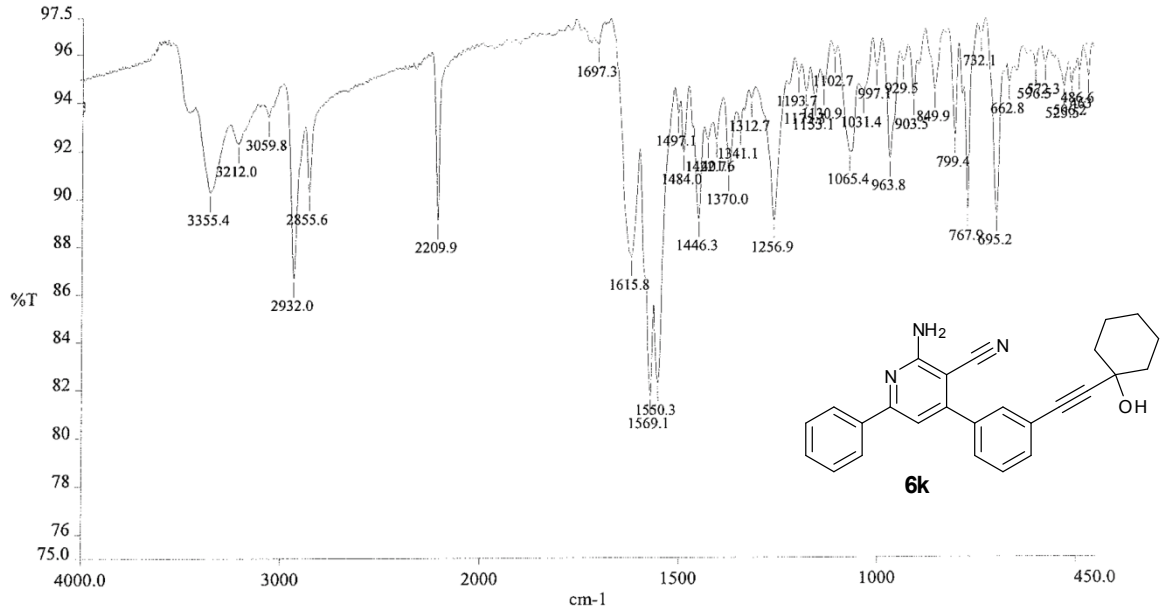
FT-IR (KBr, $cm^{-1}$): 3355.4, 3212.0, 3059.8, 2932.0, 2855.6, 2209.9, 1615.8, 1569.1.

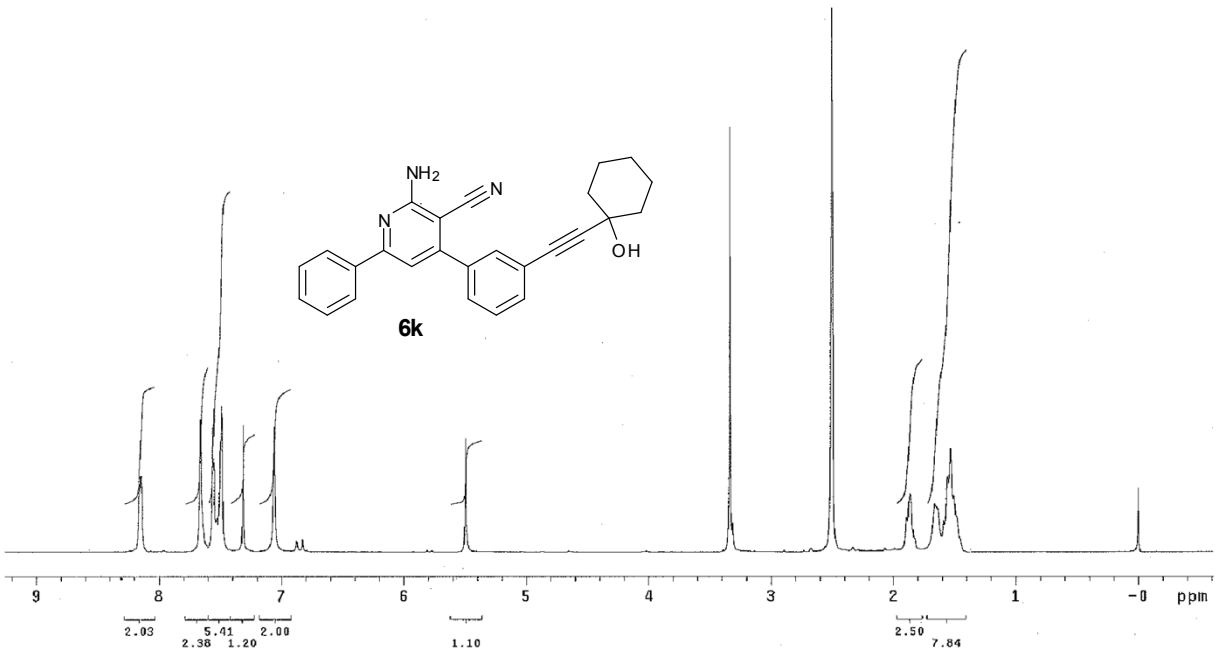
$^1$H NMR (400 MHz, DMSO-$d_6$) δ 8.15 (d, 2H, $J$ = 4.4 Hz, arom H), 7.66 (d, 2H, $J$ = 4.8 Hz, arom H), 7.56 - 7.48 (m, 5H, arom H), 7.31 (s, 1H, arom H), 7.06 (br, 2H, -$NH_2$), 5.5 (s, 1H, -OH), 1.89 – 1.82 (m, 2H, -$CH_2$), 1.66 – 1.59 (m, 2H, -$CH_2$), 1.56-1.50 (m, 6H, -3$CH_2$).

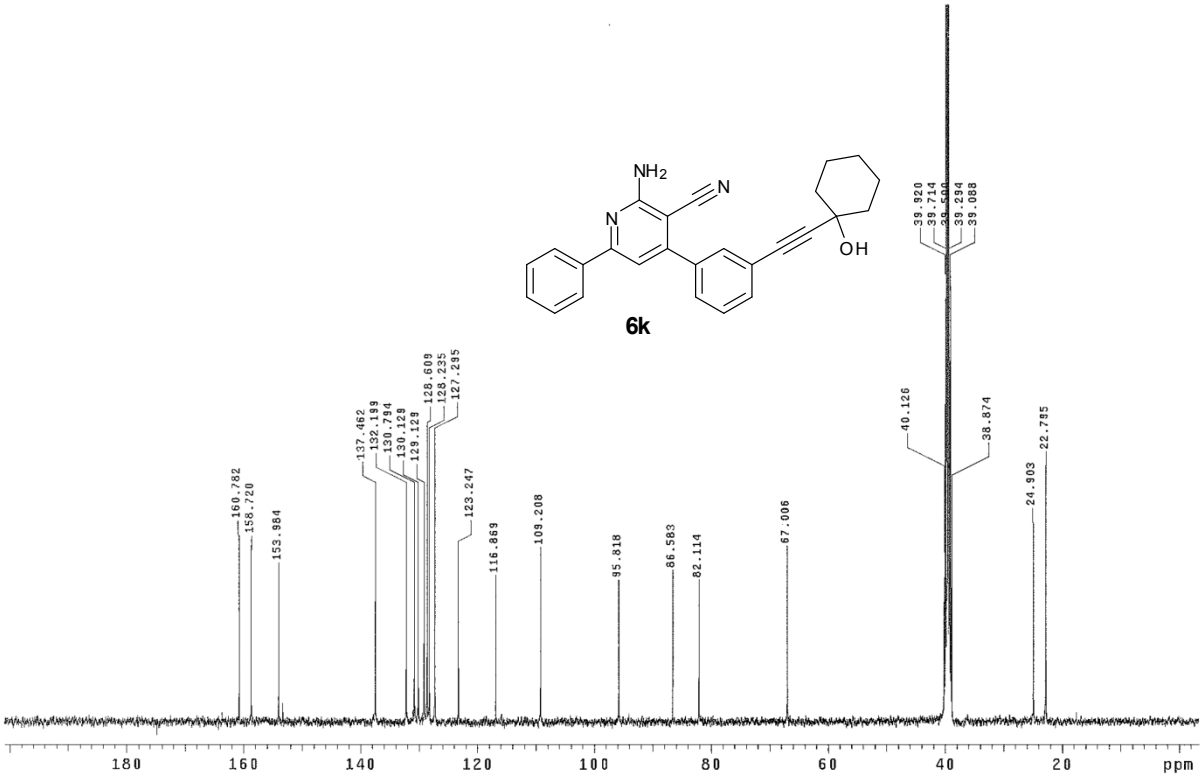
$^{13}$C NMR (100 MHz, DMSO-$d_6$) δ 160.7, 158.7, 153.9, 137.4, 132.1, 130.7, 130.1, 129.1, 128.6, 128.2, 127.2, 123.2, 116.8, 109.2, 95.8, 86.5, 82.1, 67.0, 24.9, 22.7.

HRMS (ESI): calcd for $C_{26}H_{24}N_3O$ $(M+H)^+$ 394.1919, found 394.1919

**Copies of FTIR, $^1$H NMR and $^{13}$C NMR and HRMS for 2-amino-4-(3-((1-hydroxycyclohexyl)ethynyl)phenyl)-6-phenylnicotinonitrile (6k):**

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127.295
123.247
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95.818
86.583
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60
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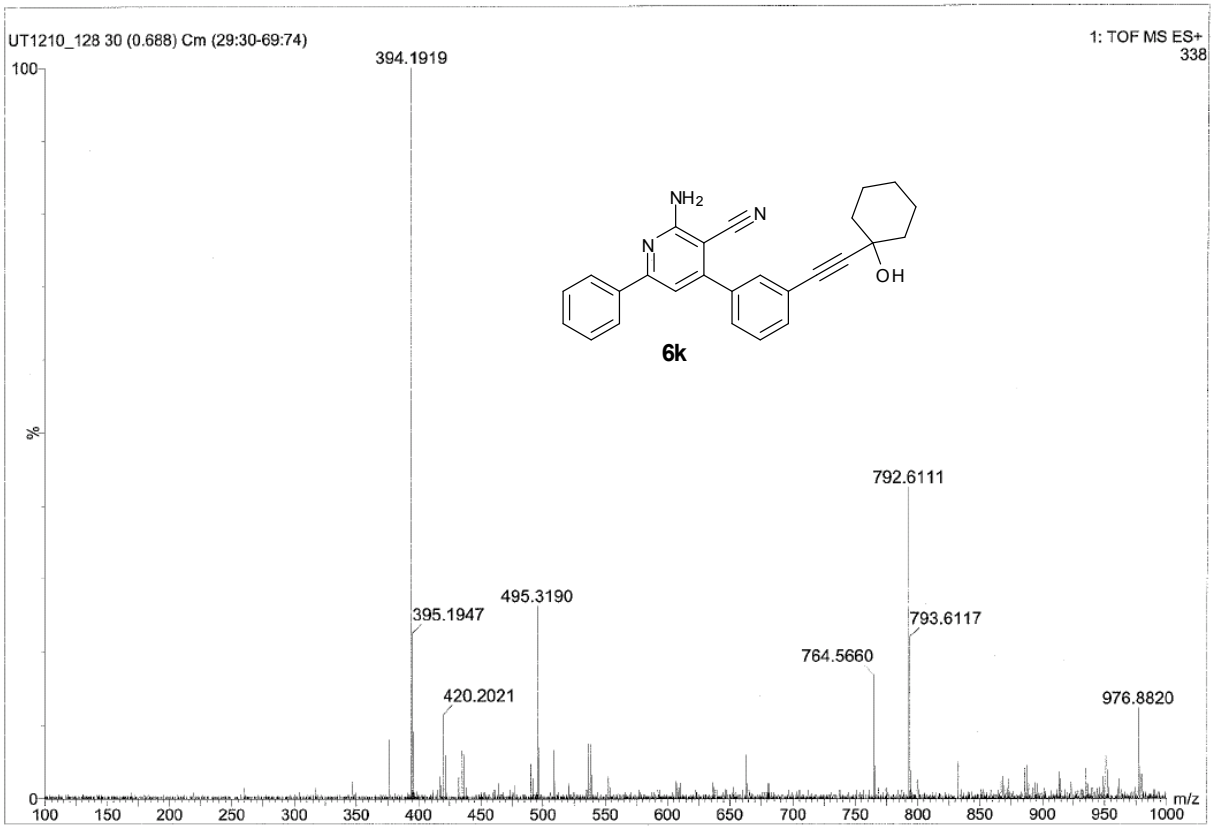
20
ppm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394.1919
100
%
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N
N
OH
6k
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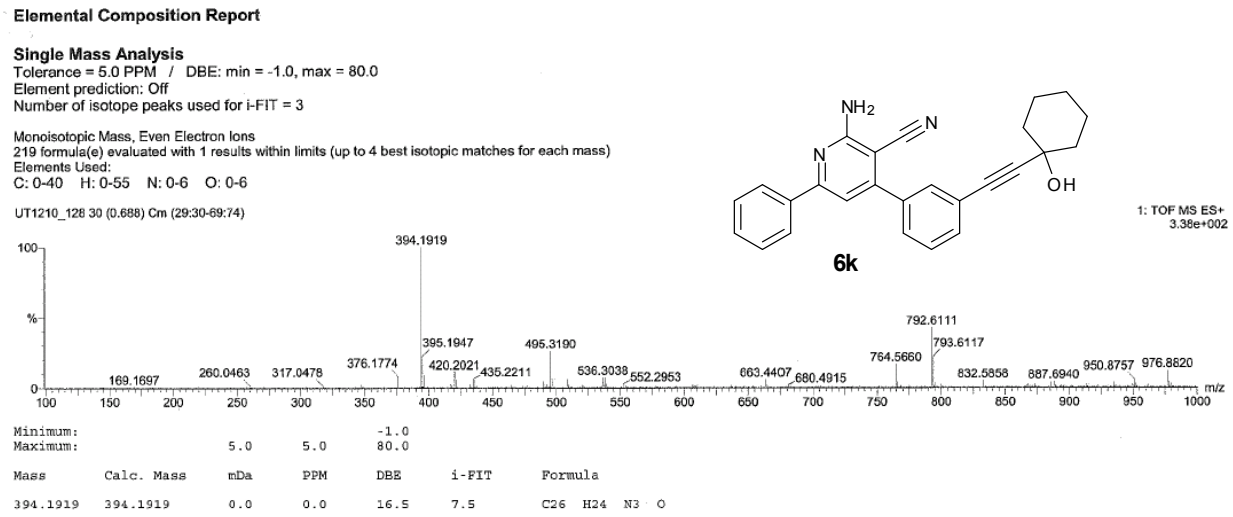
495.3190
395.1947
793.6117
764.5660
420.2021
976.8820
0
100
150
200
250
300
350
400
450
500
550
600
650
700
750
800
850
900
950
1000
m/z







**6k**

**Typical experimental procedure for the preparation of 2-amino-4-(2-(3-hydroxyprop-1-ynyl)phenyl)-6-phenylnicotinonitrile (7a):**

A mixture of 2-bromobenzaldehyde (**1a**) [10.0 mmol], malononitrile (**2**) [11.0 mmol], acetophenone (**3**) [11.0 mmol] and $NH_4OAc$ (**4**) [20.0 mmol] in the presence of pyrrolidine (5.0 mmol) in a mixture of $H_2O$-DME (1:4 ratio) (10 vol) is stirred at reflux for 1.0 hr. The first phase progress of the reaction is monitored by TLC. After the completion of the reaction, the reaction mixture is cooled to RT and then, prop-2-yn-1-ol **5a** [17.0 mmol], $PdCl_2(PPh_3)_2$ [0.002 mmol] and CuI [0.005 mmol] are added. Again the entire reaction mixture is kept under reflux conditions for 3.5 hrs in open air. Final stage progress is monitored by TLC. After the completion of the reaction, the whole reaction mixture is cooled to RT and the solvent is removed under reduced pressure. The obtained crude product is purified by column chromatography using silica gel and 1:9 ratio of EtOAc - Petroleum ether (PE) to obtain pure product **7a**. The isolated yield of product 7**a** is 80%. The same procedure is followed for the preparation of 2-amino-4-(2-(alkynyl)phenyl)-6-phenylnicotinonitrile derivatives (**7b-d**) listed in **Table-3.** Synthesized compounds (**7a-d**) gave satisfactory spectroscopic data in accordance with their proposed structures.

