

Supporting Information
for DOI: 10.1055/s-0036-1588713
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Highly Diastereoselective Synthesis of new *trans*-fused Octahydroacridines via Intramolecular Cationic Imino Diels-Alder Reaction of *N*-protected Anilines and Citronellal or Citronella Essential Oil

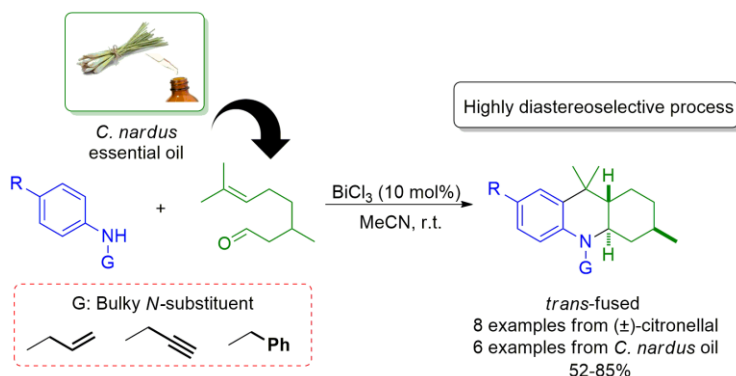
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Supporting information

Contents:

- 1- General experimental information, (Page S1)
- 2- Extraction and characterization of the essential oil of citronella (*Cymbopogon nardus*), (Page S9)
- 3- ¹H NMR and ¹³C NMR spectra of *trans* *N*-benzyl octahydroacridines **16-21**, (Page S10)
- 4- ¹H NMR and ¹³C NMR spectra of *trans* NH-octahydroacridines **22-24**, (Page S23)
- 5- Single crystal X-Ray diffraction data for *trans* *N*-benzyl octahydroacridine **16**, (Page S28)

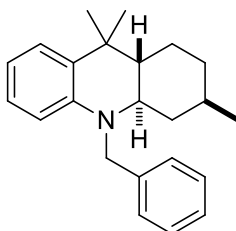
1. General Experimental Information

All reagents were purchased from Merck, J.T. Baker and Sigma and Aldrich Chemical Co. and used without further purification. The reaction progress was monitored using thin layer chromatography on PF254 TLC aluminum sheets from Merck. Column chromatography was performed using Silica gel (60-120 mesh). The melting points (uncorrected) were determined using a Fisher-Johns melting point apparatus. IR spectra were recorded on a FTIR Bruker Tensor 27 spectrophotometer coupled to a Bruker platinum ATR cell. Mass spectra were recorded on an ESI-IT Amazon X (Bruker Daltonics) with direct injection, operating in Full Scan mode at 300°C and 4500V in the capillary, using nitrogen as nebulizer gas with an influx of 8 L/min and 30 psi. A Hewlett Packard 5890a Series II Gas Chromatograph interfaced to an HP MS ChemStation Data System was also used for MS identification at 70 eV using a 60 m capillary column coated with HP-5 [5% phenylpoly(dimethylsiloxane)]. Elemental analyses were performed on a Thermo Scientific CHNS-O analyzer (Model. Flash 2000) and were within ± 0.4 of theoretical values. NMR spectra (¹H and ¹³C) were measured on a Bruker Ultrashield-400 spectrometer (400 MHz ¹H NMR and 100 MHz ¹³C NMR), using CDCl₃ as solvent and

reference. *J* values are reported in Hz; chemical shifts are reported in ppm (δ) relative to the solvent peak (residual CHCl_3 in CDCl_3 at 7.26 ppm for protons). Signals were designated as follows: s, singlet; d, doublet; dd, doublet of doublets; ddd, doublet of doublets of doublets; t, triplet; td, triplet of doublets; q, quartet; m, multiplet; br, broad.

1.1 General procedure for the synthesis of *trans* *N*-benzyl octahydroacridines from (\pm)-citronellal (method A): A solution of the corresponding *N*-benzylaniline (1 mmol) and (\pm)-citronellal (1 mmol) in 5 mL of acetonitrile was poured into a 50 mL round bottom flask and stirred at room temperature for 10 minutes, the catalyst BiCl_3 (10% mol) was then added to the mixture. After 5-6 hours of reaction as indicated by TLC, 15 mL of water and NaHCO_3 were added and the crude product was extracted with ethyl acetate and dried over Na_2SO_4 . The *cis/trans* octahydroacridine mixture was purified using the appropriate mixture of petroleum ether and ethyl acetate as eluents. Further recrystallization from petroleum ether gave only the *trans* product as a stable solid.

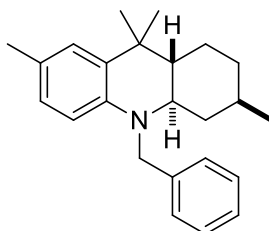
1.2 General procedure for the synthesis of *trans* *N*-benzyl octahydroacridines from citronella essential oil (method B): A solution of the corresponding *N*-benzylaniline (1 mmol) and 0.514g of citronella essential oil (approx. 1 mmol of citronellal) in 5 mL of acetonitrile was poured into a 50 mL round bottom flask and stirred at room temperature for 10 minutes, the catalyst BiCl_3 (10% mol) was then added to the mixture. After 5-6 hours of reaction as indicated by TLC, 15 mL of water and NaHCO_3 were added and the crude product was extracted with ethyl acetate and dried over Na_2SO_4 . The *cis/trans* octahydroacridine mixture was purified using the appropriate mixture of petroleum ether and ethyl acetate as eluents. Further recrystallization from petroleum ether gave only the *trans* product as a stable solid.



***trans*-*N*-Benzyl-3,9,9-trimethyl-1,2,3,4,4a,9,9a,10-octahydroacridine 16**

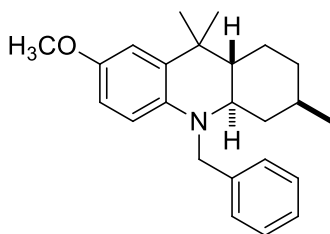
White solid, m.p. 100-101°C, (0.617 g) 80% yield from (\pm)-citronellal (method A); (0.554 g) 78% yield from citronella EO (method B). IR (ATR, cm^{-1}): 2957 ν (CH), 2916 ν (CH), 2859 ν (CH), 1130 ν (C-N), 729, 697 ν (benzyl). $^1\text{H-NMR}$ (400MHz, CDCl_3), δ 0.84 (3H, d, 6.6 Hz, 3-Me), 0.88-1.01 (2H, m, 2,4-H), 1.06 (3H, s, 9-Me), 1.12-1.24 (1H, m, 1-H), 1.38 (3H, s, 9-Me), 1.39-1.48 (1H, m, 3-H), 1.53 (1H, td, 11.2, 3.1 Hz, 9a-H), 1.72-1.79 (1H, m, 2-H), 1.95-2.03 (2H, m, 1,4-H), 3.06 (1H, td, 10.8, 3.2 Hz, 4a-H), 4.48 (1H, d, 17.7 Hz, CH_2 -Ph), 4.59 (1H, d, 17.7 Hz, CH_2 -Ph), 6.43 (1H, d, 8.1 Hz, 8-H), 6.66 (1H, t, 7.3 Hz, 7-H), 6.96 (1H, td, 7.9, 1.4 Hz, 6-H), 7.24-7.36 (6H, m, 5-

H,Ph). $^{13}\text{C-NMR}$ (100MHz, CDCl_3), δ 22.2 (3-Me), 25.2 (9-Me), 25.5 (9-Me), 25.6 (4-C), 31.4 (3-C), 34.3 (2-C), 34.8 (9-C), 42.9 (1-C), 47.1 (9a-C), 55.5 (CH_2Ph), 59.3 (4a-C), 113.0 (5-C), 116.3 (7-C), 124.3 (4- C_{Ph}), 126.3 (6-C), 126.3 (8-C), 126.9 (2- $\text{C}_{\text{Ph}(x2)}$), 128.3 (3- $\text{C}_{\text{Ph}(x2)}$), 132.9 (8a-C), 140.9 (1- C_{Ph}), 145.9 (10a-C). MS (IE), m/z (%): 319.3 (M^+ ; 70), 305.3 (47), 304.4 (100), 91.1 (81). Anal. Calcd for $\text{C}_{23}\text{H}_{29}\text{N}$: C, 86.47; H, 9.15; N, 4.38%. Found: C, 86.59; H, 9.34; N, 4.27%.



***trans*-N-Benzyl-3,7,9,9-tetramethyl-1,2,3,4,4a,9,9a,10-octahydroacridine 17**

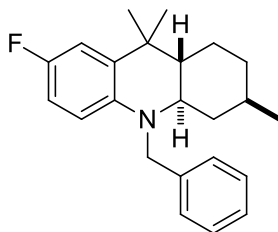
White solid, m.p. 108-110°C, (0.648 g) 85% yield from (\pm)-citronellal (method A); (0.224 g) 52% yield from citronella EO (method B). IR (ATR, cm^{-1}): 2958 ν (CH), 2915 ν (CH), 2855 ν (CH), 1145 ν (C-N), 726, 695 ν (benzyl). $^1\text{H-NMR}$ (400MHz, CDCl_3), δ 0.84 (3H, d, 6.6 Hz, 3-Me), 0.87-1.01 (2H, m, 2,4-H), 1.06 (3H, s, 9-Me), 1.11-1.24 (1H, m, 1-H), 1.38 (3H, s, 9-Me), 1.39-1.48 (1H, m, 3-H), 1.53 (1H, td, 11.8, 3.0 Hz, 9a-H), 1.72-1.80 (1H, m, 2-H), 1.94-2.03 (2H, m, 1,4-H); 2.24 (3H, s, 7-Me), 3.04 (1H, td, 10.8, 3.4 Hz, 4a-H), 4.45 (1H, d, 17.9 Hz, $\text{CH}_2\text{-Ph}$), 4.57 (1H, d, 17.9 Hz, $\text{CH}_2\text{-Ph}$), 6.35 (1H, d, 8.3 Hz, 5-H), 6.78 (1H, dd, 8.1, 1.6 Hz, 6-H), 6.88 (1H, d, 1.8 Hz, 8-H), 7.21-7.36 (5H, m, Ph). $^{13}\text{C-NMR}$ (100MHz, CDCl_3), δ 20.5 (7-Me), 22.2 (3-Me), 25.2 (9-Me $_{(x2)}$), 25.6 (4-C), 31.4 (3-C), 34.3 (2-C), 34.8 (9-C), 43.0 (1-C), 47.3 (9a-C), 55.7 (CH_2Ph), 59.24 (4a-C), 113.06 (5-C), 125.01 (4- C_{Ph}), 125.20 (7-C), 126.25 (6-C), 127.34 (8-C), 128.26 (2,3- $\text{C}_{\text{Ph}(x4)}$), 132.88 (8a-C), 141.24 (1- C_{Ph}), 143.66 (10a-C). MS (IE), m/z (%): 333.4 (M^+ ; 76), 319.3 (47), 318.4 (100), 91.1 (63). Anal. Calcd for $\text{C}_{24}\text{H}_{31}\text{N}$: C, 86.43; H, 9.37; N, 4.20%. Found: C, 86.57; H, 9.49; N, 4.32%.



***trans*-N-Benzyl-7-methoxy-3,9,9-trimethyl-1,2,3,4,4a,9,9a,10-octahydroacridine 18**

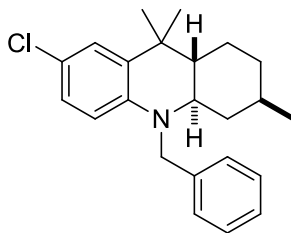
Yellow solid, m.p. 81-83°C, (0.322 g) 81% yield from (\pm)-citronellal (method A); (0.252 g) 52% yield from citronella EO (method B) IR (ATR, cm^{-1}): 2951 ν (CH), 2916 ν (CH), 2860 ν (CH), 1151 ν (C-N), 725, 695 ν (benzyl). $^1\text{H-NMR}$ (400MHz, CDCl_3), δ 0.85 (3H, d, 6.4 Hz, 3-Me), 0.88-1.01 (2H, m, 2,4-H), 1.05 (3H, s, 9-Me), 1.11-1.24 (1H, m, 1-H), 1.35 (3H, s, 9-Me), 1.38-1.48 (1H, m, 3-H), 1.53 (1H, td, 11.8, 3.0 Hz, 9a-H), 1.72-1.80 (1H, m, 2-H), 1.94-2.03 (2H, m, 1,4-H), 3.01 (1H, td, 10.8, 3.0 Hz, 4a-H), 3.73 (3H, s, OMe), 4.42 (1H, d, 17.6 Hz, $\text{CH}_2\text{-Ph}$), 4.56

(1H, d, 17.6 Hz, CH₂-Ph), 6.37 (1H, d, 8.1 Hz, 5-H), 6.56 (1H, d, 8.1 Hz, 6-H), 6.88 (1H, d, 3.0 Hz, 8-H), 7.21-7.36 (5H, m, Ph). ¹³C-NMR (100MHz, CDCl₃), δ 22.3 (3-Me), 25.3 (9-Me), 25.5 (9-Me), 25.7 (4-C), 31.4 (3-C), 34.6 (2-C), 34.8 (9-C), 43.1 (1-C), 47.3 (9a-C), 55.8 (OMe), 56.3 (CH₂Ph), 59.3 (4a-C), 111.4 (6-C), 111.6 (8-C), 113.7 (5-C), 126.4 (4-C_{Ph}), 128.4 (2,3-C_{Ph(x4)}), 134.6 (10a-C), 140.6 (8a-C), 141.4 (1-C_{Ph}), 151.04 (7-C). MS (IE), *m/z* (%): 349.4 (M⁺; 91), 335.3 (31), 334.3 (100), 91.1 (59). Anal. Calcd for C₂₄H₂₉NO: C, 82.47; H, 8.94; N, 4.01%. Found: C, 82.60; H, 9.15; N, 3.90%.