**Characterization data for 2-amino-4-(2-(3-hydroxyprop-1-ynyl)phenyl)-6-phenyl nicotinonitrile (7a):**

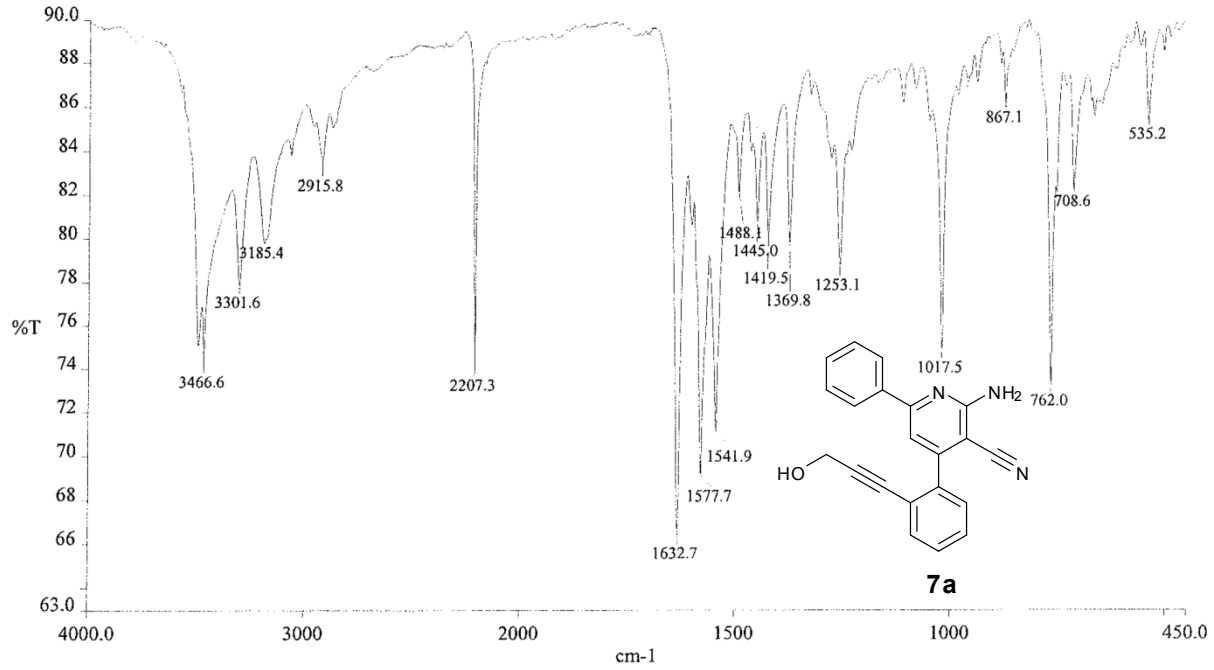
Off-white solid, Yield = 90%; mp145-147°C.

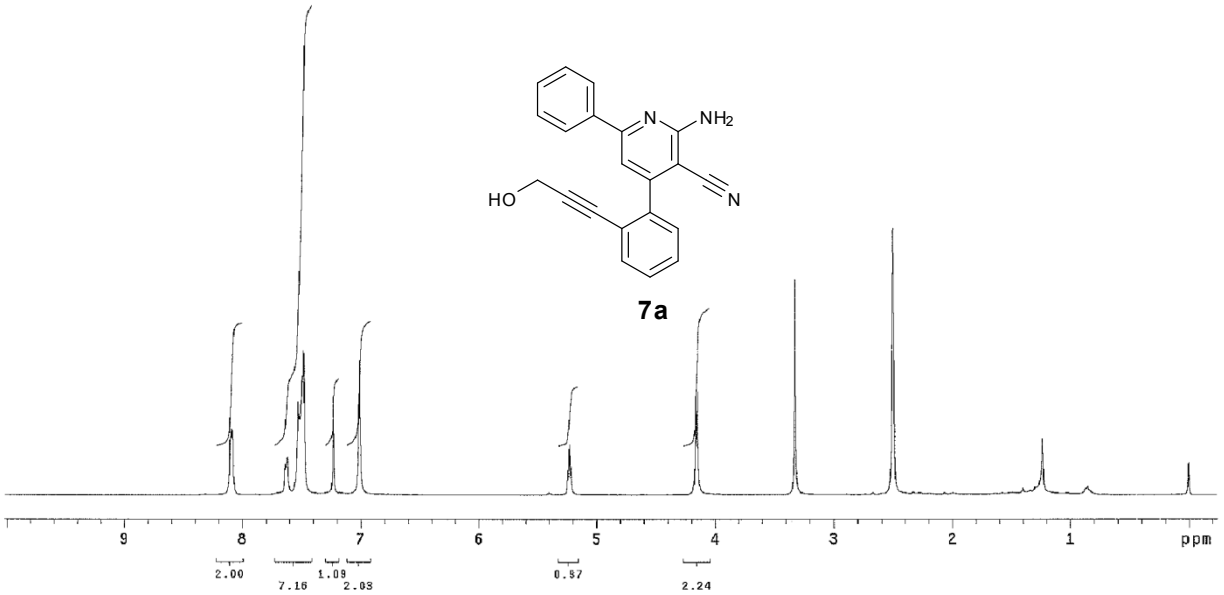
FT-IR (KBr, $cm^{-1}$): 3466.6, 3301.6, 3185.4, 2915.8, 2207.3, 1632.7, 1577.7, 1541.9.

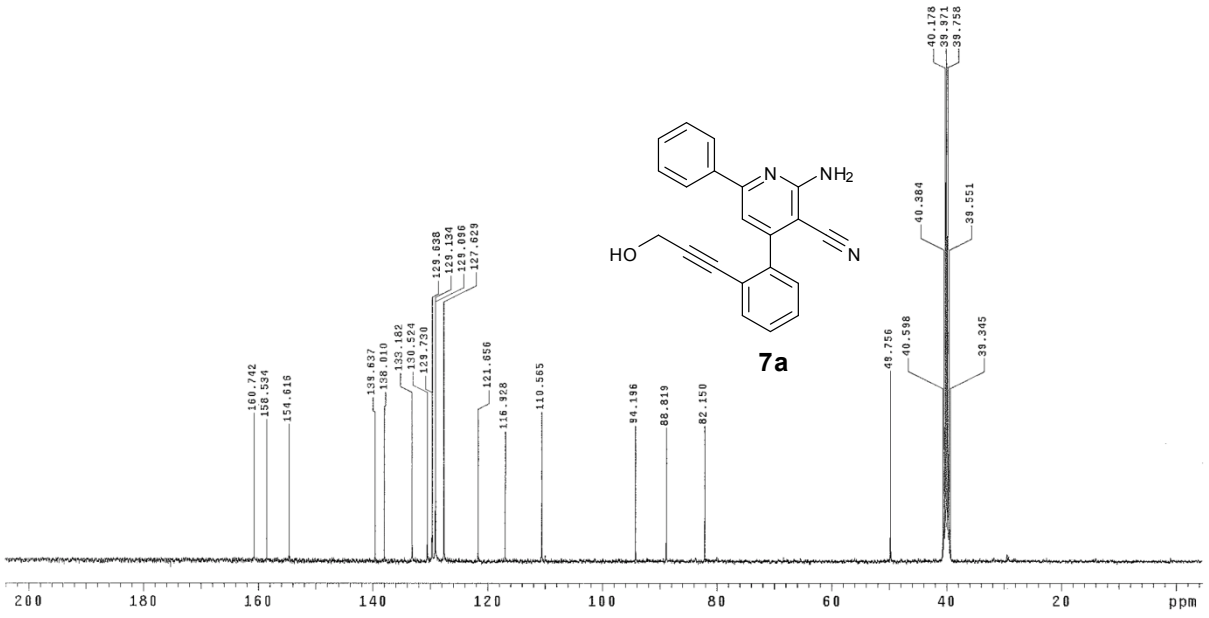
$^1H$ NMR (400 MHz, DMSO-$d_6$) δ 8.09 (d, 2H, $J$ = 6.8 Hz, arom H), 7.63 (d, 1H, $J$ = 7.6 Hz, arom H), 7.53 – 7.48 (m, 6H, arom H), 7.23 (s, 1H, arom H), 7.01 (s, 2H, $-NH_2$), 5.23 (t, 1H, $J$ = 6.0 Hz, -OH), 4.15 (d, 2H, $J$ = 5.6 Hz, $-OCH_2$).

$^{13}C$ NMR (100 MHz, DMSO-$d_6$) δ 160.7, 158.5, 154.6, 139.6, 138.01, 133.1, 130.5, 129.7, 129.6, 129.1, 129.0, 127.6, 121.6, 116.9, 110.5, 94.1, 88.8, 82.1, 49.7.

**Copies of FTIR, $^{1}H$ NMR and $^{13}C$ NMR 2-amino-4-(2-(3-hydroxyprop-1-ynyl)phenyl)-6-phenylnicotinonitrile (7a):**






**Characterization data for 2-amino-4-(2-(4-hydroxybut-1-ynyl)phenyl)-6-phenyl nicotinonitrile (7b):**

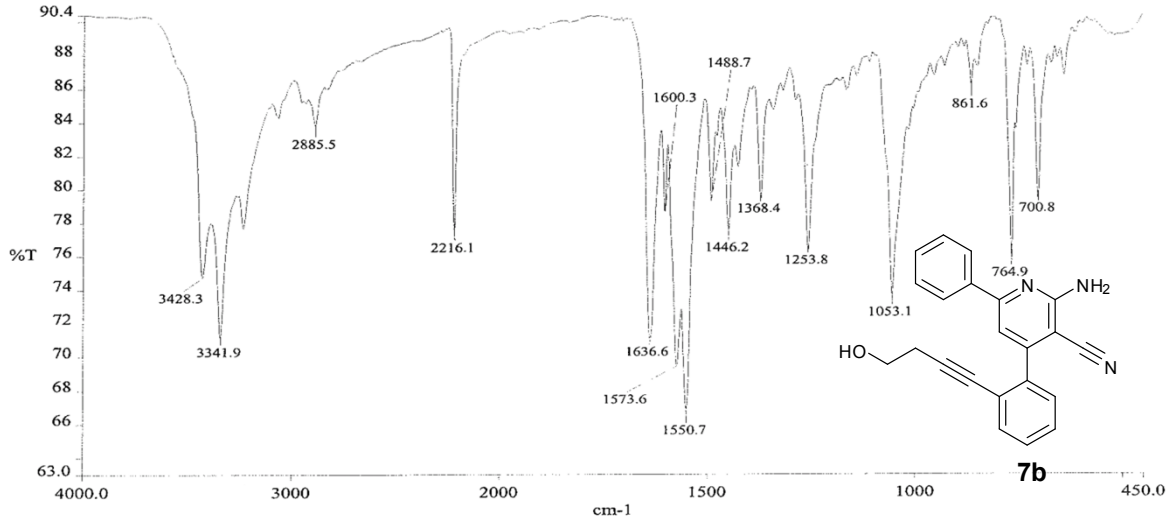
Off-white solid, Yield = 91%; mp 158–161°C.

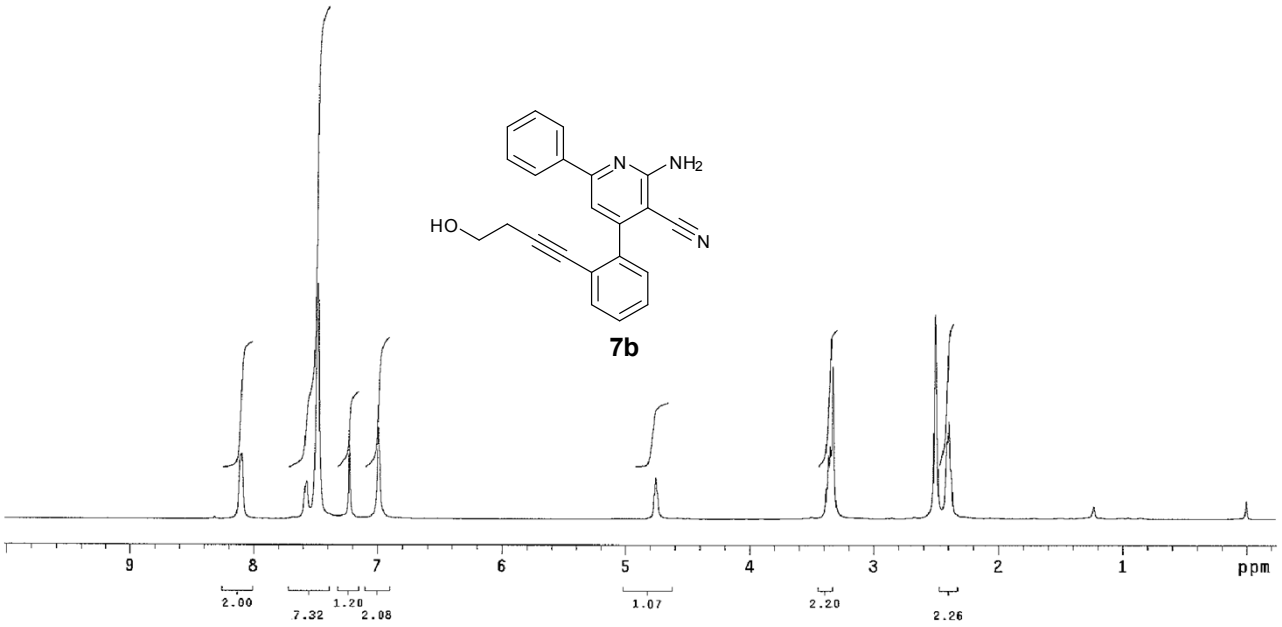
FT-IR (KBr, $cm^{-1}$): 3428.3, 3341.9, 2885.5, 2216.1, 1636.6, 1573.6, 1550.7.