***trans*-N-Benzyl-7-fluor-3,9,9-trimethyl-1,2,3,4,4a,9,9a,10-octahydroacridine 19**

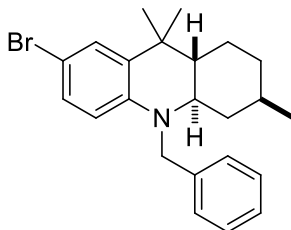
Pink solid, m.p. 120-121°C, (0.779 g) 78% yield from (±)-citronellal (method A); (0.284 g) 53% yield from citronella EO (method B). IR (ATR, cm⁻¹): 2966 ν (CH), 2902 ν (CH), 2848 ν (CH), 1170 ν (C-N), 732, 700 ν (benzyl). ¹H-NMR (400MHz, CDCl₃), δ 0.84 (3H, d, 6.6 Hz, 3-Me), 0.89-1.00 (2H, m, 2,4-H), 1.06 (3H, s, 9-Me), 1.11-1.23 (1H, m, 1-H), 1.33 (3H, s, 9-Me), 1.37-1.46 (1H, m, 3-H), 1.51 (1H, td, 11.0, 3.1 Hz, 9a-H), 1.72-1.80 (1H, m, 2-H), 1.94-2.02 (2H, m, 1,4-H), 3.04 (1H, td, 10.7, 3.2 Hz, 4a-H), 4.42 (1H, d, 17.6 Hz, CH₂-Ph), 4.57 (1H, d, 17.6 Hz, CH₂-Ph), 6.32 (1H, dd, 9.0, 5.0 Hz, 5-H), 6.65 (1H, td, 8.3, 2.7 Hz, 6-H), 6.96 (1H, dd, 10.5, 3.0 Hz, 8-H), 7.22-7.36 (5H, m, Ph). ¹³C-NMR (100MHz, CDCl₃), δ 22.2 (3-Me), 25.2 (9-Me), 25.2 (9-Me), 25.6 (4-C), 31.4 (3-C), 34.6 (2-C), 34.7 (9-C), 42.9 (1-C), 47.0 (9a-C), 56.0 (CH₂Ph), 59.3 (4a-C), 111.1 (d, 22.5 Hz, 8-C), 112.9 (d, 21.6 Hz, 6-C), 113.6 (d, 7.2 Hz, 5-C), 126.2 (3-C_{Ph(x2)}), 126.5 (4-C_{Ph}), 128.4 (2-C_{Ph(x2)}), 134.5 (d, 5.6 Hz, 8a-C), 140.8 (1-C_{Ph}), 142.3 (10a-C), 155.2 (d, 233.4 Hz, 7-C). MS (IE), *m/z* (%): 337.3 (M⁺; 63), 323.3 (32), 322.3 (100), 91.1 (77). Anal. Calcd for C₂₃H₂₈NF: C, 81.86; H, 8.36; N, 4.38%. Found: C, 81.98; H, 8.54; N, 4.49%.



***trans*-N-Benzyl-7-chloro-3,9,9-trimethyl-1,2,3,4,4a,9,9a,10-octahydroacridine 20**

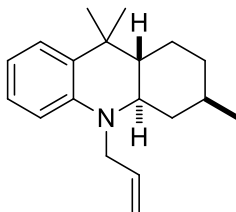
Transparent solid, m.p. 77-79°C, (0.616 g) 77% yield from (±)-citronellal (method A); (0.224 g) 66% yield from citronella EO (method B). IR (ATR, cm⁻¹): 2957 ν (CH), 2911 ν (CH), 2848 ν (CH), 1123 ν (C-N), 726, 696 ν (benzyl). ¹H-NMR (400MHz, CDCl₃), δ 0.84 (3H, d, 6.6 Hz, 3-Me), 0.87-1.00 (2H, m, 2,4-H), 1.03 (3H, s, 9-Me), 1.11-1.23 (1H, m, 1-H), 1.35 (3H, s, 9-Me), 1.37-1.48 (3H, m, 3-H), 1.49 (1H, td, 11.2, 3.1 Hz, 9a-H), 1.72-1.80 (1H, m, 2-H),

1.94-2.02 (2H, m, 1,4-H), 3.04 (1H, td, 10.8, 3.4 Hz, 4a-H), 4.43 (1H, d, 17.7 Hz, CH₂-Ph), 4.58 43 (1H, d, 17.7 Hz, CH₂-Ph), 6.33 (1H, d, 8.8 Hz, 5-H), 6.88 (1H, dd, 8.8, 2.6 Hz, 6-H), 7.17 (1H, d, 2.6 Hz, 8-H), 7.22-7.36 (5H, m, Ph). ¹³C-NMR (100MHz, CDCl₃), δ 22.2 (3-Me), 25.0 (9-Me), 25.2 (9-Me), 25.5 (4-C), 31.4 (3-C), 34.6 (2-C), 34.7 (9-C), 42.7 (1-C), 47.0 (9a-C), 55.2 (CH₂Ph), 59.2 (4a-C), 114.2 (5-C), 121.0 (7-C), 124.3 (6-C), 126.2 (4-C_{Ph}), 126.5 (3-C_{Ph(x2)}), 126.5 (8-C), 128.4 (2-C_{Ph(x2)}), 134.7 (8a-C), 140.3 (1-C_{Ph}), 144.3 (10a-C). MS (IE), *m/z* (%): 353.3 (M⁺; 59), 340.3 (29), 339.3 (100), 91.2 (50). Anal. Calcd for C₂₃H₂₈ClN: C, 78.05; H, 7.97; N, 3.96%. Found: C, 78.19; H, 8.16; N, 4.06%.



***trans*-N-Benzyl-7-bromo-3,9,9-trimethyl-1,2,3,4,4a,9,9a,10-octahydroacridine 21**

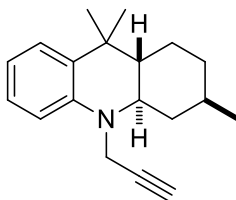
White solid, m.p. 96-97°C, (0.393 g) 85% yield from (±)-citronellal (method A); (0.186 g) 55% yield from citronella EO (method B). IR (ATR, cm⁻¹): 2966 ν (CH), 2920 ν (CH), 2848 ν (CH), 1143 ν (C-N), 732, 700 ν (benzyl). ¹H-NMR (400MHz, CDCl₃), δ 0.84 (3H, d, 6.6 Hz, 3-Me), 0.87-0.99 (2H, m, 2,4-H), 1.02 (3H, s, 9-Me), 1.11-1.22 (1H, m, 1-H), 1.34 (3H, s, 9-Me), 1.36-1.44 (1H, m, 3-H), 1.48 (1H, td, 11.0, 3.2 Hz, 9a-H), 1.72-1.79 (1H, m, 2-H), 1.94-2.02 (2H, m, 1,4-H), 3.04 (1H, td, 10.7, 3.2 Hz, 4a-H), 4.43 (1H, d, 17.9 Hz, CH₂-Ph), 4.58 (1H, d, 17.9 Hz, CH₂-Ph), 6.29 (1H, d, 8.8 Hz, 5-H), 7.01 (1H, dd, 8.8, 2.4 Hz, 6-H), 7.22-7.36 (6H, m, 8-H, Ph). ¹³C-NMR (100MHz), δ [ppm]: 22.2 (3-Me), 25.1 (9-Me), 25.2 (9-Me), 25.5 (4-C), 31.4 (3-C), 34.6 (2-C), 34.7 (9-C), 42.6 (1-C), 47.0 (9a-C), 55.2 (CH₂Ph), 59.2 (4a-C), 114.8 (5-C), 122.0 (7-C), 125.1 (8a-C), 126.2 (4-C_{Ph}), 126.6 (3-C_{Ph(x2)}), 127.1 (6-C), 128.5 (2-C_{Ph(x2)}), 129.5 (8-C), 135.4 (1-C_{Ph}), 144.8 (10a-C). MS (EI), *m/z* (%): 399.3 (M⁺,54), 397.3 (M⁺,53), 382.2 (82), 384.2 (83), 91.1 (100). Anal. Calcd for C₂₃H₂₈BrN: C, 69.34; H, 7.08; N, 3.52%. Found: C, 69.47; H, 7.23; N, 3.44%.



***trans*-N-Allyl-3,9,9-trimethyl-1,2,3,4,4a,9,9a,10-octahydroacridine 14**

Transparent solid, m.p. 49-50°C, (0.521 g) 64% yield (method A). IR (ATR, cm⁻¹): 2948 ν (CH), 2919 ν (CH), 2866 ν (CH), 1186 ν (C-N), 919 ν (allyl). ¹H-NMR (400MHz, CDCl₃), δ 0.88-1.01 (2H, m, 2,4-H), 0.99 (3H, d, 6.7 Hz, 3-Me), 1.06 (3H, s, 9-Me), 1.14-1.26 (1H, m, 1-H), 1.38 (3H, s, 9-Me), 1.46 (1H, td, 10.9, 3.2 Hz, 9a-H), 1.48-1.56 (1H,

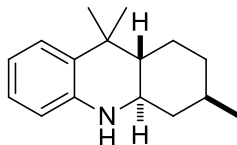
m, 3-H), 1.77-1.85 (1H, m, 2-H), 1.97-2.04 (1H, m, 4-H), 2.14-2.20 (1H, m, 1-H) 2.99 (1H, td, 10.8, 3.4 Hz, 4a-H), 3.85-4.03 (2H, m, CH₂-allyl), 5.21 (1H, dq, 10.4, 1.7 Hz, *cis*-allyl-H), 5.32 (1H, dq, 10.4, 1.7 Hz, *trans*-allyl-H), 5.98 (1H, ddt, 17.2, 10.3, 4.3 Hz, allyl-H), 6.67 (1H, d, 7.8 Hz, 5-H), 6.69 (1H, d, 7.8 Hz, 7-H), 7.08 (1H, td, 7.8, 1.5 Hz, 6-H), 7.25 (1H, dd, 8.0, 1.5 Hz, 8-H). ¹³C-NMR (100MHz), δ[ppm]: 22.3 (3-Me), 25.0 (9-Me), 25.2 (9-Me), 25.5 (4-C), 31.4 (3-C), 34.2 (9-C), 34.8 (2-C), 42.9 (1-C), 47.1 (9a-C), 53.8 (CH₂-allyl), 58.9 (4a-C), 113.0 (5-C), 115.4 (=CH₂), 116.1 (7-C), 124.1 (6-C), 126.8 (8-C), 133.0 (8a-C), 136.7 (-CH-allyl), 145.6 (10a-C). MS (EI), *m/z* (%): 269.3 (M⁺, 34), 255.3 (25), 254.3 (100), 184.2 (12). Anal. Calcd for C₁₉H₂₇N: C, 84.70; H, 10.10; N, 5.20%. Found: C, 84.88; H, 10.28; N, 5.06%.