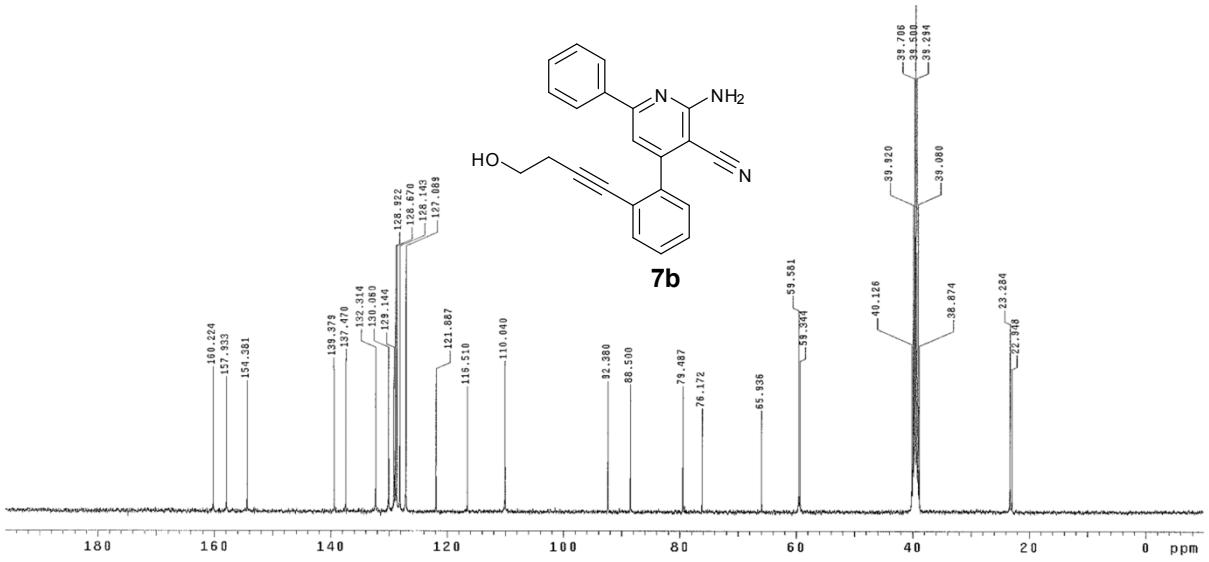
$^1$H NMR (400 MHz, DMSO-$d_6$) δ 8.1 (d, 2H, $J$ = 4.0 Hz, arom H), 7.57 (s, 1H, arom H), 7.48 (s, 6H, arom H), 7.23 (s, 1H, arom H), 6.99 (s, 2H, -$NH_2$), 4.75 (t, 1H, $J$ = 5.2 Hz, -OH), 3.36-3.32 (m, 2H, -$OCH_2$), 2.39 (t, 2H, $J$ = 6.8 Hz, -$CH_2$).

$^{13}$C NMR (100 MHz, DMSO-$d_6$) δ 160.2, 157.9, 154.3, 139.3, 137.4, 132.3, 130.0, 129.1, 128.9, 128.6, 128.1, 127.0, 121.8, 116.5, 110.0, 92.3, 88.5, 79.4, 76.1, 65.9, 59.5, 59.3, 23.2, 22.9.

**Copies of FTIR, $^1$H NMR and $^{13}$C NMR for 2-amino-4-(2-(4-hydroxybut-1-ynyl)phenyl)-6-phenylnicotinonitrile (7b):**






**Characterization data for 2-amino-4-(2-(3-hydroxy-3-methyl but-1-ynyl)phenyl)-6-phenyl nicotinonitrile (7c):**

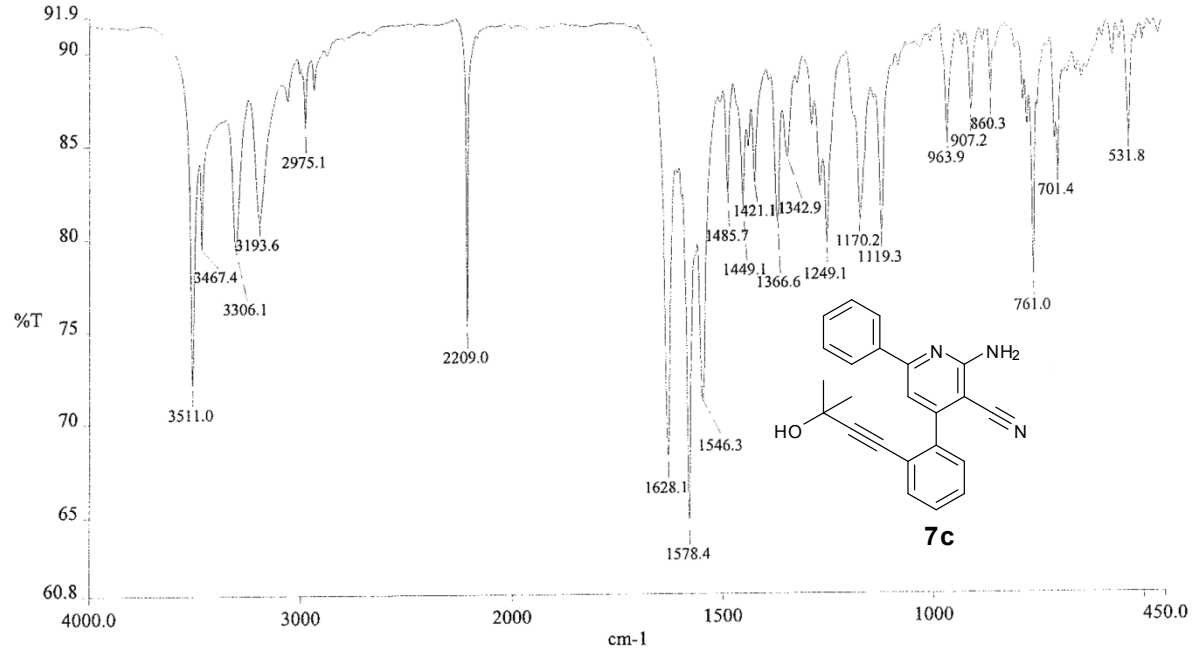
Off-white solid, Yield = 88%; mp. 157–161°C.

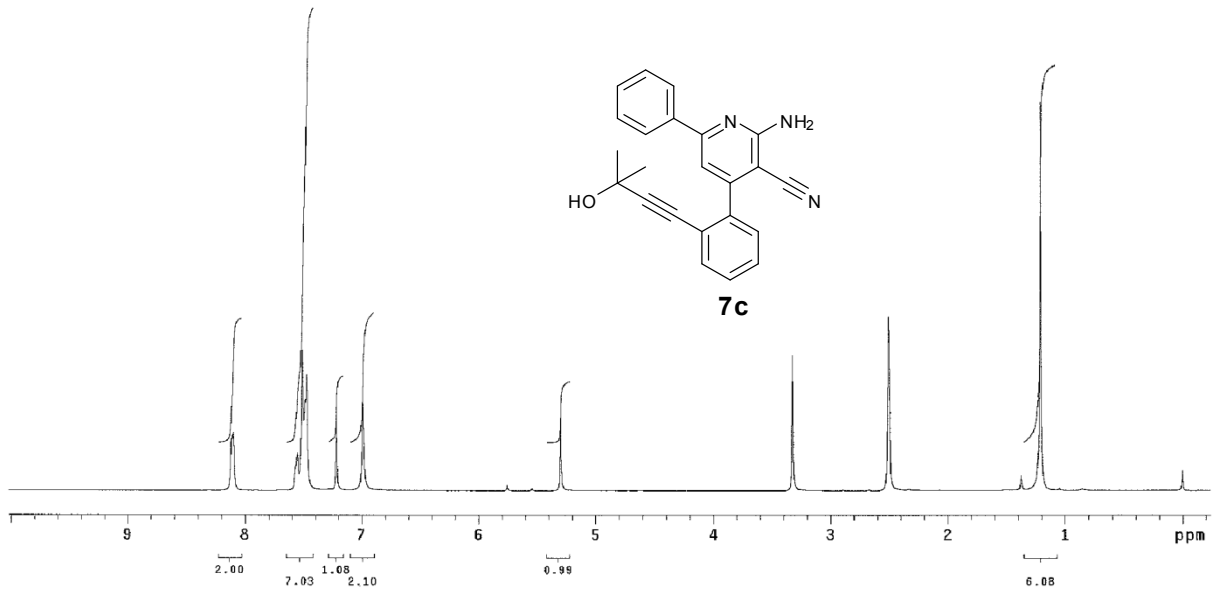
FT-IR (KBr, $cm^{-1}$): 3511.0, 3467.4, 3306.1, 3193.6, 2975.1, 2209.0, 1628.1, 1578.4, 1546.3.

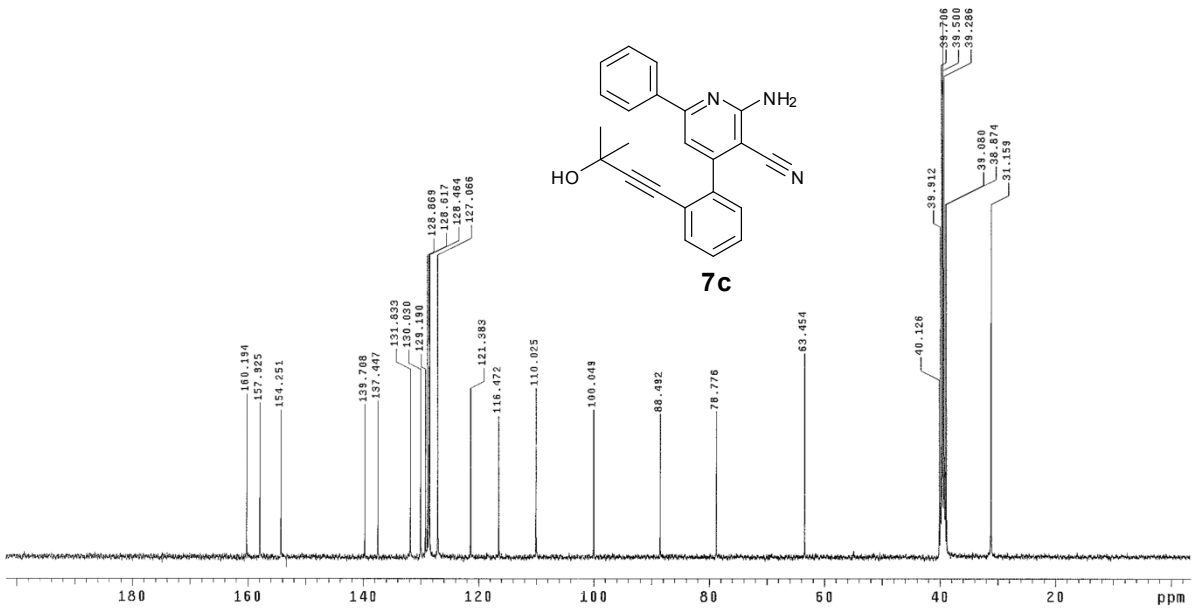
$^{1}H$ NMR (400 MHz, DMSO-$d_6$) δ 8.1 (d, 2H, $J$ = 4.4 Hz, arom H), 7.55 (s, 1H, arom H), 7.51 – 7.47 (m, 6H, arom H), 7.22 (s, 1H, arom H), 6.99 (s, 2H, $-NH_2$), 5.30 (s, 1H, -OH), 1.21 (s, 6H, $-2CH_3$).

$^{13}C$ NMR (100 MHz, DMSO-$d_6$) δ 160.1, 157.9, 154.2, 139.7, 137.4, 131.8, 130.0, 129.1, 128.8, 128.6, 128.4, 127.0, 121.3, 116.4, 110.0, 100.0, 88.4, 78.7, 63.4, 31.1.

**Copies of FTIR, $^{1}H$ NMR and $^{13}C$ NMR for 2-amino-4-(2-(3-hydroxy-3-methyl but-1-ynyl) phenyl)-6-phenylnicotinonitrile (7c):**





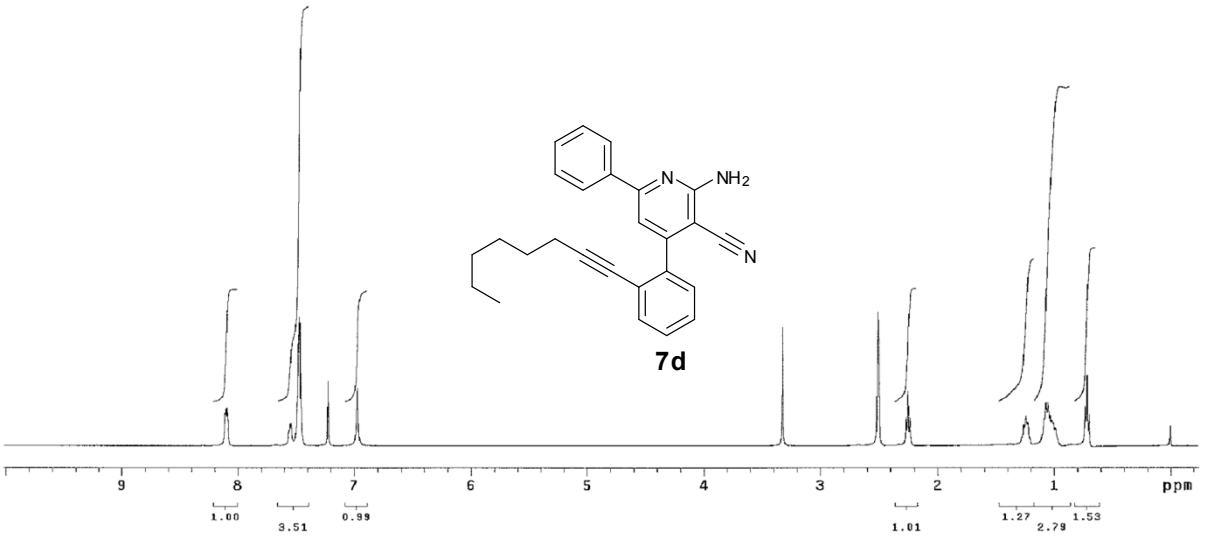

**Characterization data for 2-amino-4-(2-(3-hydroxy-3-methylbut-1-ynyl)phenyl)-6-phenylnicotinonitrile (7d):**

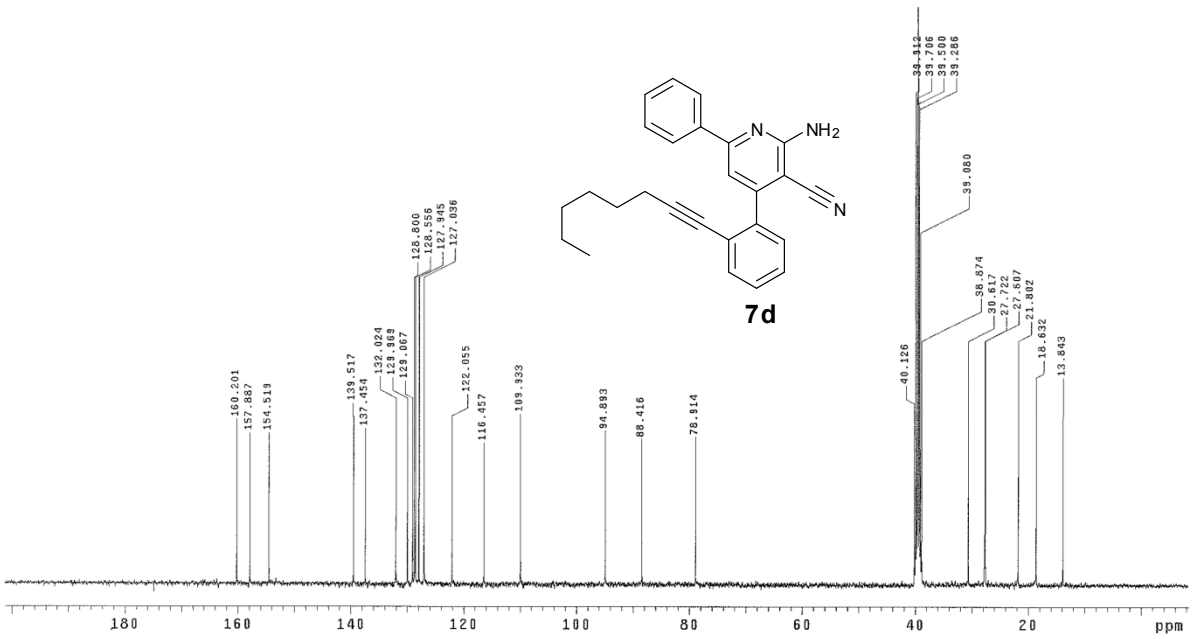
Off-white solid, Yield = 87%; mp. 99–101°C.

$^{1}$H NMR (400 MHz, DMSO-$d_6$) δ 8.1 (d, 2H, $J$ = 4.0 Hz, arom H), 7.56 (d, 1H, $J$ = 4.0 Hz, arom H), 7.48 – 7.47 (m, 6H, arom H), 7.23 (s, 1H, arom H), 6.97 (s, 2H, -$NH_2$), 2.25 (t, 2H, $J$ = 6.8 Hz, -$CH_2$), 1.24 (t, 2H, $J$ = 7.2 Hz, -$CH_2$), 1.1 – 0.99 (m, 6H, -3$CH_2$), 0.72 (t, 3H, $J$ = 6.8 Hz, -$CH_3$).

$^{13}$C NMR (100 MHz, DMSO-$d_6$) δ 160.2, 157.8, 154.5, 139.5, 137.4, 132.0, 129.9, 129.0, 128.8, 128.5, 127.9, 127.0, 116.8, 122.0, 116.4, 109.9, 94.8, 88.4, 78.9, 30.6, 27.7, 27.6, 21.8, 18.6, 13.8.

**Copies of FTIR, $^{1}$H NMR and $^{13}$C NMR for 2-amino-4-(2-(3-hydroxy-3-methylbut-1-ynyl)phenyl)-6-phenylnicotinonitrile (7d):**






**Typical experimental procedure for the preparation of (*E*)-methyl 3-(3-(2-amino-3-cyano-6-phenylpyridin-4-yl)phenyl)acrylate (9a):**

A mixture of 3-bromobenzaldehyde (**1**) [10.0 mmol], malononitrile (**2**) [11.0 mmol], acetophenone (**3**) [11.0 mmol] and $NH_4OAc$ (**4**) [20.0 mmol] in presence of pyrrolidine (5.0 mmol) in a mixture of $H_2O$-DME (1:4 ratio) (10 vol) is stirred at reflux for 1.0 hr. The first phase progress of the reaction is monitored by TLC. After the completion of the reaction, the reaction mixture is cooled to RT and then, methyl acrylate (**8a**) [16.0 mmol] and $PdCl_2(PPh_3)_2$ [0.002 mmol] are added. Again, the entire reaction mixture is kept under reflux conditions for 3.0 hrs in open air. Final stage progress is monitored by TLC. After the completion of the reaction, the whole reaction mixture is cooled to RT and the solvent is removed under reduced pressure. The obtained crude product is purified by column chromatography using silica gel and 1:9 ratio of EtOAc - Petroleum ether (PE) to obtain pure compound **(9a)**. The isolated yield of product **9a** is 88%. The same procedure is followed for the preparation of 2-amino-4-(3-(alkenyl)phenyl)-6-phenylnicotinonitrile derivatives (**9b-f**) listed in **Table-4.** Synthesized compounds (**9a-f**) gave satisfactory spectroscopic data in accordance with their proposed structures. Based on $^1$H NMR data, all the prepared alkenes (**9a-f**) are confirmed as '*E'* isomers (*J*= 16.0 - 16.5 Hz).

**Characterization data for (*E*)-Methyl-3-(3-(2-amino-3-cyano-6-phenylpyridin-4-yl) phenyl) acrylate (9a):**

Off-white solid; Yield = 88%; mp. 180–182°C.

FT-IR (KBr, $cm^{-1}$): 3440.8, 3352.1, 3229.7, 3063.5, 2211.5, 1698.5, 1628.4, 1260.6**.**

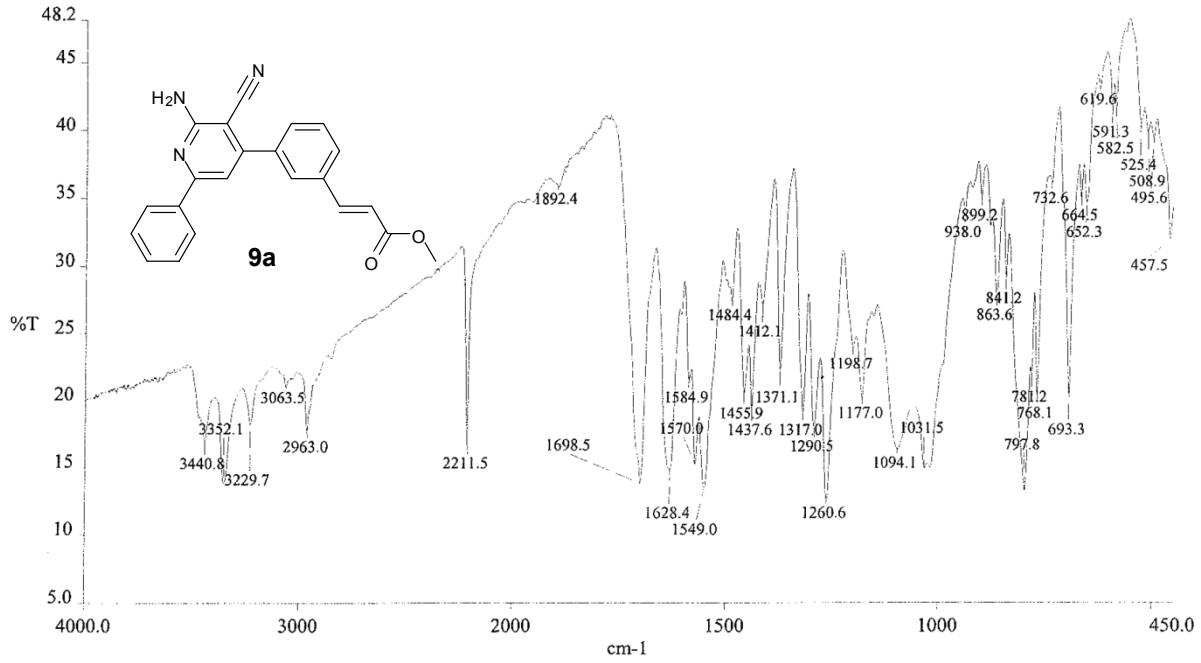
$^1$H NMR (400 MHz, DMSO-$d_6$) δ 8.21(dd, 2H, *J* = 7.6 Hz, *J* = 4.4 Hz, arom H), 8.12 (s, 1H, arom H), 7.95 (d, 1H, *J* = 7.6 Hz, arom H), 7.85 –7.79 (m, 2H, arom H and *trans* H), 7.66 (t, 1H, *J* = 8.0 Hz, arom

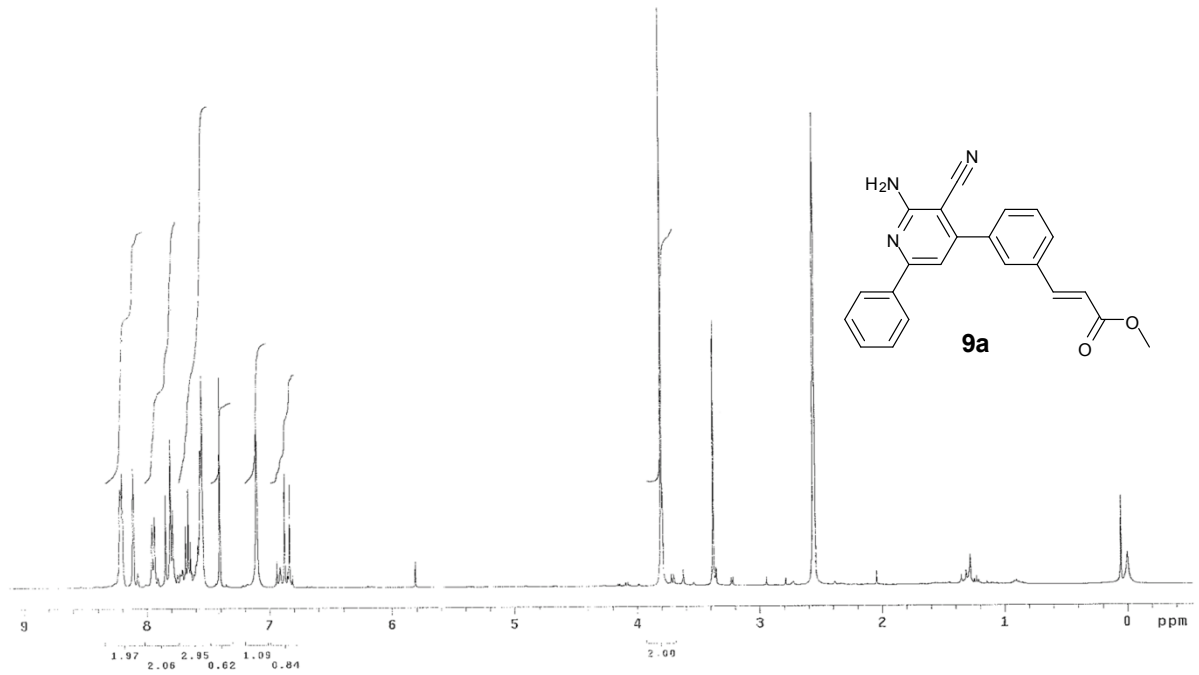
H), 7.61 – 7.54 (m, 3H, arom H), 7.41 (s, 1H, arom H), 7.11 (br, 2H, -$NH_2$). 6.85 (d, 1H, $J$ = 16.0 Hz, *trans* H), 3.80 (s, 3H, -$OCH_3$).

$^{13}$C NMR (100 MHz, DMSO-$d_6$) δ 166.5, 160.8, 158.7, 154.1, 143.8, 137.6, 137.5, 134.5, 130.1, 130.1, 129.2, 129.2, 128.5, 128.3, 127.2, 118.9, 116.9, 109.3, 86.5, 51.5.

MS (ESI) m/z: $(M+H)^+$ 356.20.

**Copies of FTIR, $^1$H NMR and $^{13}$C NMR and Mass for (*E*)-Methyl-3-(3-(2-amino-3-cyano-6-phenylpyridin-4-yl) phenyl) acrylate (9a):**

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N
O
O
9a
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5
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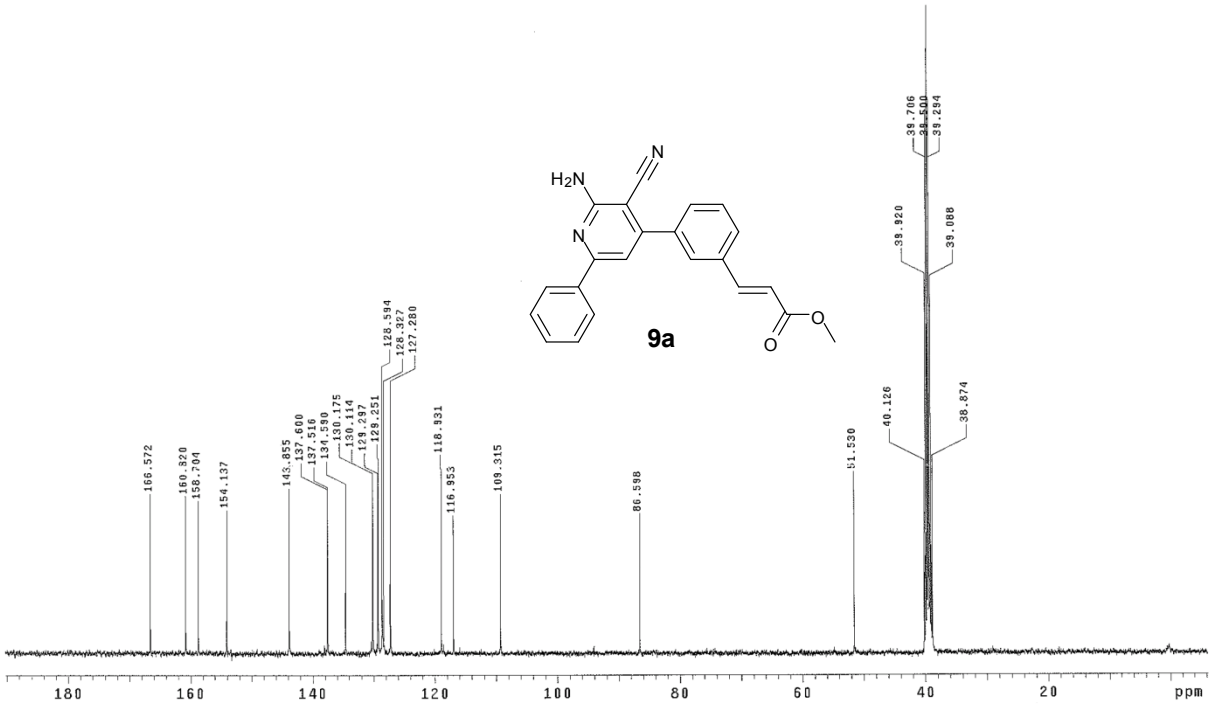
2.00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N
O
O
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137.600
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130.114
129.297
129.251
128.594
128.327
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116.931
116.953
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86.598
51.530
40.126
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140
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80
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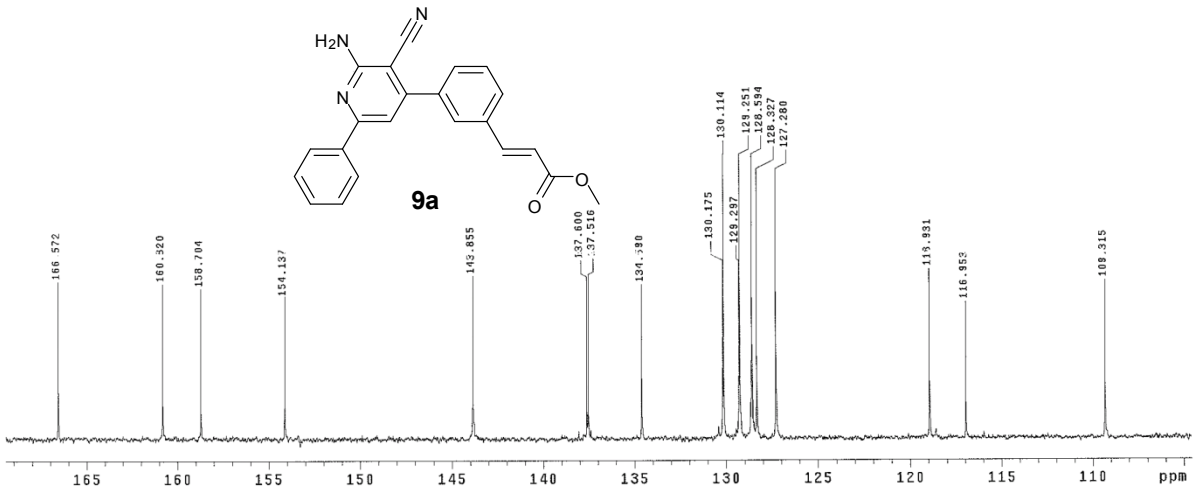
40
20
ppm