***trans*-N-Propargyl-3,9,9-trimethyl-1,2,3,4,4a,9,9a,10-octahydroacridine 15**

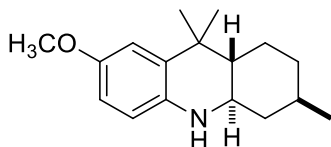
Transparent solid, m.p. 71-72°C, (0.826 g) 70% yield (method A). IR (ATR, cm⁻¹): 3264 ν (≡CH), 2953 ν (CH), 2918 ν (CH), 2848 ν (CH), 1130 ν (C-N), 655 ν (C≡CH bend). ¹H-NMR (400MHz, CDCl₃), δ 0.91-1.05 (2H, m, 2,4-H), 1.01 (3H, d, 6.6Hz, 3-Me), 1.05 (3H, s, 9-Me), 1.13-1.25 (1H, m, 1-H), 1.35 (3H, s, 9-Me), 1.41 (1H, td, 11.4, 3.2 Hz, 9a-H), 1.49-1.62 (1H, m, 3-H), 1.77-1.84 (1H, m, 2-H), 1.95-2.01 (1H, m, 1-H), 2.21 (1H, t, 2.4Hz, H_{Proparg}) 2.32-2.38 (1H, m, 4-H), 3.05 (1H, td, 10.8, 3.5 Hz, 4a-H), 4.04 (1H, dd, 18.4, 2.4 Hz, H_{CH2-Proparg}), 4.16 (1H, dd, 18.4, 2.4 Hz, H_{CH2-Proparg}), 6.74 (1H, td, 7.5, 1.1 Hz, 7-H), 6.87 (1H, dd, 8.2, 1.1 Hz, 5-H), 7.14 (1H, ddd, 8.3, 7.5, 1.1 Hz, 6-H), 7.25 (1H, dd, 7.5, 1.6 Hz, 8-H). ¹³C-NMR (100MHz, CDCl₃), δ 22.3 (3-Me), 25.1 (9-Me), 25.1 (9-Me), 25.5 (4-C), 31.4 (3-C), 34.4 (9-C), 34.7 (2-C), 38.9 (CH₂-Proparg), 41.9 (1-C), 47.2 (9a-C), 57.9 (4a-C), 71.1 (1-C_{Proparg}), 81.5 (2-C_{Proparg}), 113.4 (5-C), 117.2 (7-C), 124.4 (6-C), 126.9 (8-C), 144.3 (8a-C), 144.2 (10a-C). MS (EI), *m/z* (%): 267.3 (M⁺, 35), 253.3 (24), 252.3 (100), 182.2 (11). Anal. Calcd for C₁₉H₂₅N: C, 85.34; H, 9.42; N, 5.24%. Found: C, 85.53; H, 9.67; N, 5.38%.

1.3 *General procedure for the synthesis of trans octahydroacridines:* A solution of *N*-benzyl octahydroacridine (1 mmol) in a 4 mL of a 3:1 mixture of methanol:dichloromethane was poured into a 25 mL round bottom flask and stirred at room temperature. The Pd/C catalyst (10% wt) was then added and the suspension was stirred overnight under hydrogen atmosphere (1 atm). The crude product was filtered over celite, extracted with ethyl acetate and dried over Na₂SO₄. The *trans* octahydroacridine was purified using flash chromatography employing the appropriate mixture of petroleum ether and ethyl acetate as eluents. The product was obtained as a coloured oil.



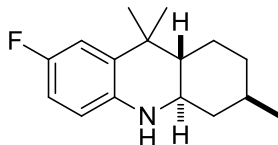
***trans*-3,9,9-Trimethyl-1,2,3,4,4a,9,9a,10-octahydroacridine 22**

Yellow oil, (0.092 g) 96% yield from **20**; (0.065 g); 89% yield from **21**. IR (ATR, cm^{-1}): 3395 ν (N-H), 2948 ν (CH), 2921 ν (CH), 2864 ν (CH), 1158 ν (C-N). $^1\text{H-NMR}$ (400MHz, CDCl_3), δ 0.98 (3H, d, 6.6 Hz, 3-Me), 1.00-1.15 (2H, m, 2,4-H), 1.12 (3H, s, 9-Me), 1.17-1.25 (1H, m, 1-H), 1.21 (1H, td, 12.5, 3.0 Hz, 9a-H), 1.35 (3H, s, 9-Me), 1.49-1.62 (1H, m, 3-H), 1.78-1.85 (1H, m, 2-H), 1.86-1.94 (2H, m, 1,4-H), 3.09 (1H, td, 10.6, 4.2 Hz, 4a-H), 3.49 (bs, NH), 6.46 (1H, dd, 7.9, 1.1 Hz, 5-H), 6.66 (1H, td, 7.8, 1.3 Hz, 7-H), 6.98 (1H, ddd, 7.9, 7.2, 1.5 Hz, 6-H), 7.25 (1H, dd, 7.9, 1.5 Hz, 8-H). $^{13}\text{C-NMR}$ (100MHz, CDCl_3), δ 22.2 (3-Me), 24.6 (4-C), 26.6 (9-Me), 27.1 (9-Me), 30.8 (3-C), 34.8 (9-C), 35.0 (2-C), 43.3 (1-C), 47.0 (9a-C), 50.5 (4a-C), 113.6 (5-C), 116.8 (7-C), 126.5 (6,8-C), 131.2 (8a-C), 142.9 (10a-C). MS (EI), m/z (%): 229.2 (M^+ , 37), 214.2 (100), 158.1 (13), 144.0 (20). Anal. Calcd for $\text{C}_{16}\text{H}_{23}\text{N}$: C, 83.79; H, 10.11; N, 6.11%. Found: C, 83.98; H, 10.37; N, 5.98%.



***trans*-7-Methoxy-3,9,9-trimethyl-1,2,3,4,4a,9,9a,10-octahydroacridine 23**

Red oil, (0.061 g) 81% yield IR (ATR, cm^{-1}): 3371 ν (N-H), 2945 ν (CH), 2927 ν (CH), 2865 ν (CH), 1172 ν (C-N). $^1\text{H-NMR}$ (400MHz, CDCl_3), δ 0.95 (3H, d, 6.6 Hz, 3-Me), 0.93-1.02 (1H, m, 2-H), 1.01-1.15 (1H, m, 4-H), 1.12 (3H, s, 9-Me), 1.15-1.23 (1H, m, 1-H), 1.27-1.34 (1H, m, 9a-H), 1.32 (3H, s, 9-Me), 1.46-1.59 (1H, m, 3-H), 1.76-1.83 (1H, m, 2-H), 1.83-1.93 (2H, m, 1,4-H), 3.03 (1H, td, 10.6, 4.2 Hz, 4a-H), 3.28 (bs, NH), 3.75 (3H, s, OMe), 6.43 (1H, d, 8.7 Hz, 5-H), 6.60 (1H, dd, 8.7, 2.8 Hz, 6-H), 6.84 (1H, d, 2.8 Hz, 8-H). $^{13}\text{C-NMR}$ (100MHz, CDCl_3), δ 22.2 (3-Me), 24.7 (4-C), 27.0 (9-Me), 27.3 (9-Me), 30.8 (3-C), 35.0 (2-C), 35.1 (9-C), 43.2 (1-C), 47.1 (9a-C), 50.6 (4a-C), 55.8 (OMe), 112.1 (5-C), 113.0 (8-C), 114.6 (6-C), 132.9 (8a-C), 137.1 (10a-C), 151.7 (7-C). MS (EI), m/z (%): 259.1 (M^+ , 63), 245.2 (18), 244.2 (100), 174.1 (15). Anal. Calcd for $\text{C}_{17}\text{H}_{25}\text{NO}$: C, 78.72; H, 9.71; N, 5.40%. Found: C, 78.95; H, 9.93; N, 5.26%.



***trans*-7-Fluor-3,9,9-trimethyl-1,2,3,4,4a,9,9a,10-octahydroacridine 24**

Red oil, (0.083 g) 94% yield. IR (ATR, cm^{-1}): 3399 ν (N-H), 2959 ν (CH), 2923 ν (CH), 2866 ν (CH), 1171 ν (C-N). $^1\text{H-NMR}$ (400MHz, CDCl_3), δ 0.96 (3H, d, 6.8 Hz, 3-Me), 0.93-1.08 (2H, m, 2,4-H), 1.09 (3H, s, 9-Me), 1.12-1.23 (1H, m, 1-H), 1.24-1.31 (1H, m, 9a-H), 1.30 (3H, s, 9-Me), 1.47-1.59 (1H, m, 3-H), 1.76-1.83 (1H, m, 2-H), 1.83-1.92 (2H, m, 1,4-H), 3.04 (1H, td, 10.5, 4.2 Hz, 4a-H), 3.32 (bs, NH), 6.37 (1H, dd, 8.7, 5.0 Hz, 5-H), 6.67 (1H, ddd, 8.7, 8.1, 2.1 Hz, 6-H), 6.93 (1H, dd, 10.7, 2.9 Hz, 8-H). $^{13}\text{C-NMR}$ (100MHz, CDCl_3), δ 22.2 (3-Me), 24.7 (4-C), 26.8 (9-Me), 27.1 (9-Me), 30.8 (3-C), 34.9 (2-C), 35.2 (9-C), 43.2 (1-C), 46.7 (9a-C), 50.5 (4a-C), 112.9 (d, 22.2 Hz, 6-C), 113.1 (d, 22.5 Hz, 8-C), 114.2 (d, 7.5 Hz, 5-C), 132.6 (d, 5.6 Hz, 8a-C), 139.1 (10a-C), 155.6 (d, 233.1 Hz, 7-C). MS (EI), m/z (%): 247.2 (M^+ , 43), 232.2 (100), 176.1 (13), 162.0 (22). Anal. Calcd for $\text{C}_{16}\text{H}_{22}\text{NF}$: C, 77.69; H, 8.96; N, 5.66%. Found: C, 77.88; H, 9.16; N, 5.79%.

2. Extraction and characterization of the essential oil of citronella (*Cymbopogon nardus*).

The essential oil of citronella was extracted by hydro-distillation from dried leaves and stems in a 1.1 ± 0.1 % yield with a pale yellow color. The main compounds were citronellal (29.15 %), geraniol (24.35 %) and citronellol (19,73%) as shown in the chromatogram (Fig S1).

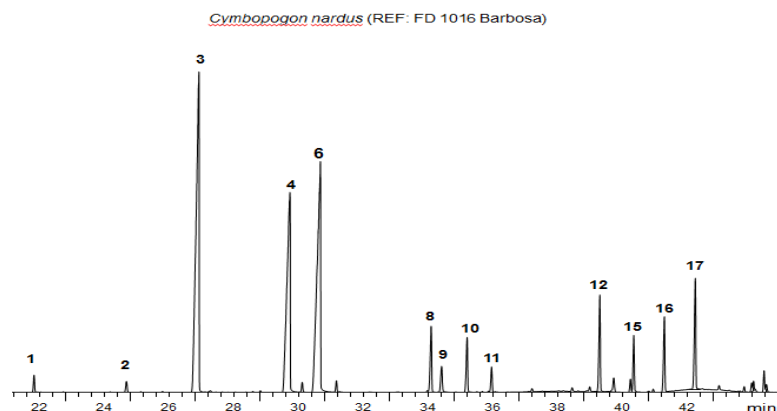


Figure S1. Chromatographic profile of *C. nardus* essential oil. DB-5 (60m) column, split 1:30, MSD (EI, 70 eV).