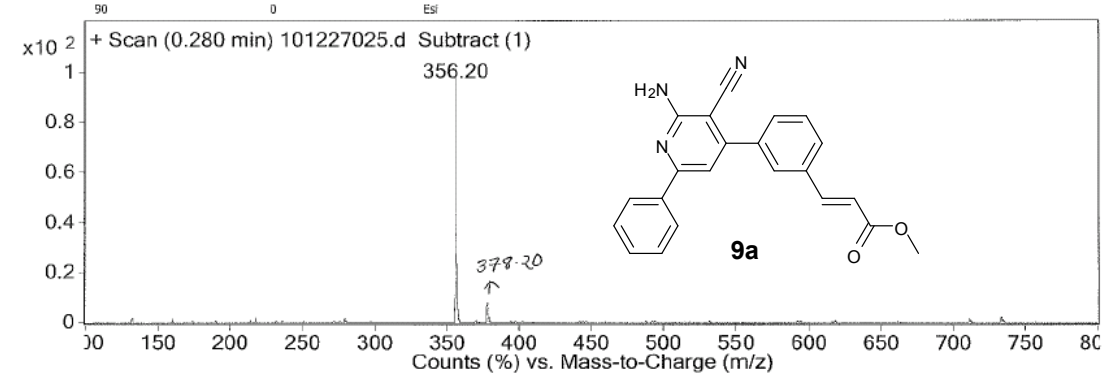



**Mass Analysis Report**

| | | | |
|---|---|---|---|
| **Sample Type** | Sample | **Position** | Vial 25 |
| **Instrument Name** | Instrument 1 | **User Name** | |
| **Acq Method** | ESI.m | **IRM Calibration Status** | Success |
| **DA Method** | CDD-MRM.m | **Comment** | |

**User Spectra**

| Fragmentor Voltage | Collision Energy | Ionization Mode |
|---|---|---|
| 90 | 0 | Esi |




**Characterization data for (*E*)-Ethyl-3-(3-(2-amino-3-cyano-6-phenylpyridin-4-yl) phenyl) acrylate (9b):**

Off-white solid; Yield = 82%; mp. 161–163°C.

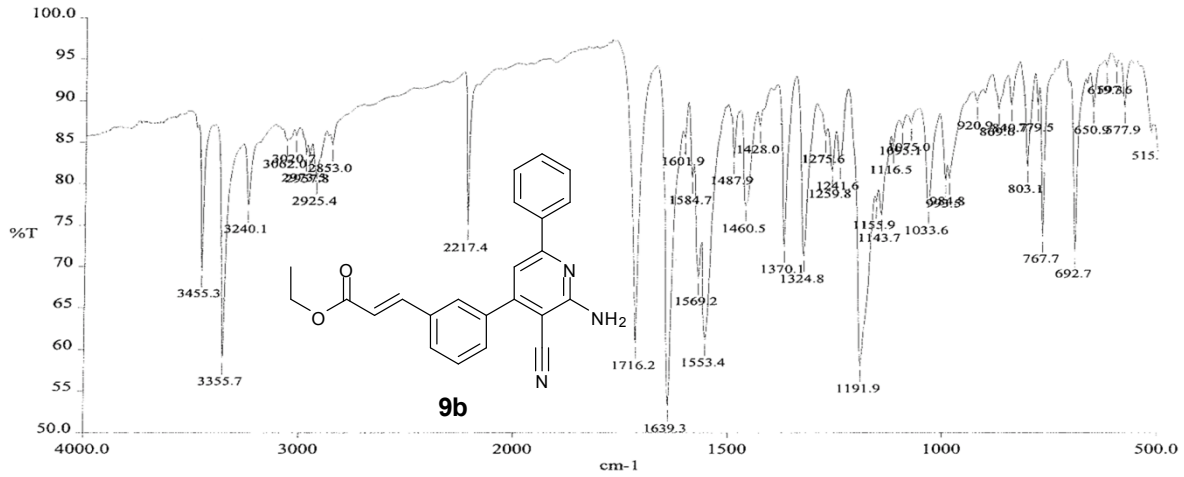
FT-IR (KBr, $cm^{-1}$): 3455.3, 3355.7, 3240.1, 3020.7, 2217.4, 1716.2, 1639.3, 1569.2, 1553.4, 1191.9.

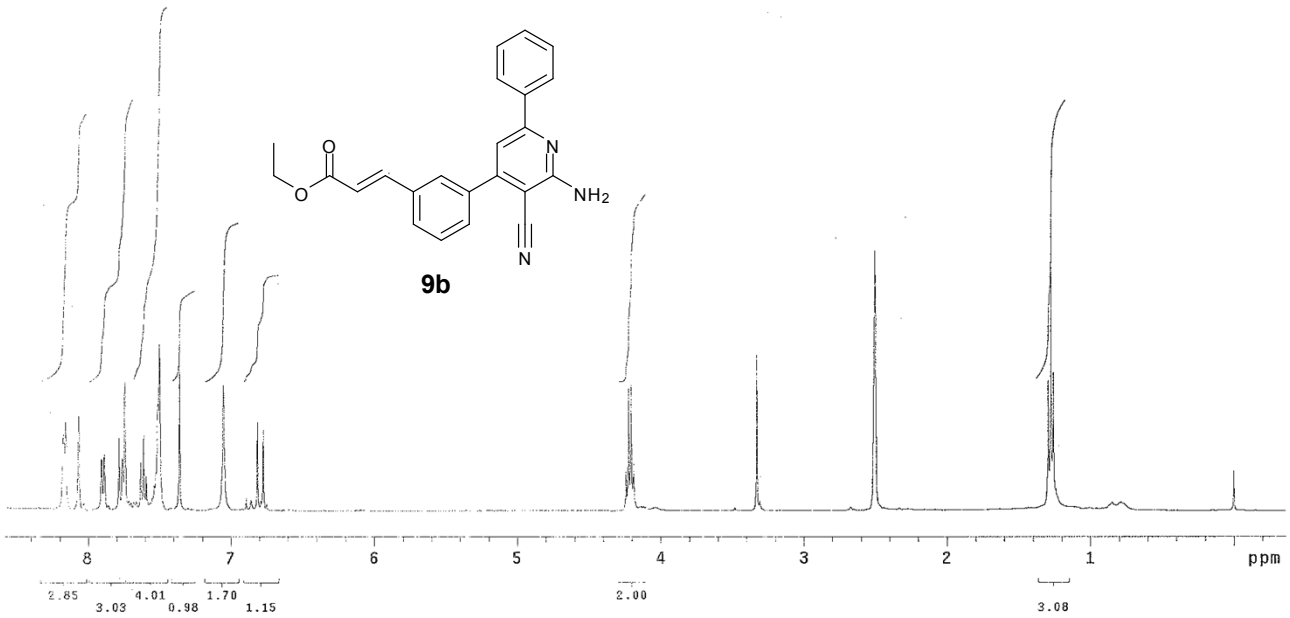
$^{1}H$ NMR (400 MHz, DMSO-$d_6$) δ 8.16 (dd, 2H, $J$ = 7.2 Hz, $J$ = 3.2 Hz, arom H), 8.06 (s, 1H, arom H), 7.89 (d, 1H, $J$ = 7.6 Hz, arom H), 7.79-7.69 (m, 2H, arom H and *trans* H), 7.61 (t, 1H, $J$ = 7.2 Hz, arom H), 7.55-7.49 (d, 1H, $J$ = 3.9 Hz, arom H), 7.36 (s, 1H, arom H), 7.05 (s, 2H, $NH_2$), 6.79 (d, 1H, $J$ = 16.0 Hz, *trans* H), 4.21 (quartet, 2H, $J$ = 7.6 Hz, $OCH_2$), 1.276 (t, 3H, $J$ = 7.2 Hz, $CH_3$)

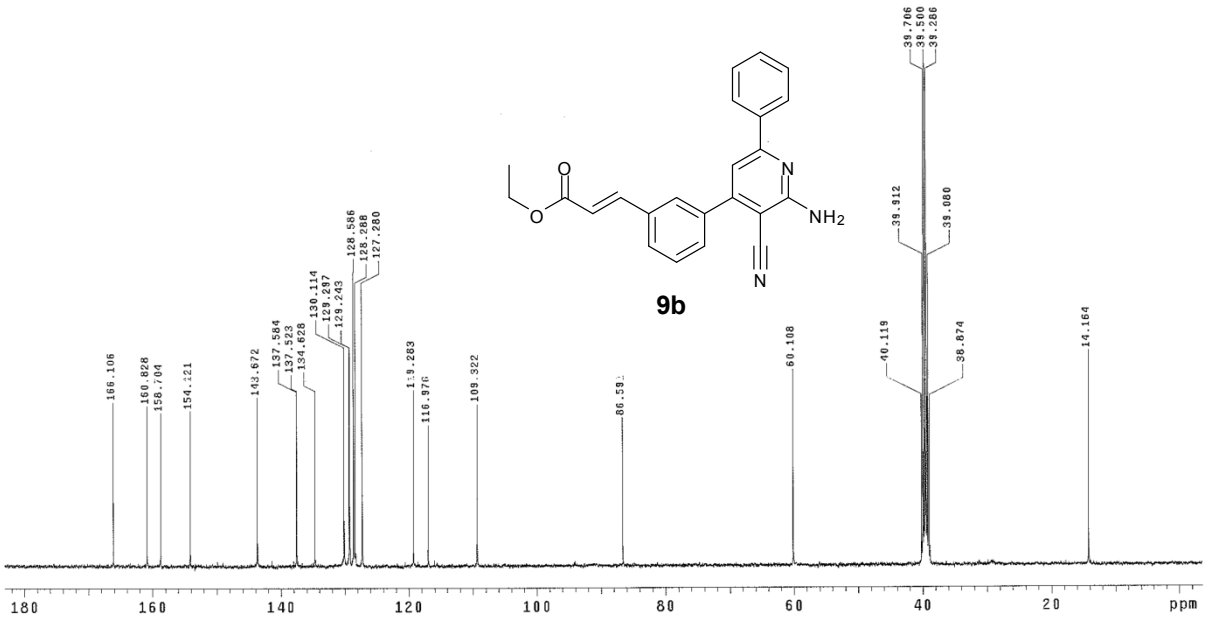
$^{13}C$ NMR (100 MHz, DMSO-$d_6$) δ 166.1, 160.8, 158.7, 154.1, 143.6, 137.58, 137.52, 134.6, 130.1, 129.29, 129.24, 128.5, 128.2, 127.2, 119.2, 116.9, 109.3, 86.5, 60.1, 14.1

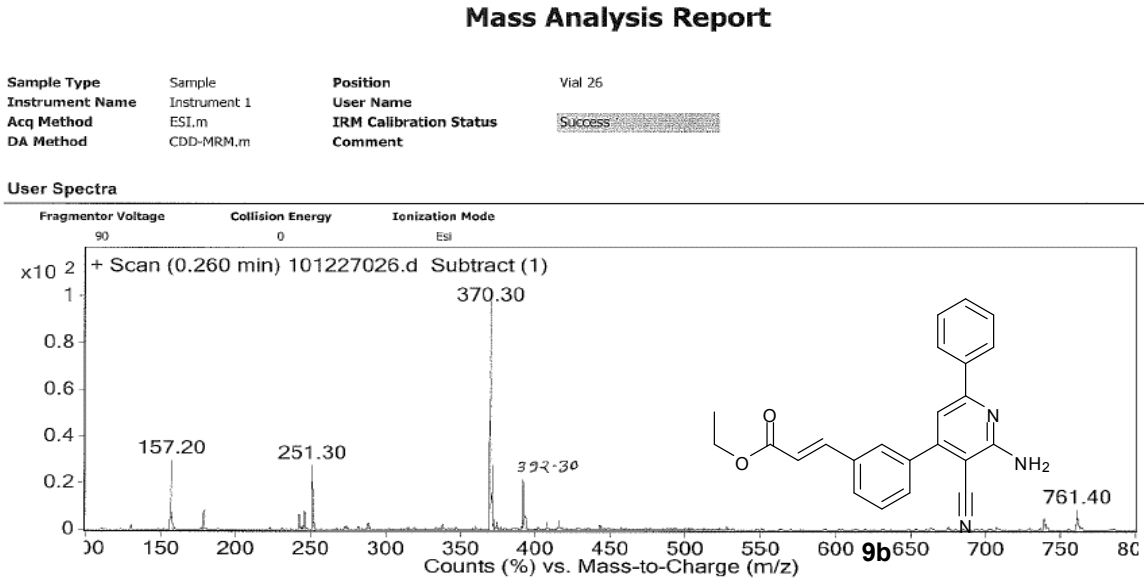
MS (ESI) m/z: $(M+H)^+$ 370.30.

**Copies of FTIR, $^{1}$H NMR and $^{13}$C NMR and Mass for (*E*)-Ethyl-3-(3-(2-amino-3-cyano-6-phenylpyridin-4-yl) phenyl) acrylate (9b):**






**Characterization data for (*E*)-t-butyl-3-(3-(2-amino-3-cyano-6-phenylpyridin-4-yl) phenyl) acrylate (9c):**

Off-white solid; Yield = 83%; mp. 202–204°C.

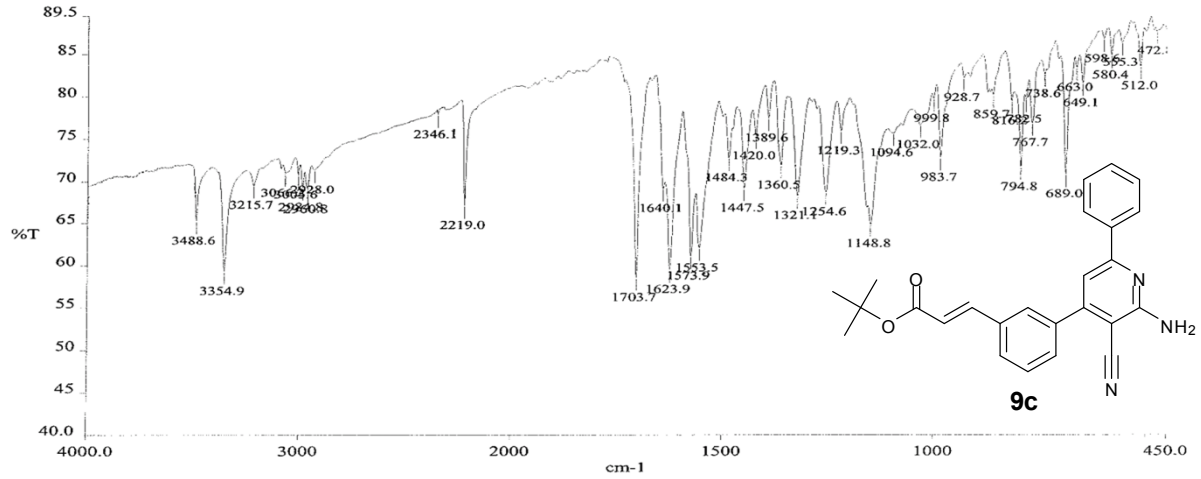
FT-IR (KBr, $cm^{-1}$): 3488.6, 3354.9, 3215.7, 2219.0, 1703.7, 1640.1, 1623.9, 1573.9, 1553.5.