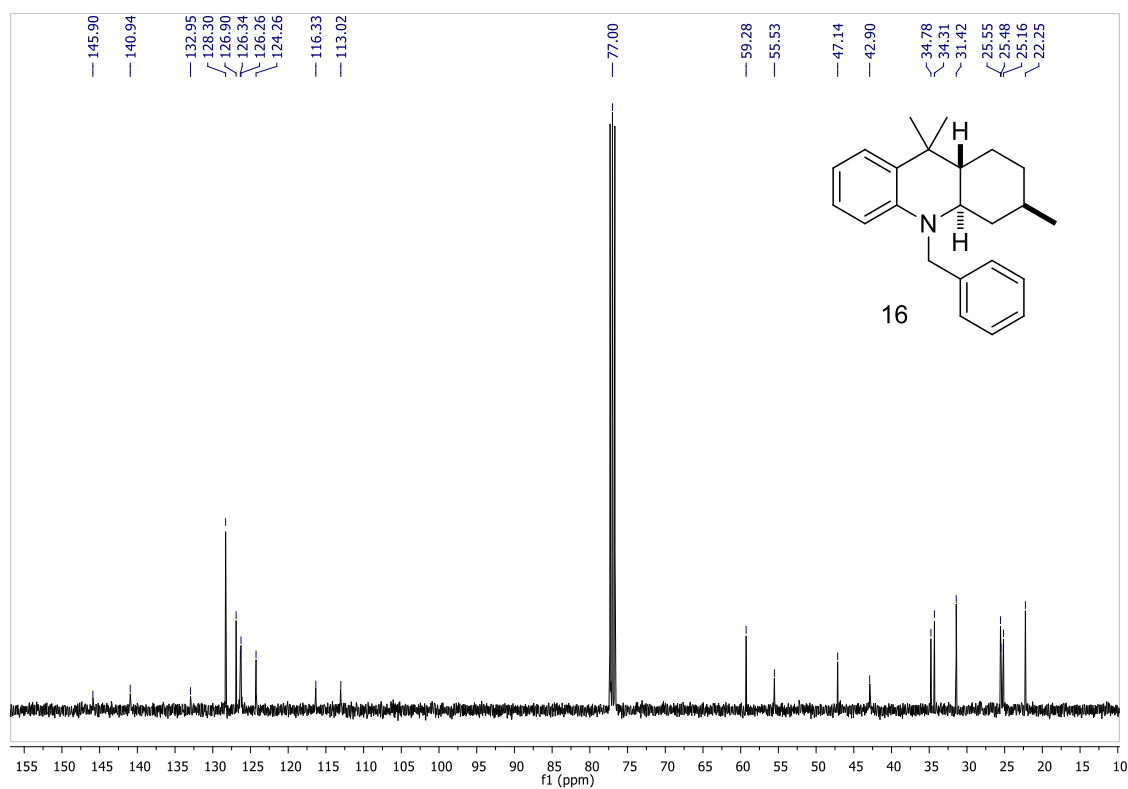
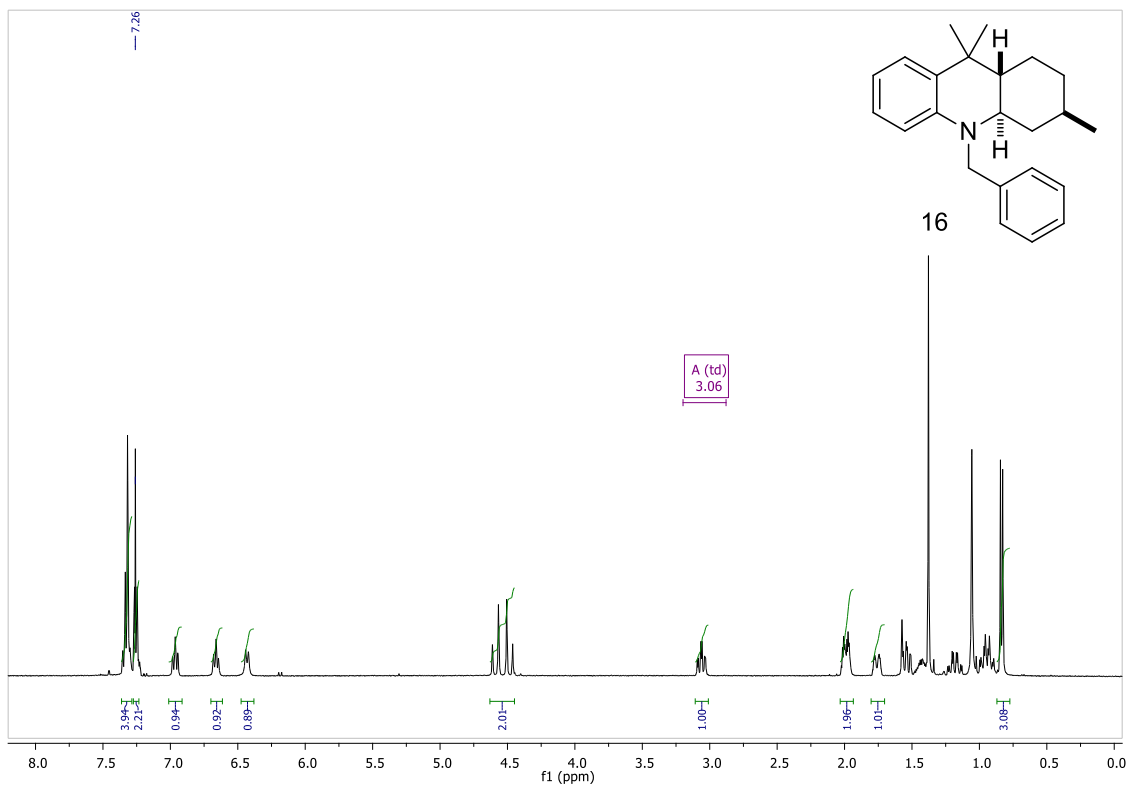
The 19 components of the essential oil with concentrations >0.1% were quantified and identified by GC-MS using an internal standard. Their calculated lineal retention indexes and concentration in the 97.8% of the Total Ionic Current (TIC) are summarized in table S1.

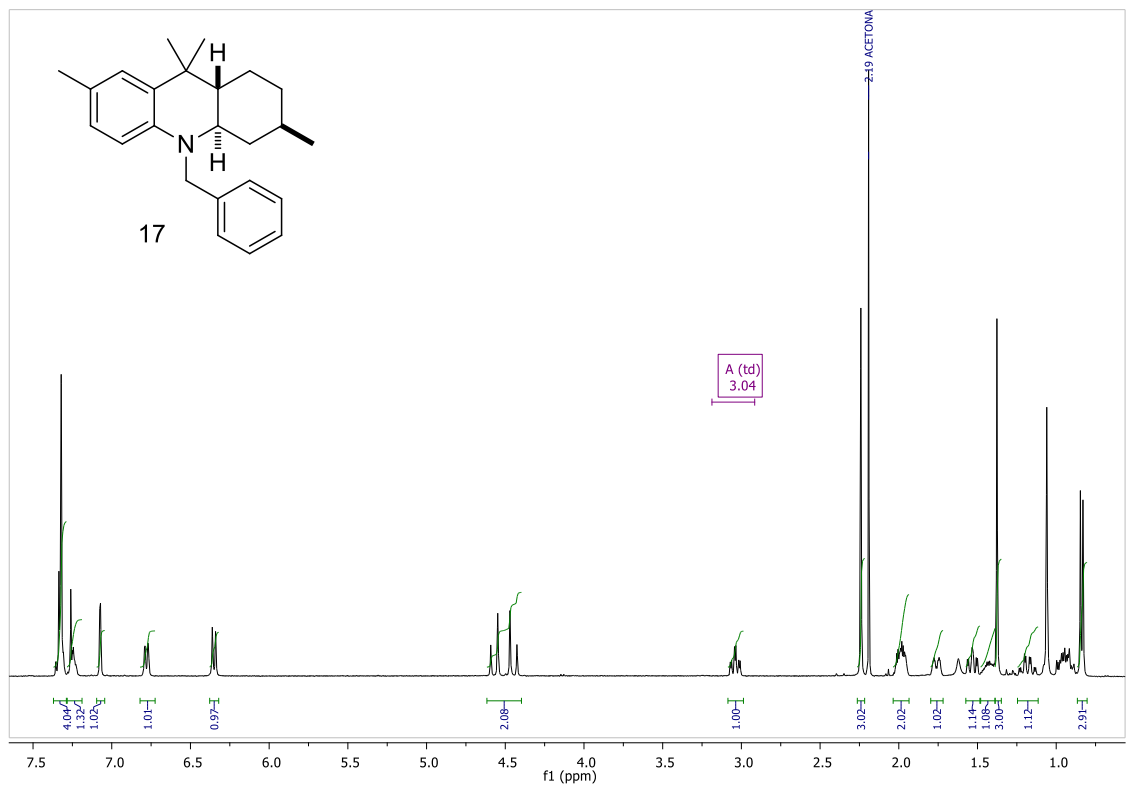
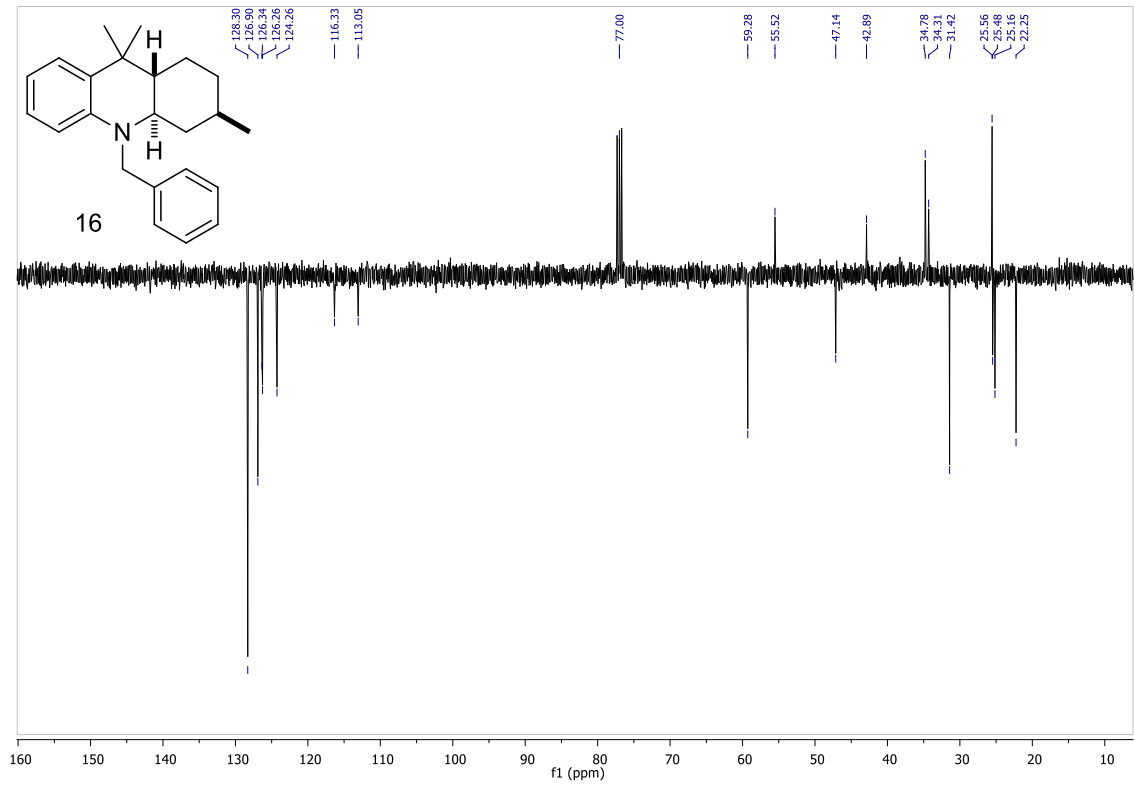
Table S1. Compounds identified in citronella essential oil.

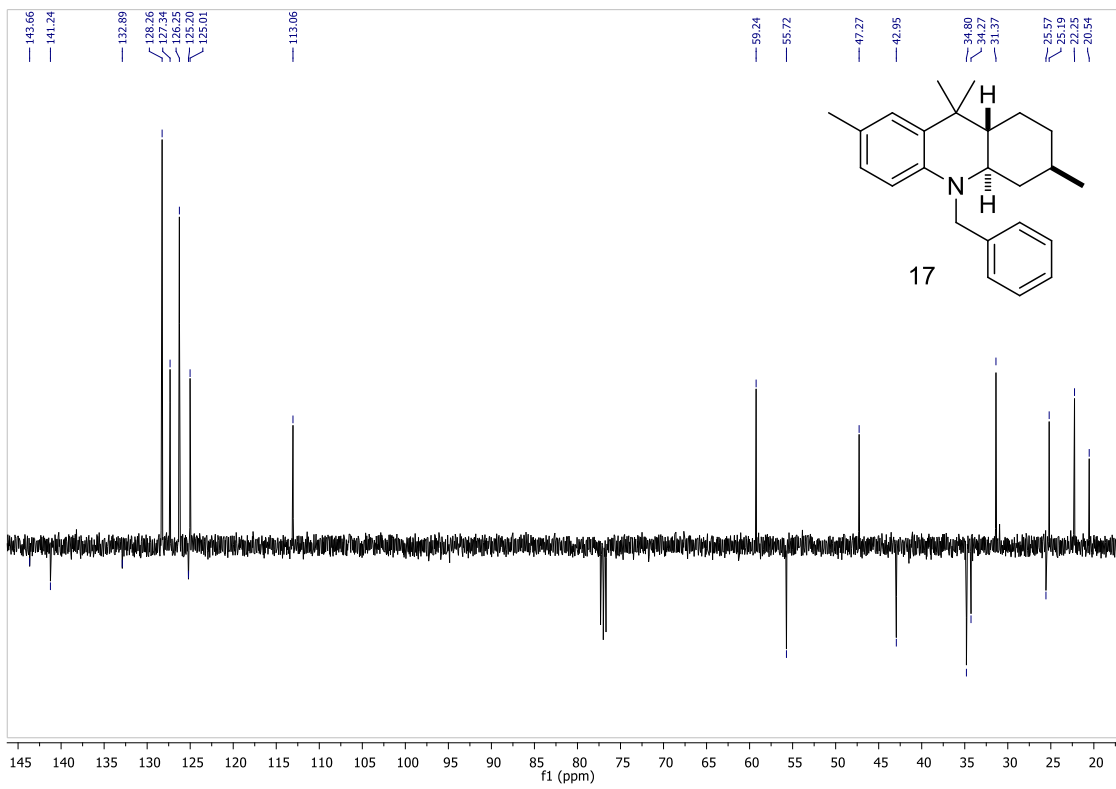
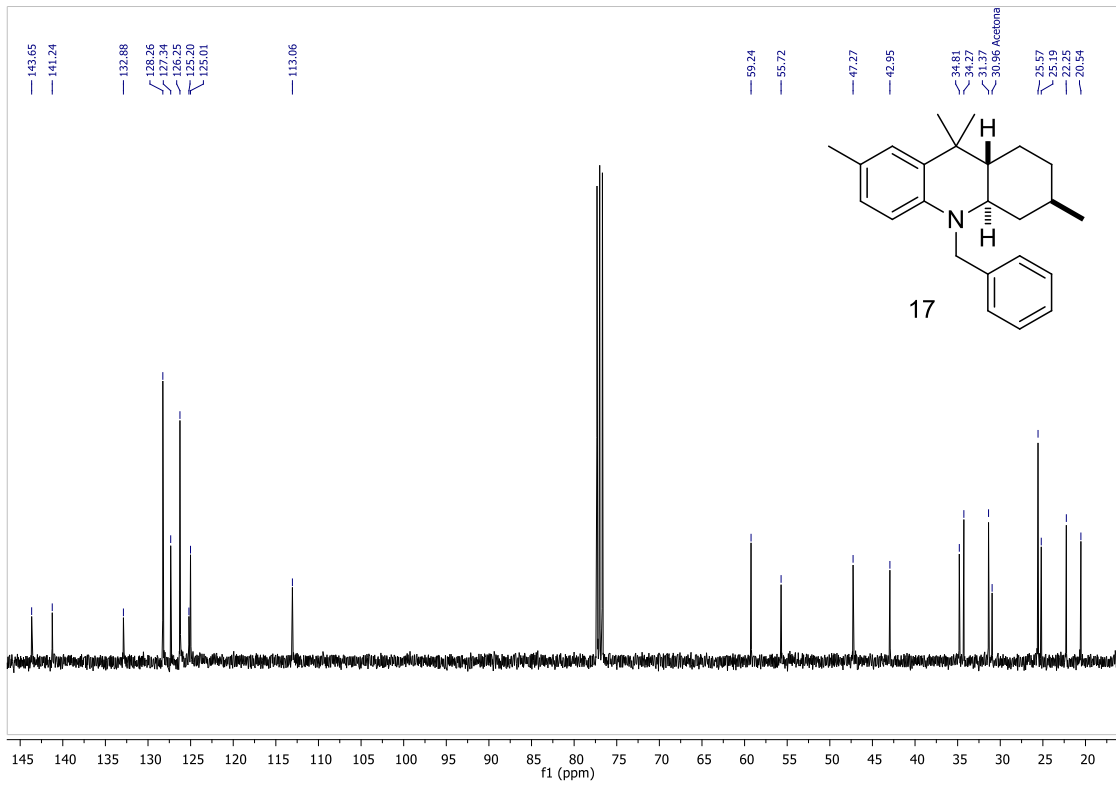
No Peak	Compound	LRI*	Relative amount [%]
1	Limonene	1031	0,61
2	Linabiol	1099	0,48
3	Citronellal	1156	29,15
4	Citronellol	1230	19,73
5	Neral	1240	0,36
6	Geraniol	1256	24,35
7	Geranial	1269	0,41
8	Citronelyl acetate	1347	2,97
9	Eugenol	1355	1,26
10	Geranyl acetate	1376	2,38
11	β -elemene	1396	1,03
12	Germacrene-D	1492	4,07
13	α -Muurokene	1506	0,70
14	γ -cadinene	1523	0,49
15	δ -cadinene	1526	2,18
16	Elemol	1558	3,12
17	Germacrene-D-4-ol	1589	4,85
18	γ -eudesmol	1645	0,20
19	α -cadinol	1668	0,78

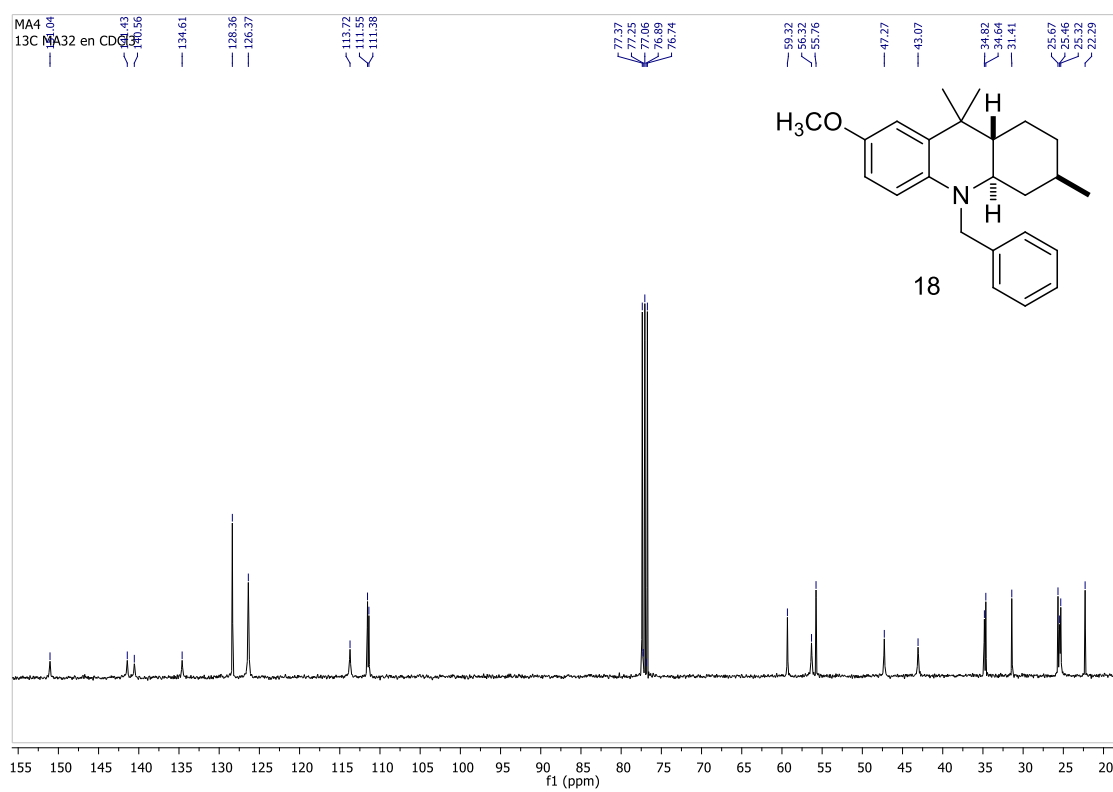
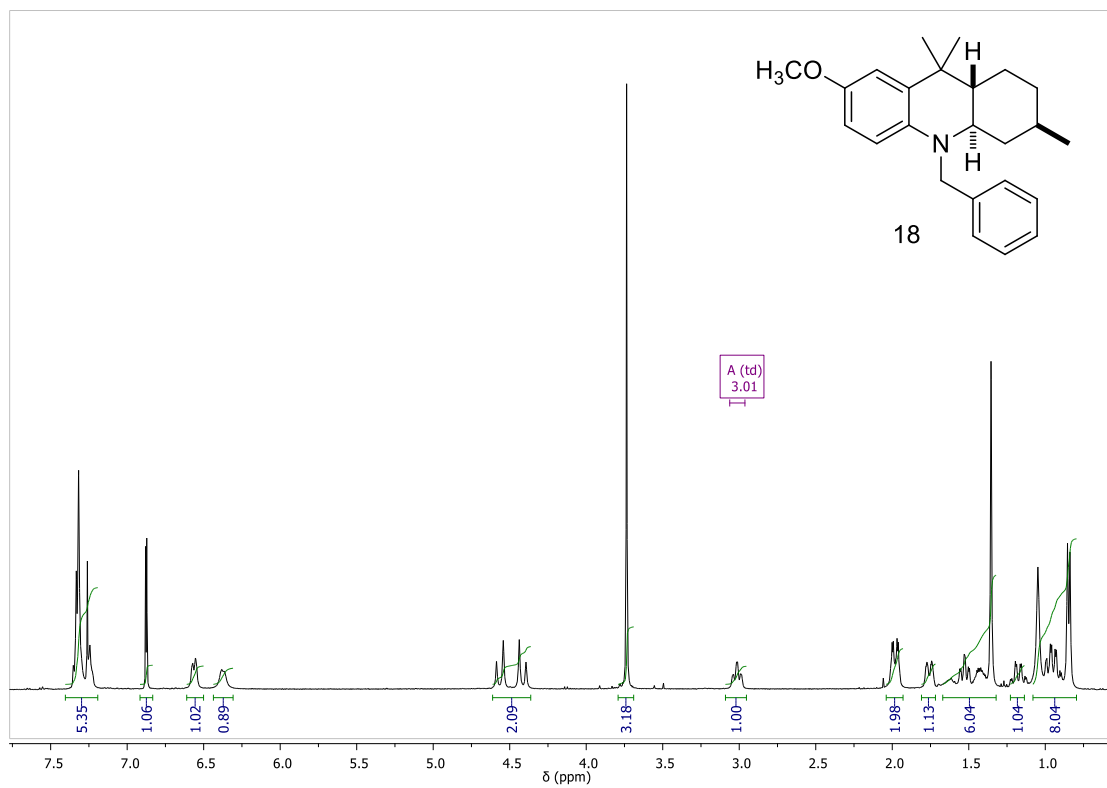
*Calculated lineal retention indexes.

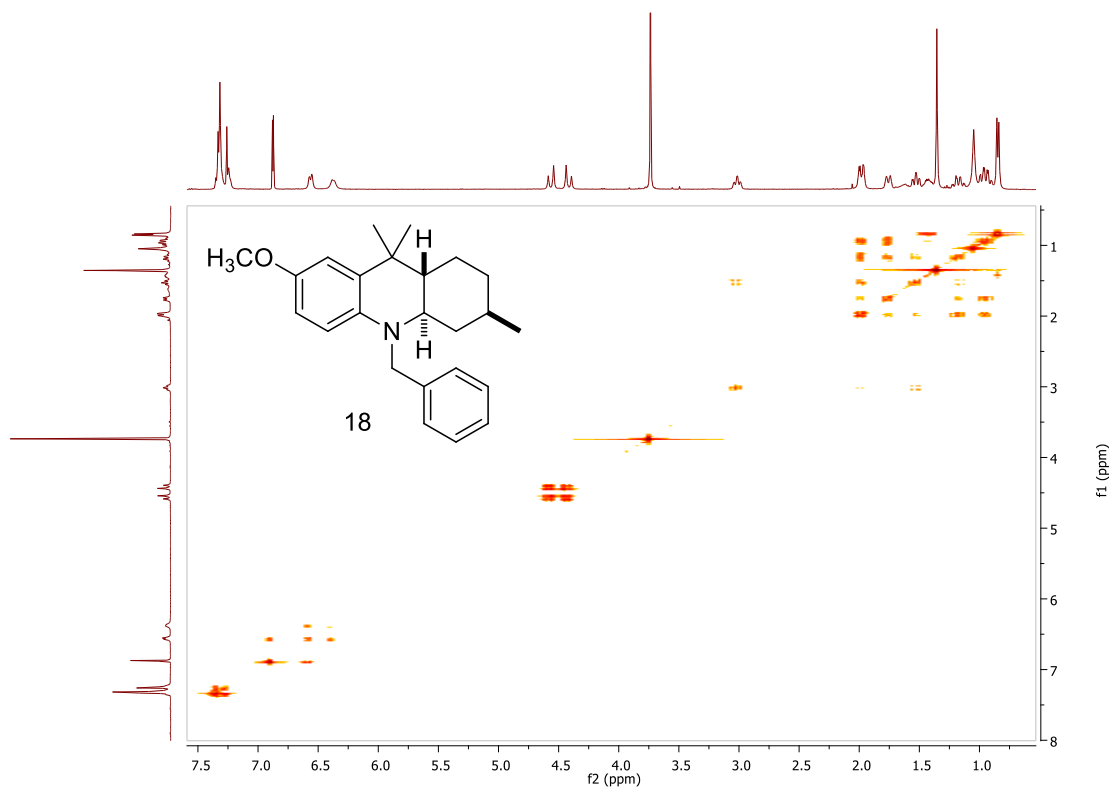
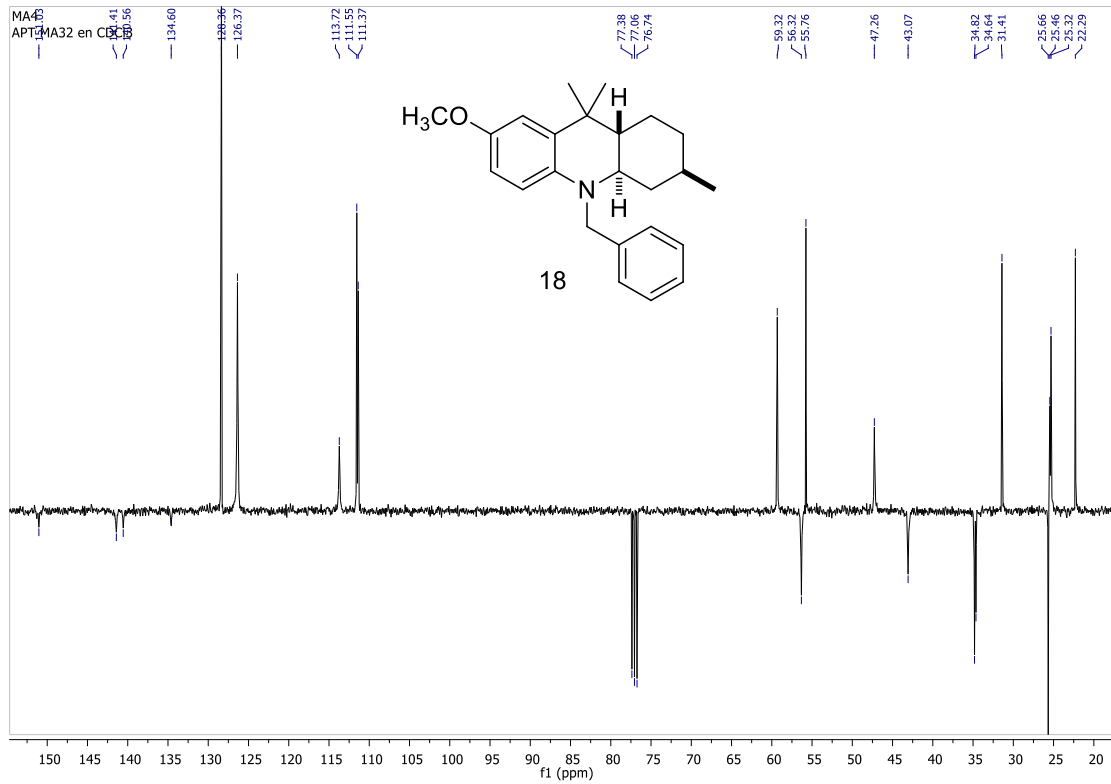
3. ^1H NMR and ^{13}C NMR spectra of *trans*-*N*-benzyl-3,9,9-trimethyl-1,2,3,4,4a,9,9a,10-octahydroacridines 16-21.