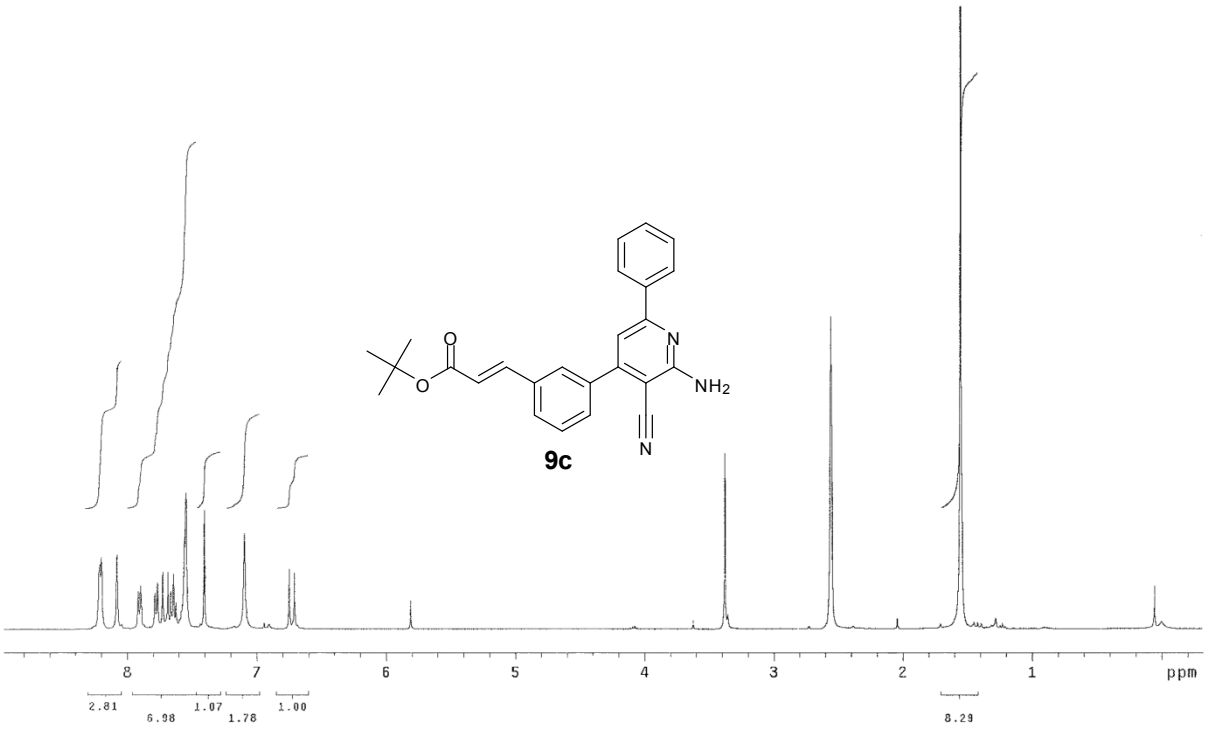
$^1$H NMR (400 MHz, DMSO-$d_6$) δ 8.21 (dd, 2H, $J$ = 8.0 Hz, $J$ = 4.0 Hz, arom H), 8.08 (s, 1H, arom H), 7.91 (d, 1H, $J$ = 7.2 Hz, arom H), 7.78 (d, 1H, $J$ = 7.6 Hz, arom H), 7.71 (d, 1H, $J$ = 16.0 Hz , *trans* H), 7.65 (t, 1H, $J$= 7.6 Hz, arom H), 7.56 – 7.54 (m, 4H, arom H), 7.41 (s, 1H, arom H), 7.10 (br, 2H, -$NH_2$), 6.73 (d, 1H, $J$ = 15.6 Hz, *trans* H), 1.55 (s, 9H, -3$CH_3$).

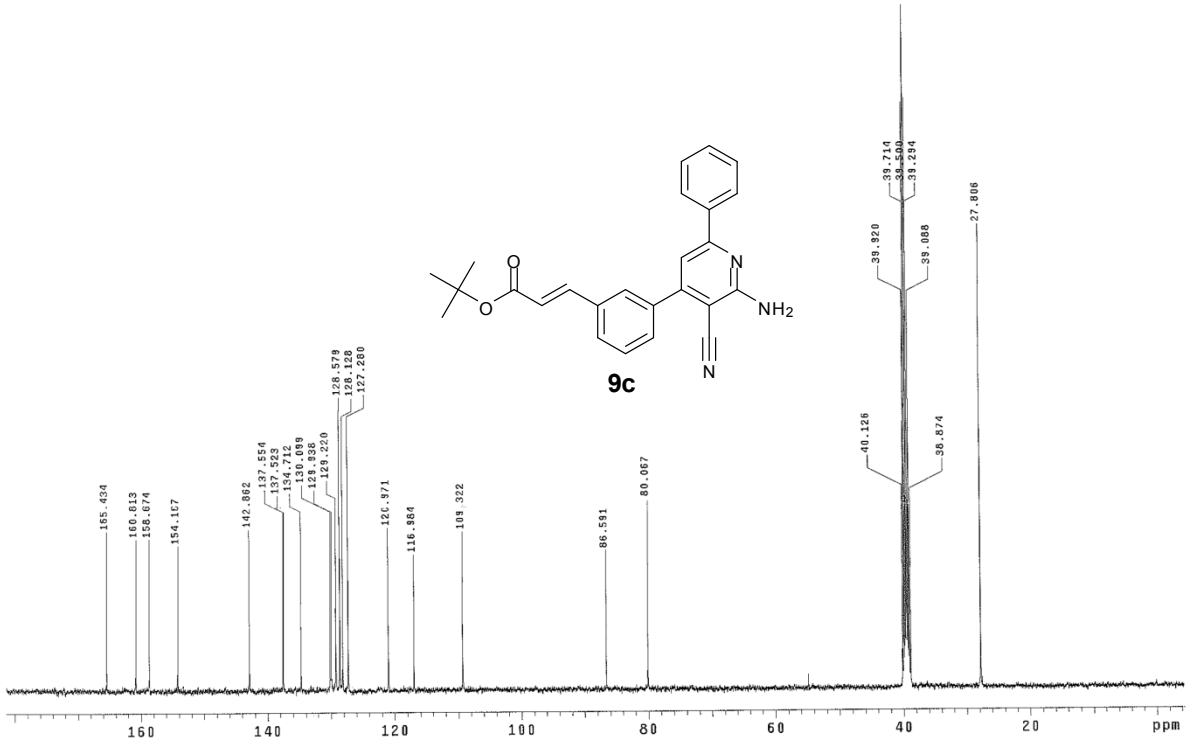
$^{13}$C NMR (100 MHz, DMSO-$d_6$) δ 165.4, 160.8, 158.6, 154.1, 142.8, 137.55, 137.52, 134.7, 130.0, 129.9, 129.2, 128.5, 128.1, 127.2, 120.9, 116.9, 109.3, 86.5, 80.0, 27.8

MS (ESI) m/z: $(M+H)^+$ 398.30.

**Copies of FTIR, $^{1}H$ NMR and $^{13}C$ NMR and Mass for (*E*)-t-butyl-3-(3-(2-amino-3-cyano-6-phenylpyridin-4-yl) phenyl) acrylate (9c):**



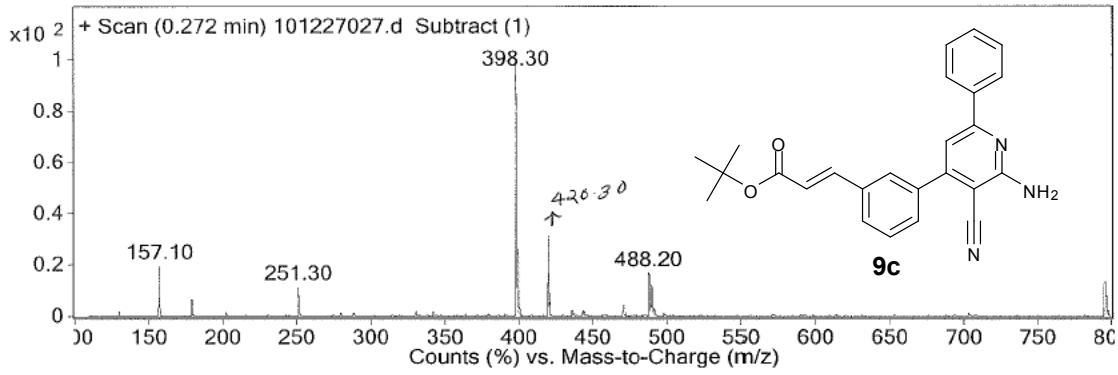



**Mass Analysis Report**

| | | | |
|---|---|---|---|
| **Sample Type** | Sample | **Position** | Vial 27 |
| **Instrument Name** | Instrument 1 | **User Name** | |
| **Acq Method** | ESI.m | **IRM Calibration Status** | Success |
| **DA Method** | CDD-MRM.m | **Comment** | |

**User Spectra**

| Fragmentor Voltage | Collision Energy | Ionization Mode |
|---|---|---|
| 90 | 0 | Esi |




**Characterization data for (*E*)-2-amino-4-(3-(3-oxobut-1-enyl)phenyl)-6-phenyl nicotinonitrile (9d):**

Off-white solid; Yield = 86%; mp. 182–184°C.

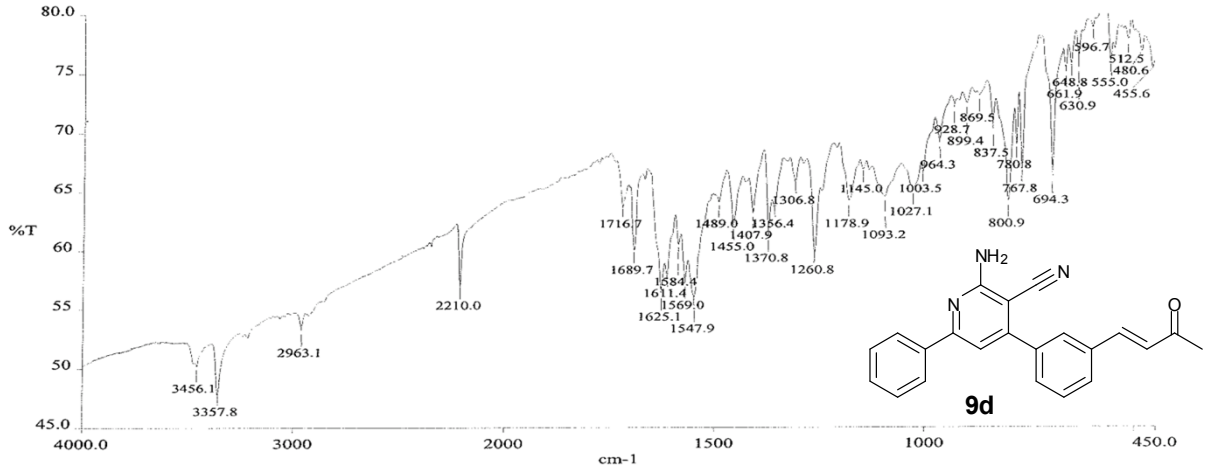
FT-IR (KBr, $cm^{-1}$): 3456.1, 3357.8, 2963.1, 2210.0, 1716.7, 1689.7, 1625.1, 1611.4, 1569.0, 1547.9, 1260.8.

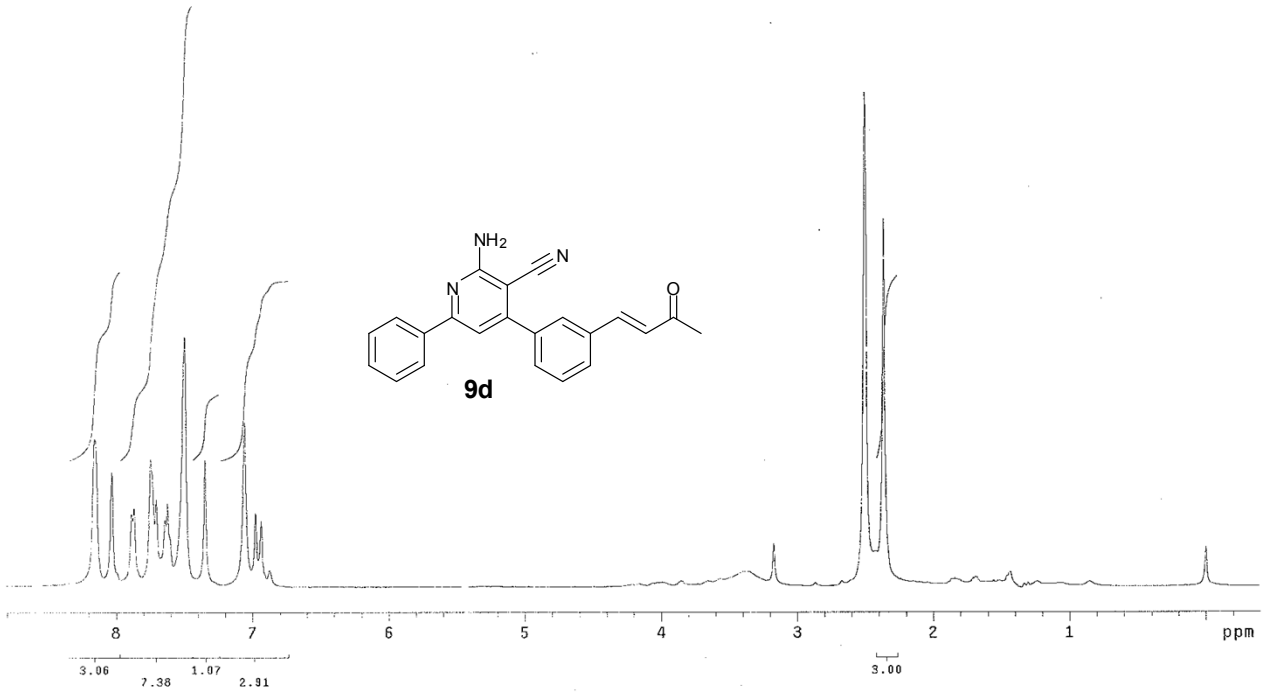
$^1$H NMR (400 MHz, DMSO-$d_6$) δ 8.16 (s, 2H, arom H), 8.03 (s, 1H, arom H), 7.88 (d, 1H, $J$ = 7.2 Hz, arom H), 7.74-7.70 (m, 2H, arom H and *trans* H), 7.63 (d, 1H, $J$ = 7.2 Hz, arom H), 7.5 (s, 3H, arom H), 7.35 (s, 1H, arom H), 7.06 (br, 2H, -$NH_2$), 6.96 (d, 1H, $J$ = 16.4 Hz, *trans* H), 2.36 (s, 3H, $CH_3$).