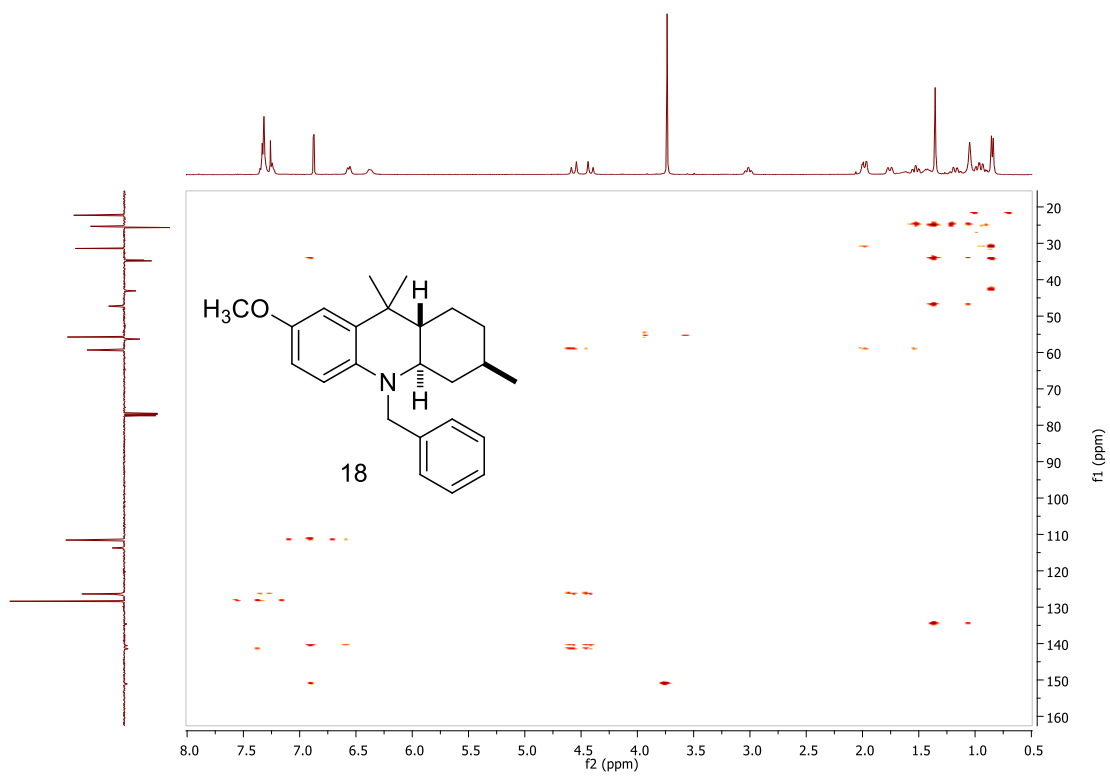
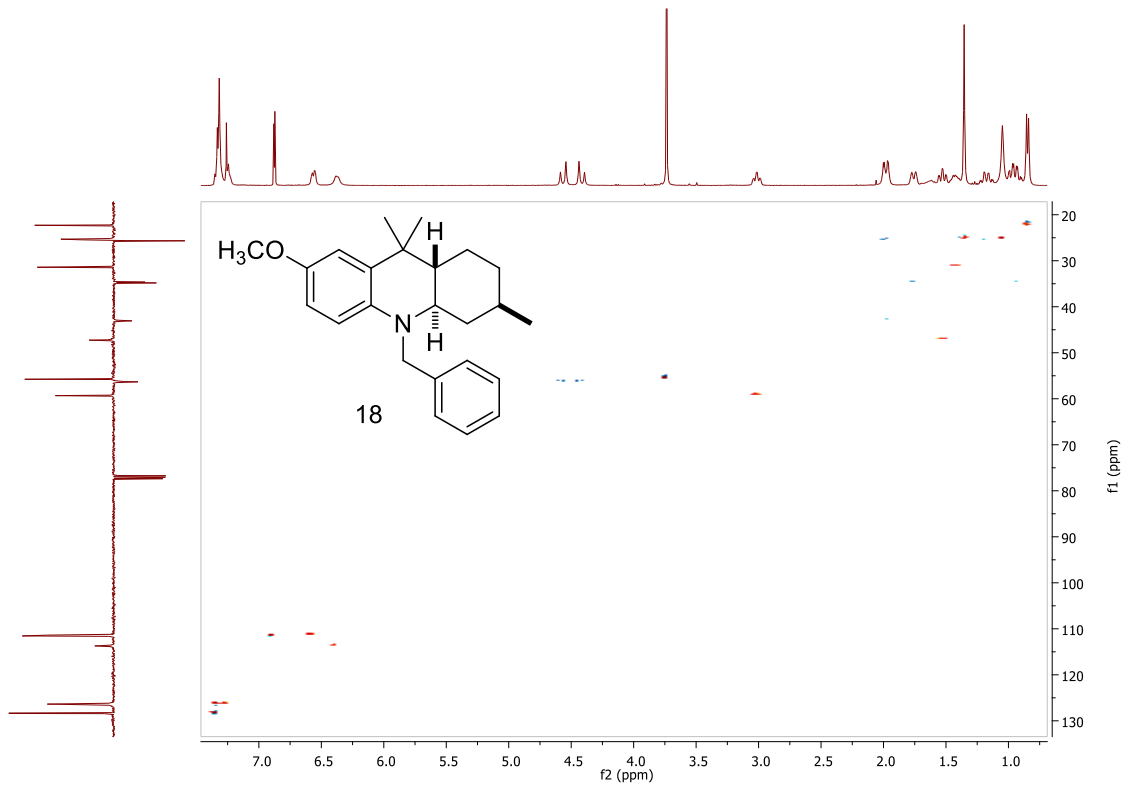


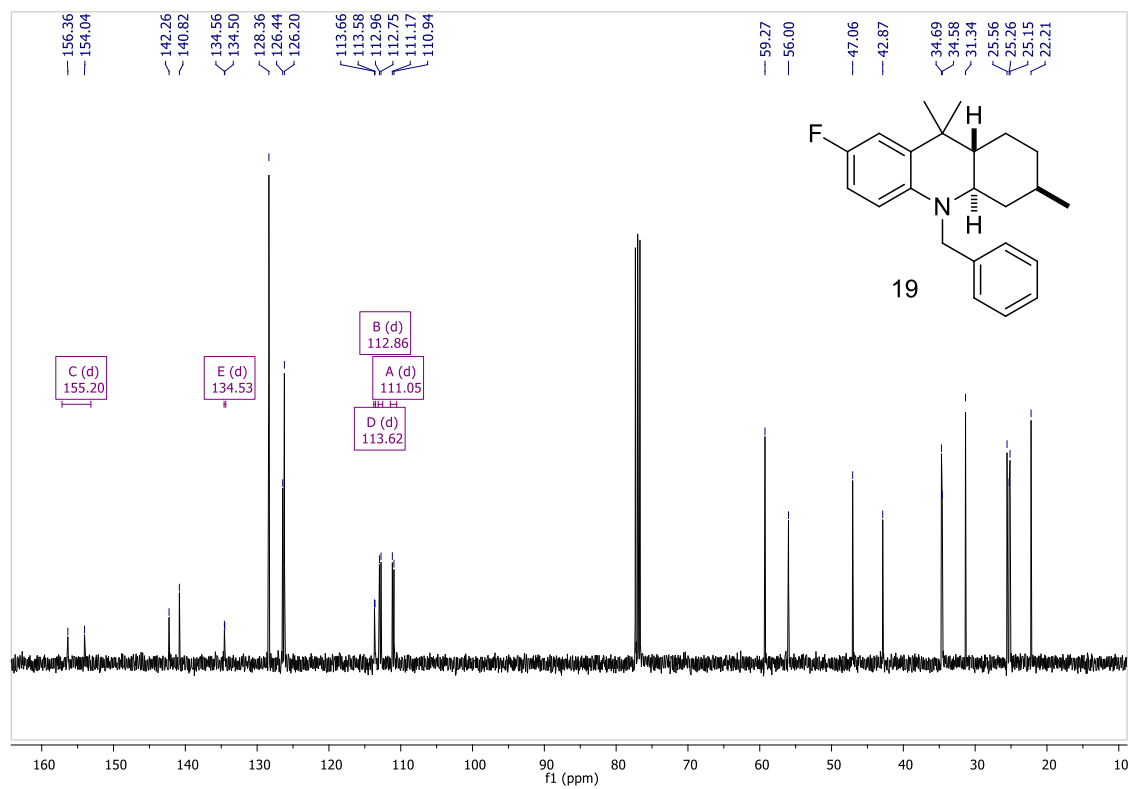
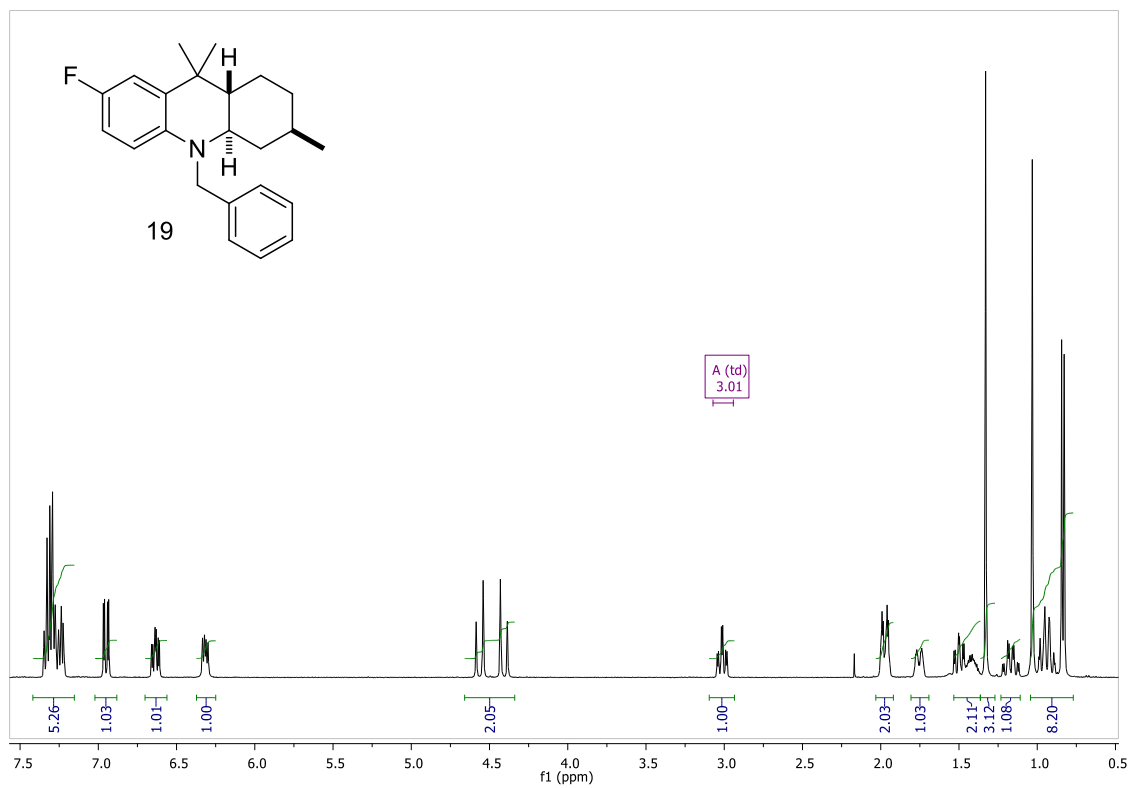