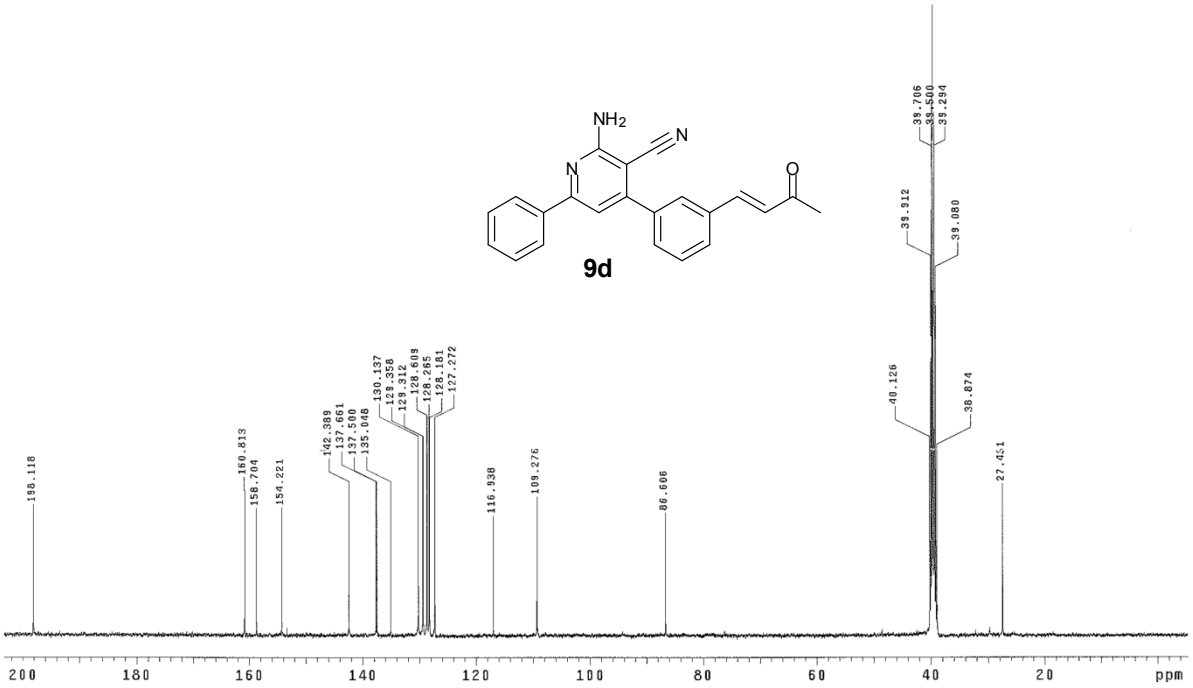
$^{13}$C NMR (100 MHz, DMSO-$d_6$) δ 198.1, 160.8, 158.7, 154.2, 132.3, 137.6, 137.5, 135.0, 130.1, 129.35, 129.31, 128.6, 128.2, 128.1, 127.2, 116.9, 109.2, 86.6, 27.4

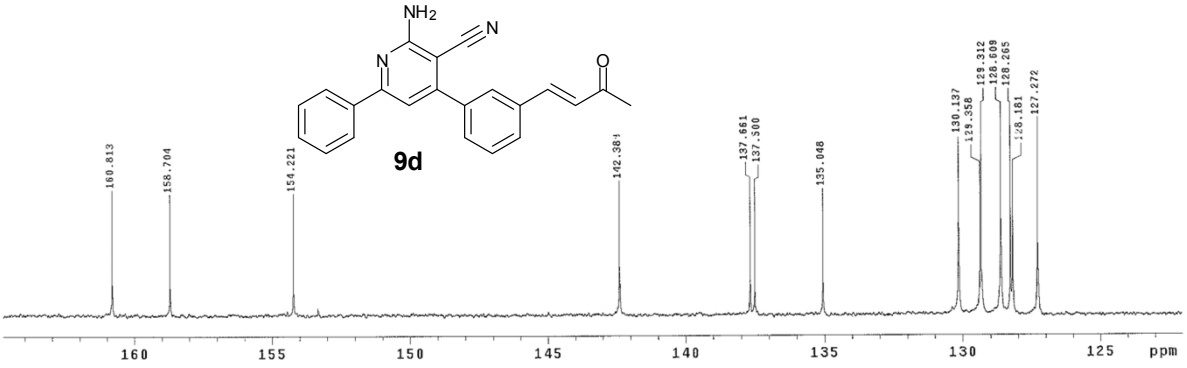
MS (ESI) m/z: $(M+H)^+$ 340.20.

**Copies of FTIR, $^1$H NMR and $^{13}$C NMR and Mass (E)-2-amino-4-(3-(3-oxobut-1-enyl) phenyl)-6-phenylnicotinonitrile (9d):**





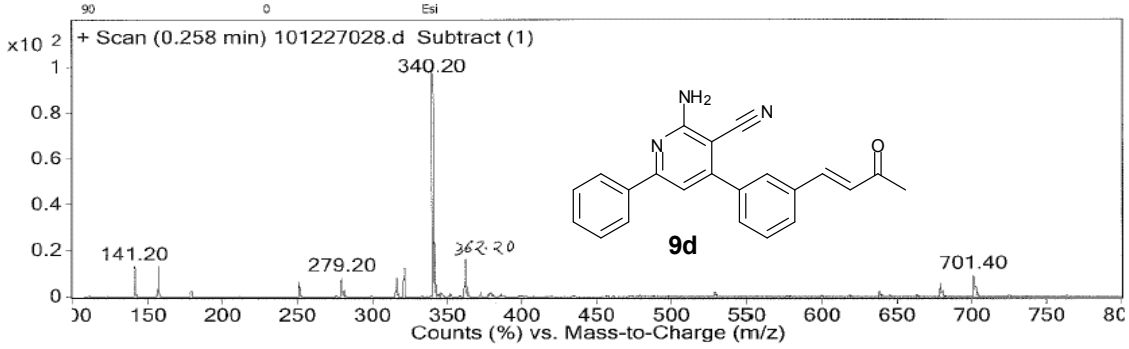




## Mass Analysis Report

| | | | |
|---|---|---|---|
| **Sample Type** | Sample | **Position** | Vial 28 |
| **Instrument Name** | Instrument 1 | **User Name** | |
| **Acq Method** | ESI.m | **IRM Calibration Status** | Success |
| **DA Method** | CDD-MRM.m | **Comment** | |

**User Spectra**

| Fragmentor Voltage | Collision Energy | Ionization Mode |
|---|---|---|
| 90 | 0 | Esi |



**Characterization data for (*E*)-3-(3-(2-amino-3-cyano-6-phenylpyridin-4-yl) phenyl) acrylamide (9e):**

Off-white solid; Yield = 87%; mp. 199–201°C

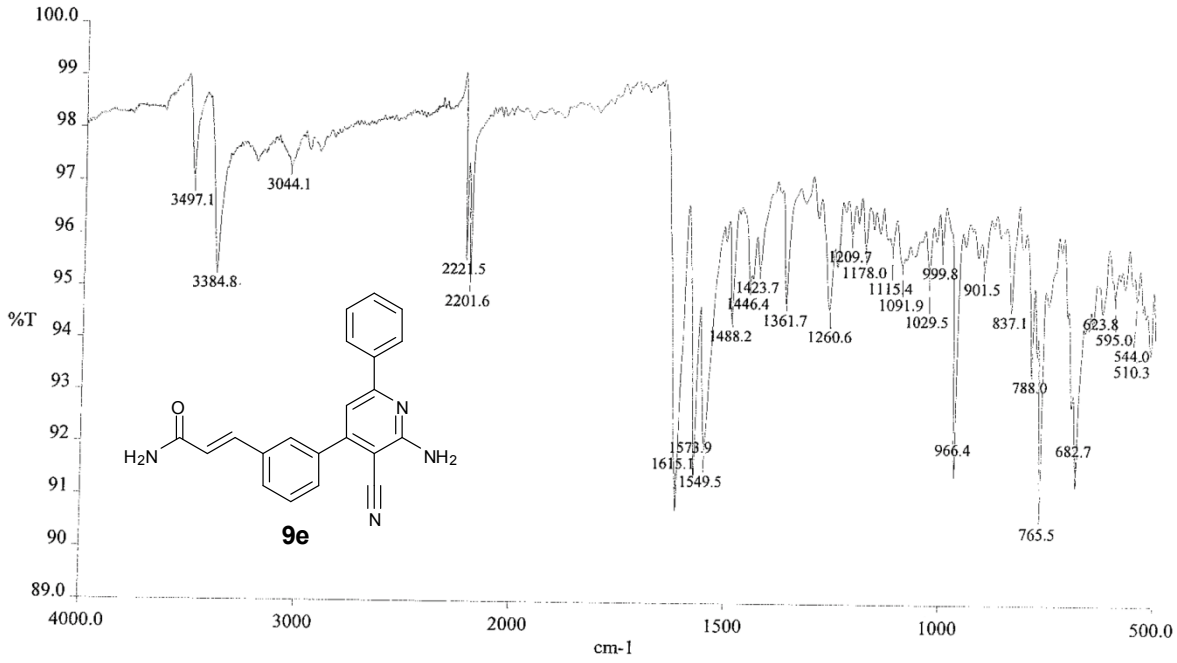
FT-IR (KBr, $cm^{-1}$): 3497.1, 3384.8, 3044.1, 2221.5, 2201.6, 1615.1, 1573.9, 1549.5

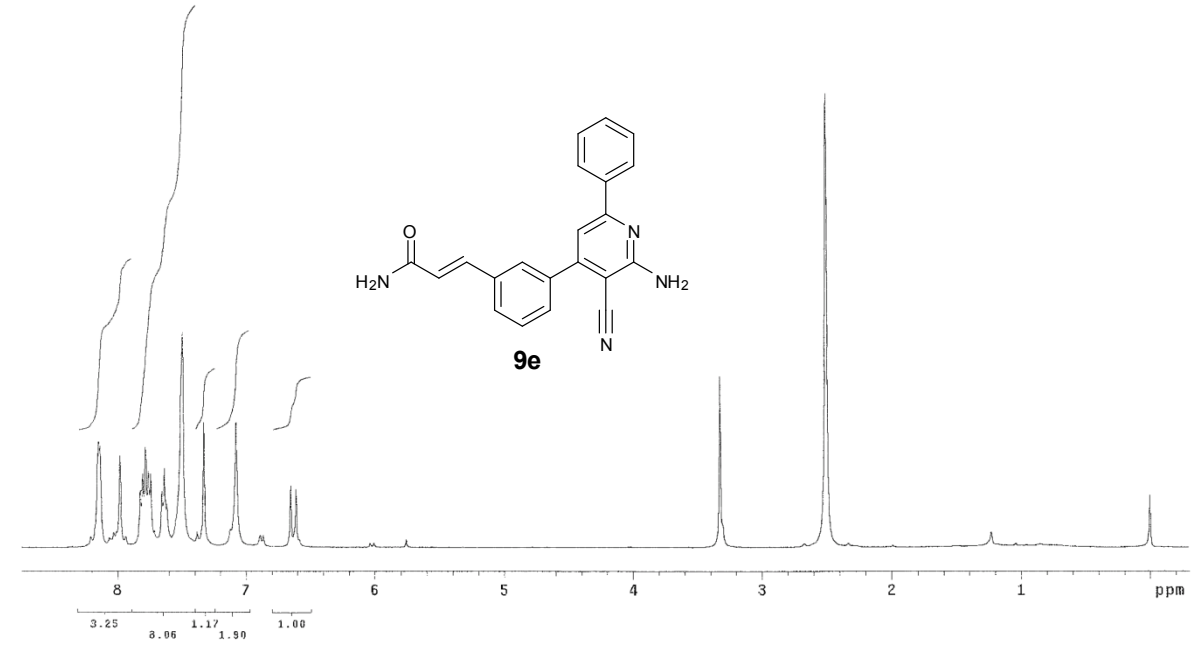
$^1H$ NMR (400 MHz, DMSO-$d_6$) δ 8.14 (d, 2H, $J$ = 3.6 Hz, arom H), 7.98 (s, 1H, arom H), 7.82 – 7.74 (m, 3H, arom H and *trans* H), 7.65 (t, 1H, $J$ = 8.0 Hz, arom H), 7.5 (s, 4H, arom H), 7.33 (s, 1H, arom H), 7.08 (s, 2H, $-NH_2$), 6.63 (d, 2H, $J$ = 16.4 Hz, *trans* H)

$^{13}C$ NMR (100 MHz, DMSO-$d_6$) δ 160.7, 158.7, 154.0, 149.9, 137.7, 137.4, 134.3, 130.7, 130.1, 129.3, 128.7, 128.6, 127.5, 127.2, 118.6, 116.8, 109.2, 97.9, 86.5

MS (ESI) m/z: $(M+H)^+$ 341.30

**Copies of FTIR, $^1H$ NMR and $^{13}C$ NMR and Mass (*E*)-3-(3-(2-amino-3-cyano-6-phenylpyridin-4-yl) phenyl) acrylamide (9e):**

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N
NH2
N
9e
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7
6
5
4
3
2
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ppm
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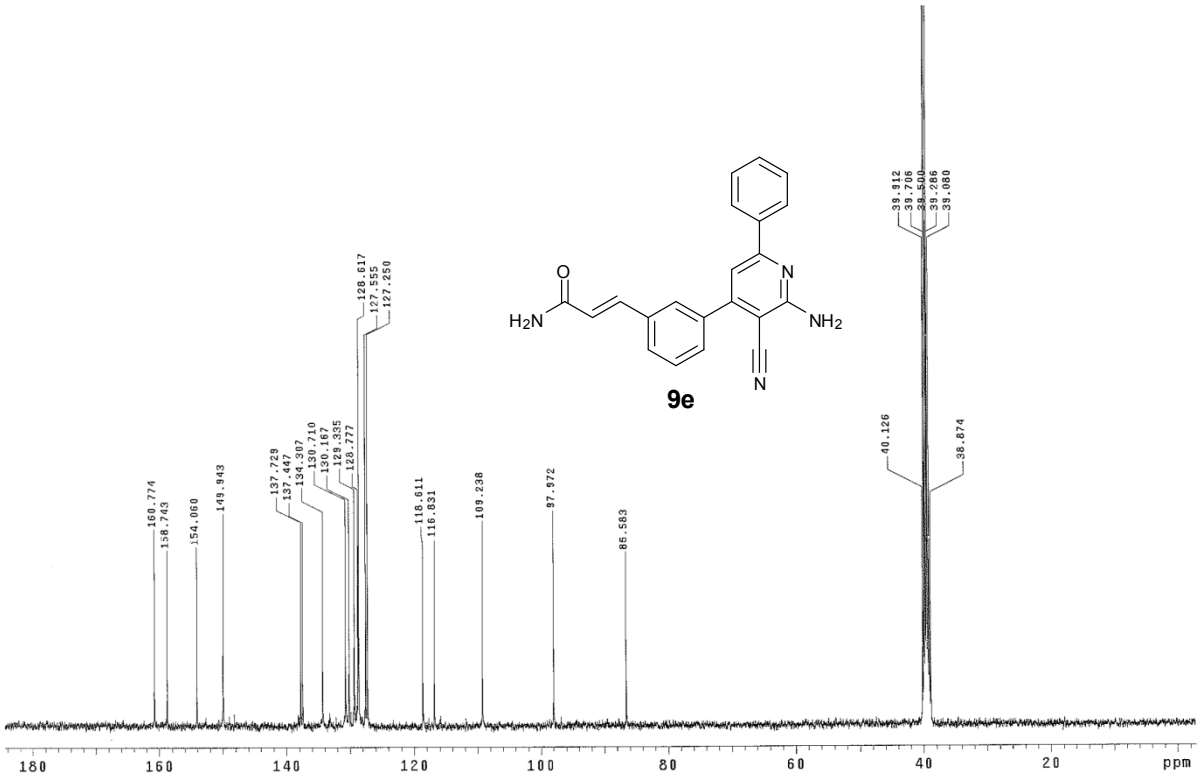
1.17
1.90
1.00