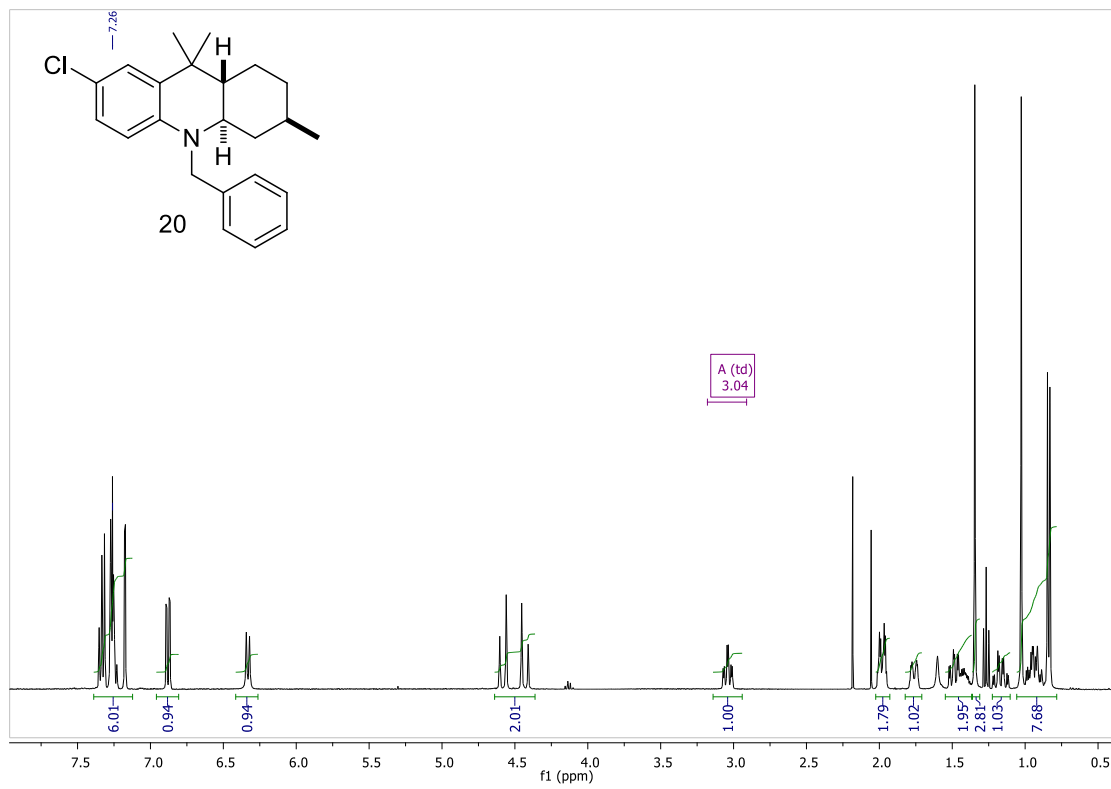
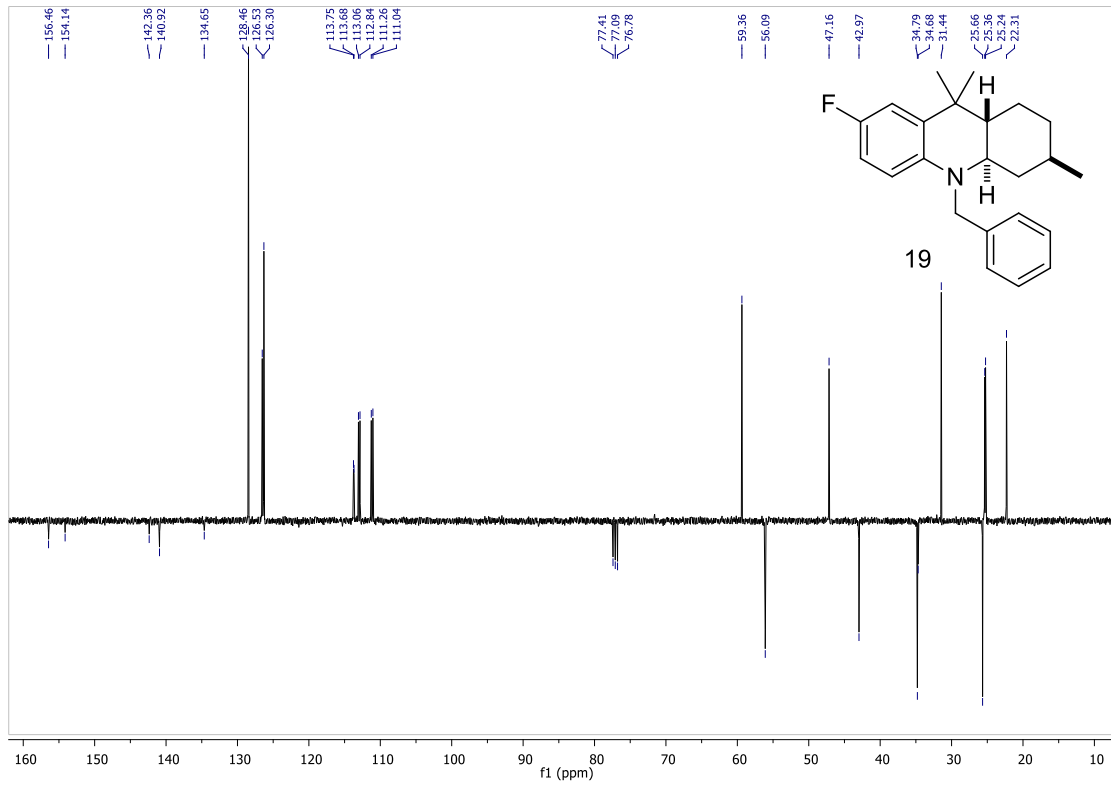


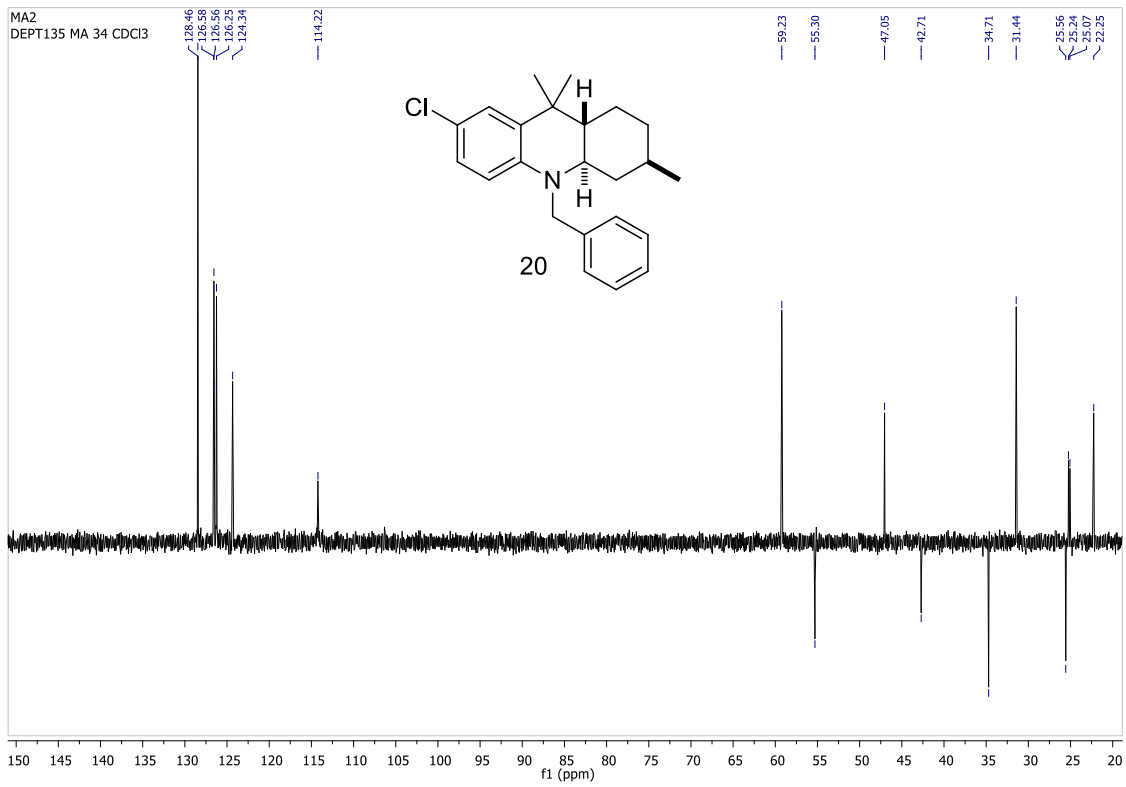
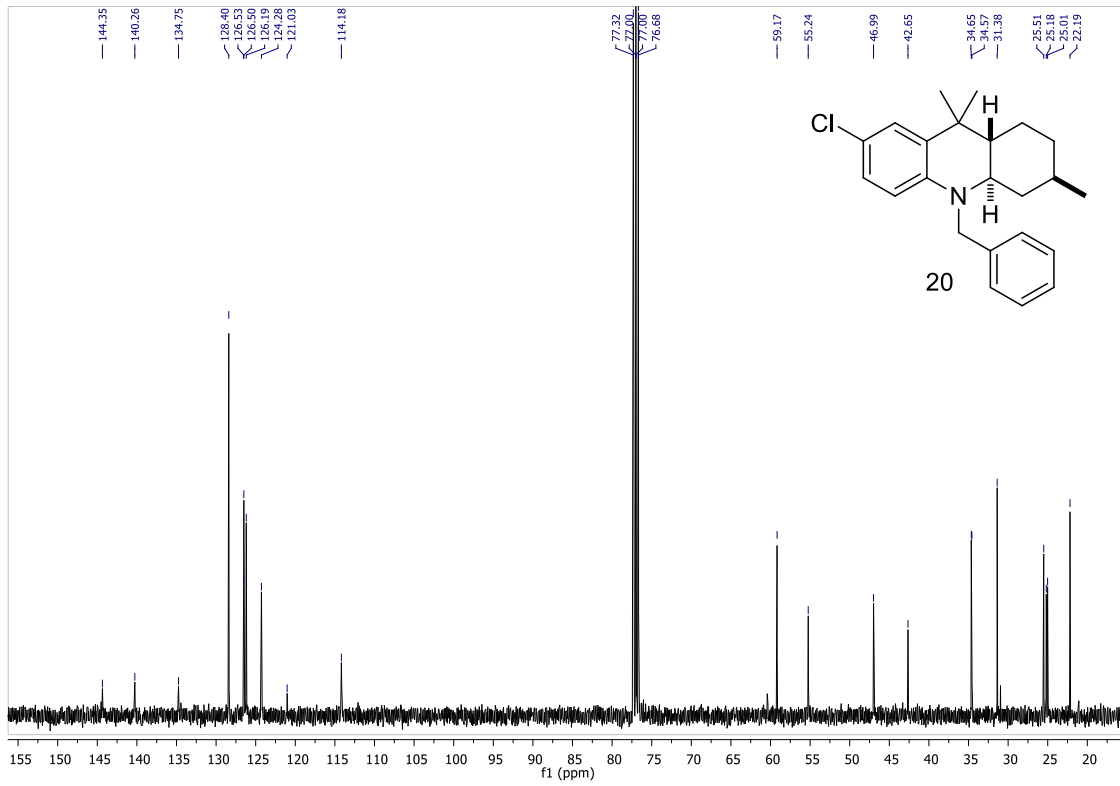