O
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N
NH2
N
9e
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149.943
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130.167
129.335
128.777
128.617
127.555
127.250
118.611
116.831
109.238
97.672
86.583
40.126
39.912
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39.080
38.874
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140
120
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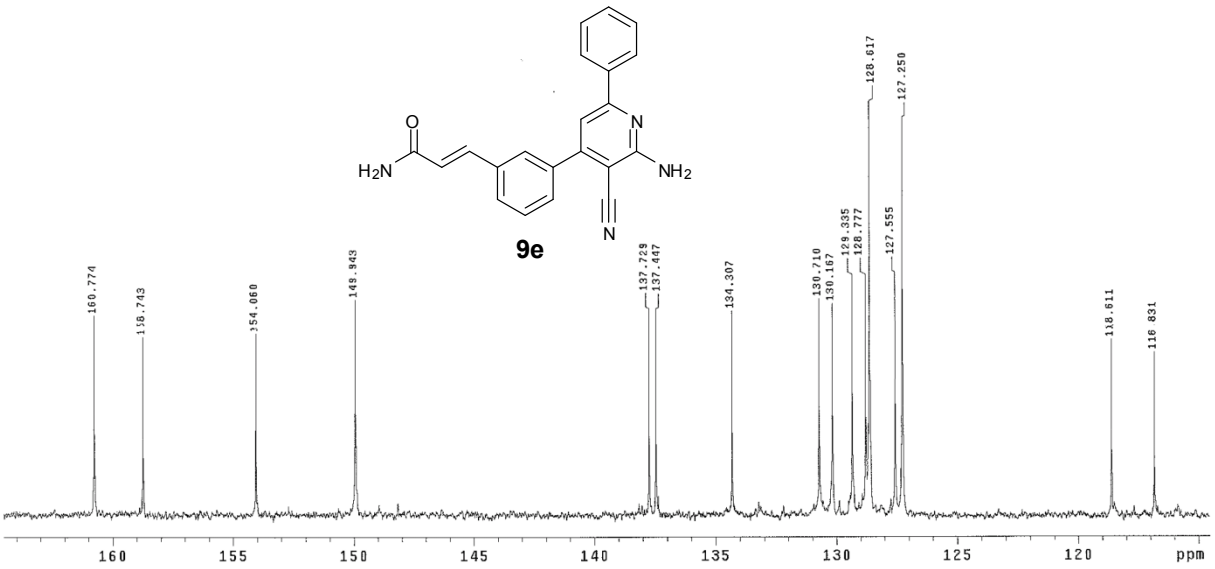
80
60
40
20
ppm

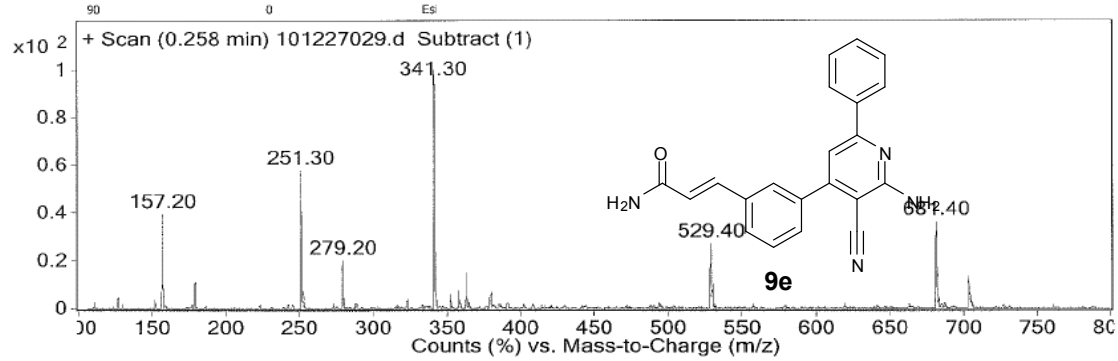



**Mass Analysis Report**

| | | | |
|---|---|---|---|
| **Sample Type** | Sample | **Position** | Vial 29 |
| **Instrument Name** | Instrument 1 | **User Name** | |
| **Acq Method** | ESI.m | **IRM Calibration Status** | Success |
| **DA Method** | CDD-MRM.m | **Comment** | |

**User Spectra**

| Fragmentor Voltage | Collision Energy | Ionization Mode |
|---|---|---|
| 90 | 0 | Es |




**Characterization data for (*E*)-2-amino-4-(3-(2-cyanovinyl)phenyl)-6-phenylnicotinonitrile (9f):**

Off-white solid; Yield = 85%; mp. 178–181°C

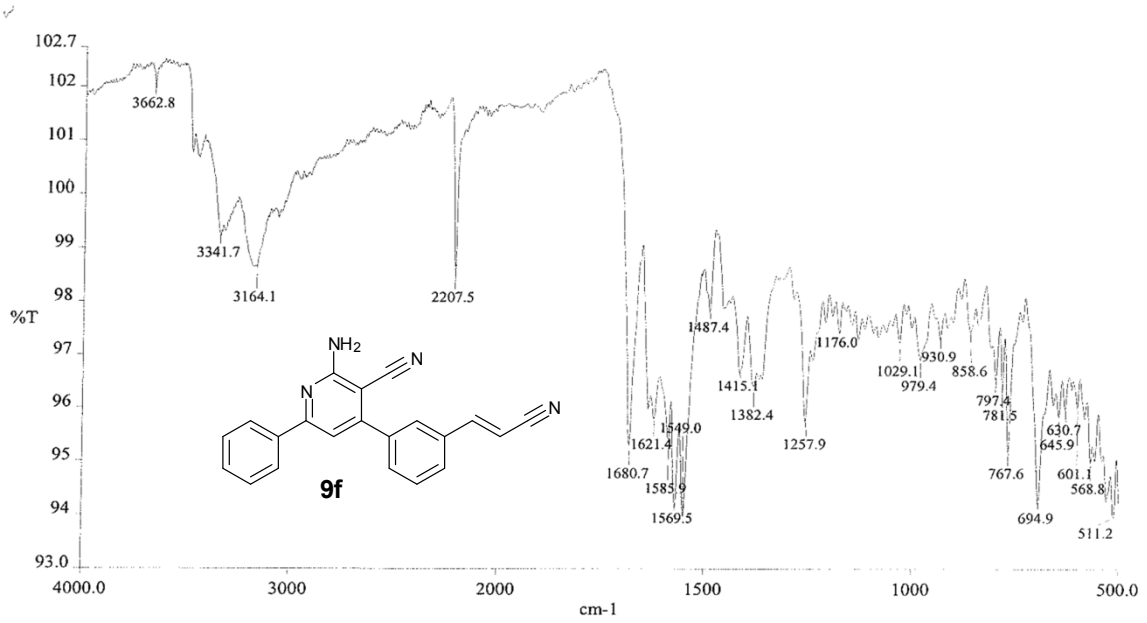
FT-IR (KBr, $cm^{-1}$): 3341.7, 3164.1, 2207.5, 1680.7, 1621.4, 1585.9, 1569.5, 1257.9

$^{1}H$ NMR (400 MHz, DMSO-$d_6$) δ 8.16 (d, 2H, $J$ = 2.9 Hz, arom H), 7.86 (s, 1H, arom H), 7.74-7.62 (m, 3H, arom H and *trans* H), 7.60-7.49 (m, 6H, arom H), 7.35 (s, 1H, arom H), 7.16 (s, 1H, arom H), 7.05 (s, 2H, $NH_2$), 6.74 (d, 2H, $J$ = 15.6 Hz, *trans* H)

$^{13}C$ NMR (100 MHz, DMSO-$d_6$) δ 166.5, 160.8, 158.7, 154.4, 138.5, 137.59, 137.50, 135.4, 132.0, 130.5, 130.1, 129.3, 129.2, 128.6, 128.4, 109.2, 86.5.27.5, 127.2, 123.3, 116.9, 109.2, 86.5

MS (ESI) m/z (%): $(M+H)^+$ 323.20

**Copies of FTIR, $^{1}H$ NMR and $^{13}C$ NMR and Mass (E)-2-amino-4-(3-(2-cyanovinyl)phenyl)-6-phenylnicotinonitrile (9f):**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1569.5
1549.0
1487.4
1415.1
1382.4
1257.9
1176.0
1029.1
979.4
930.9
858.6
797.4
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694.9
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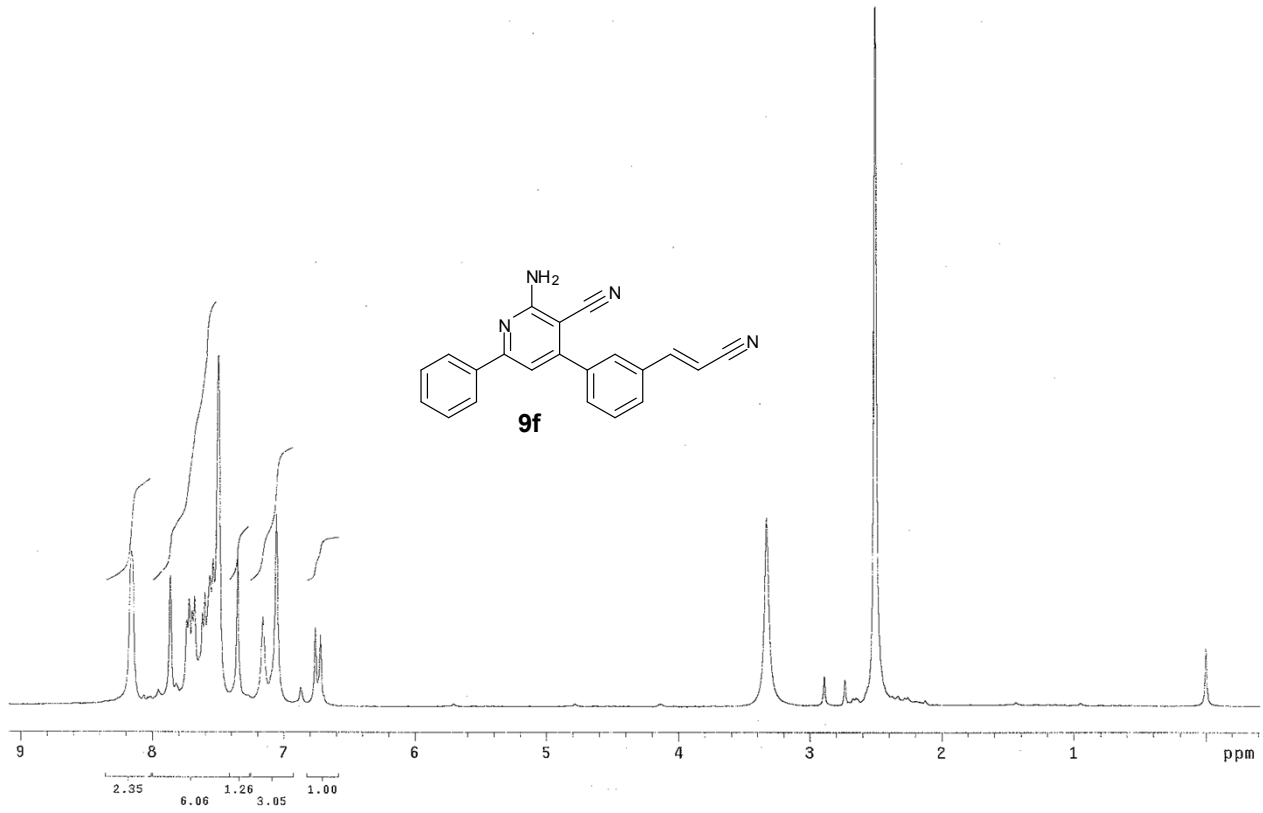
630.7
601.1
568.8
511.2
NH2
N
N
9f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N
9f
ppm
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6.06
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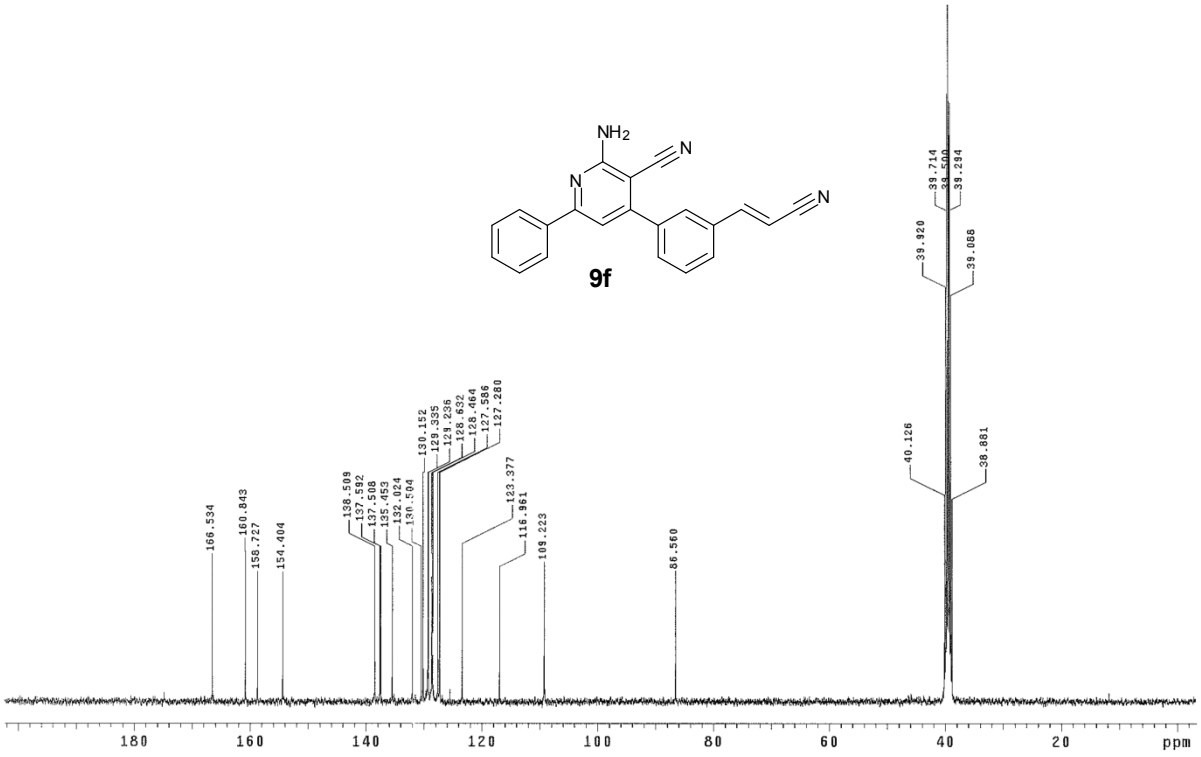
3.05
1.00




## Mass Analysis Report

| | | | |
|---|---|---|---|
| **Sample Type** | Sample | **Position** | Vial 30 |
| **Instrument Name** | Instrument 1 | **User Name** | |
| **Acq Method** | ESI.m | **IRM Calibration Status** | Success |
| **DA Method** | CDD-MRM.m | **Comment** | |

**User Spectra**