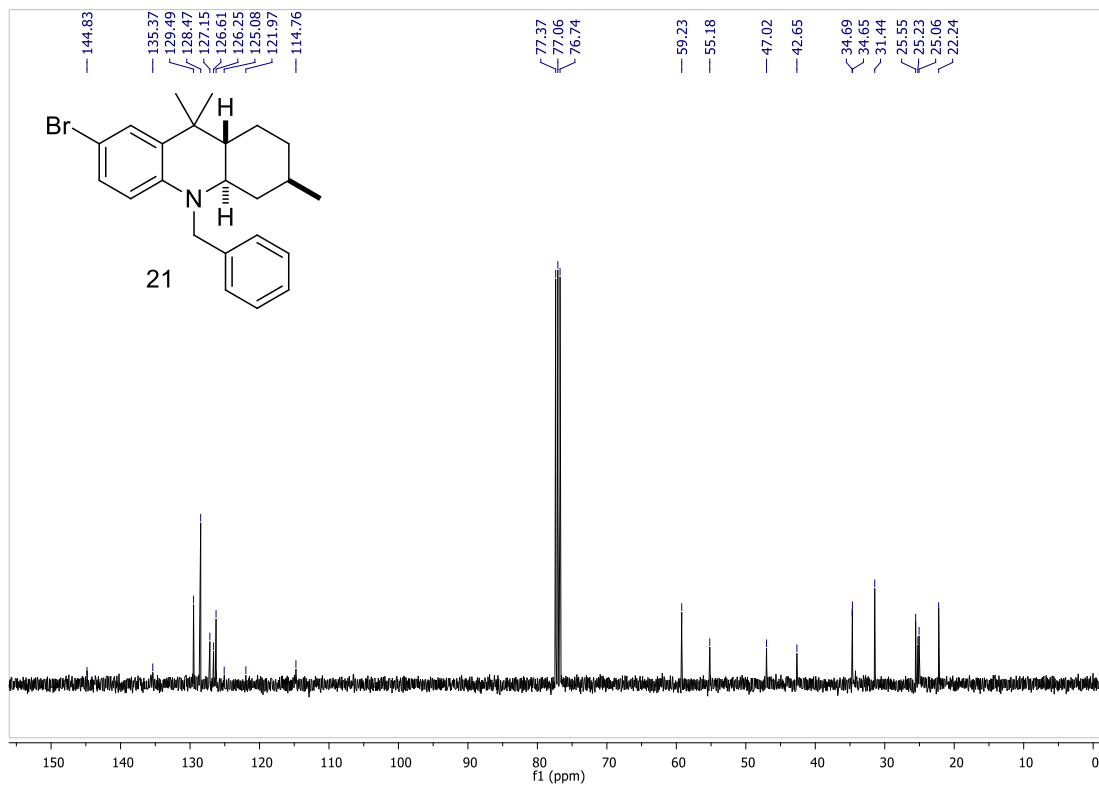
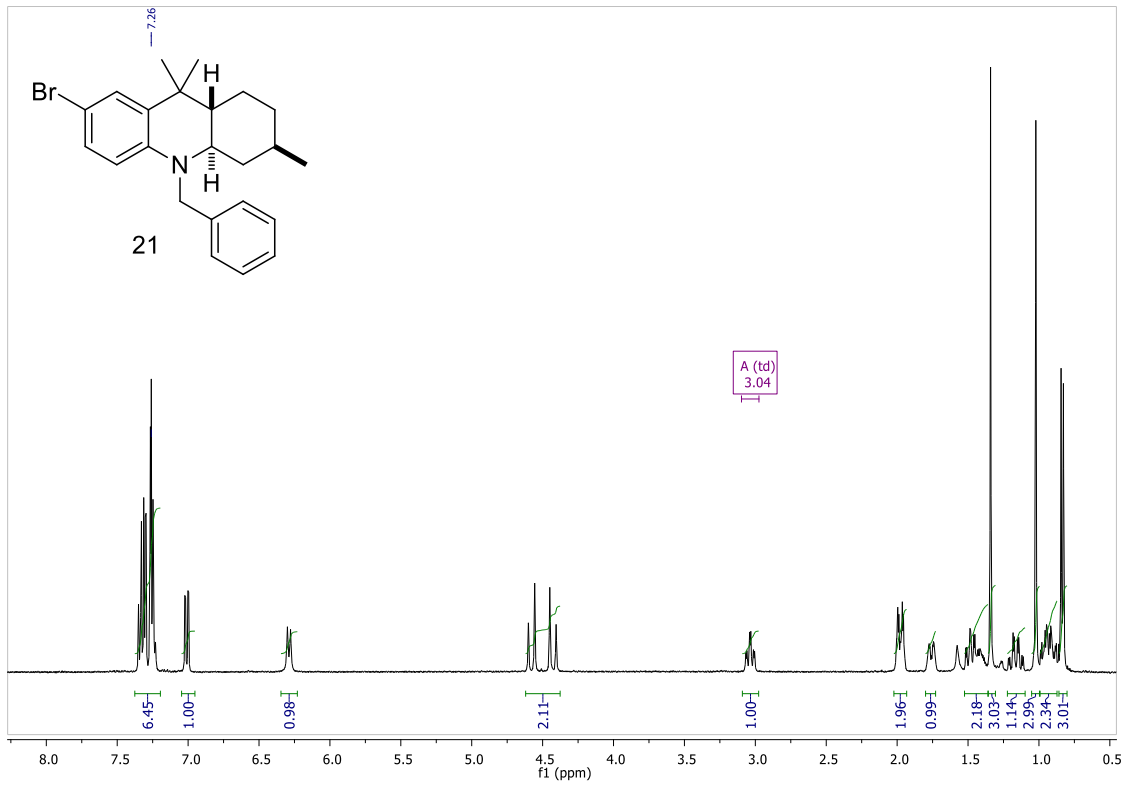


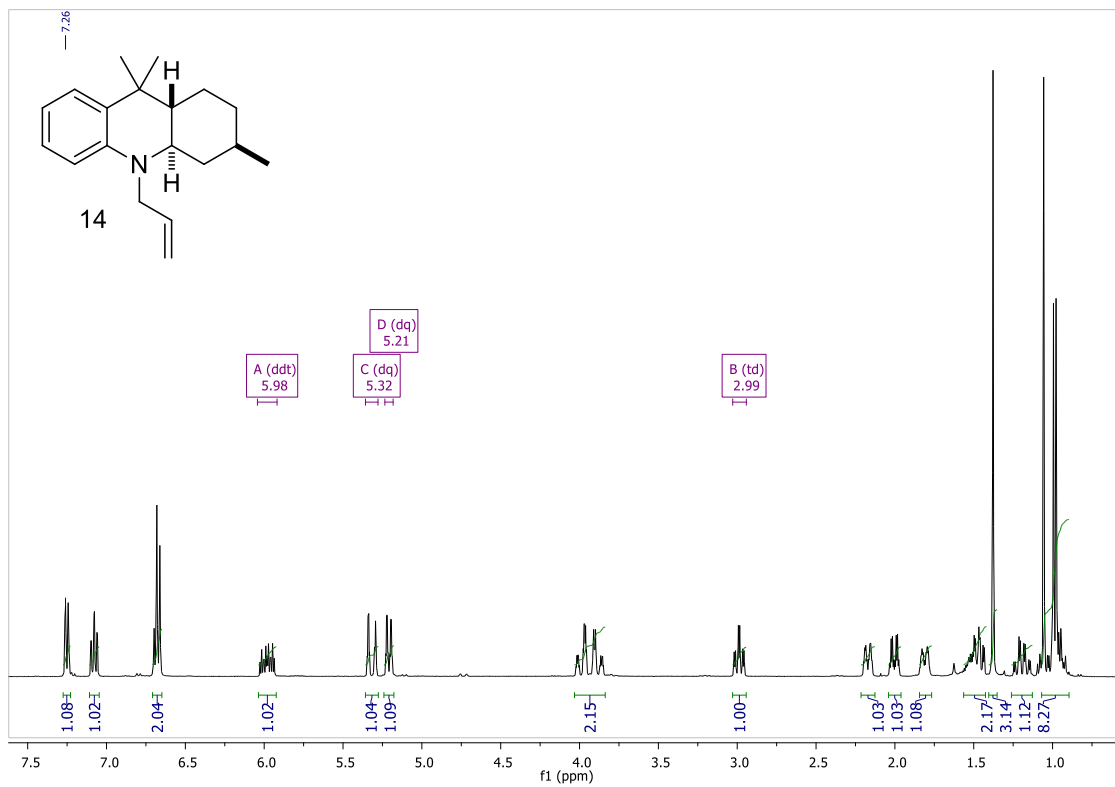
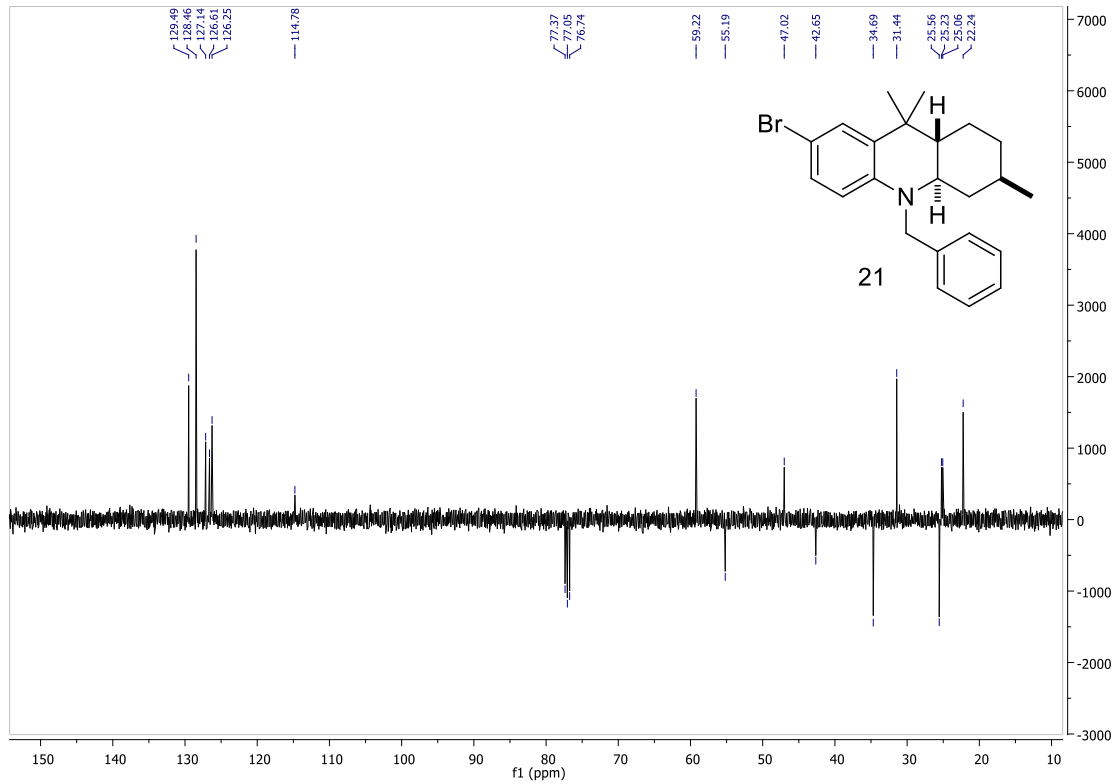


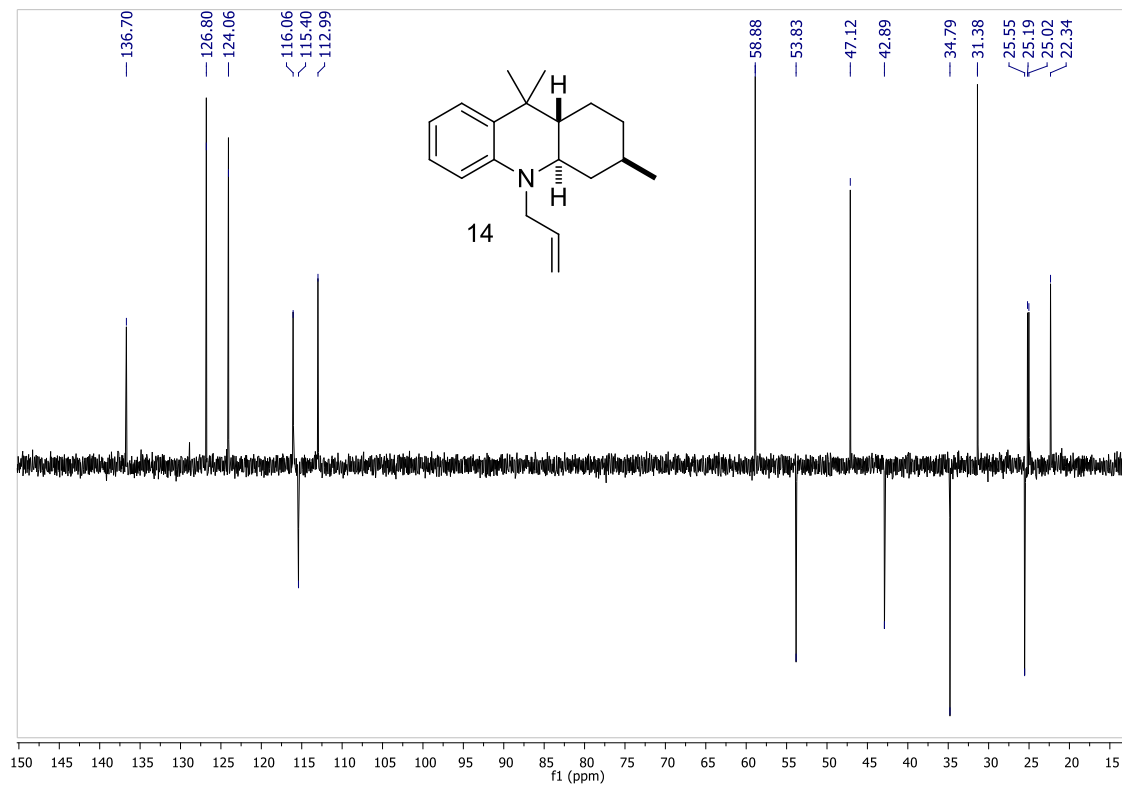
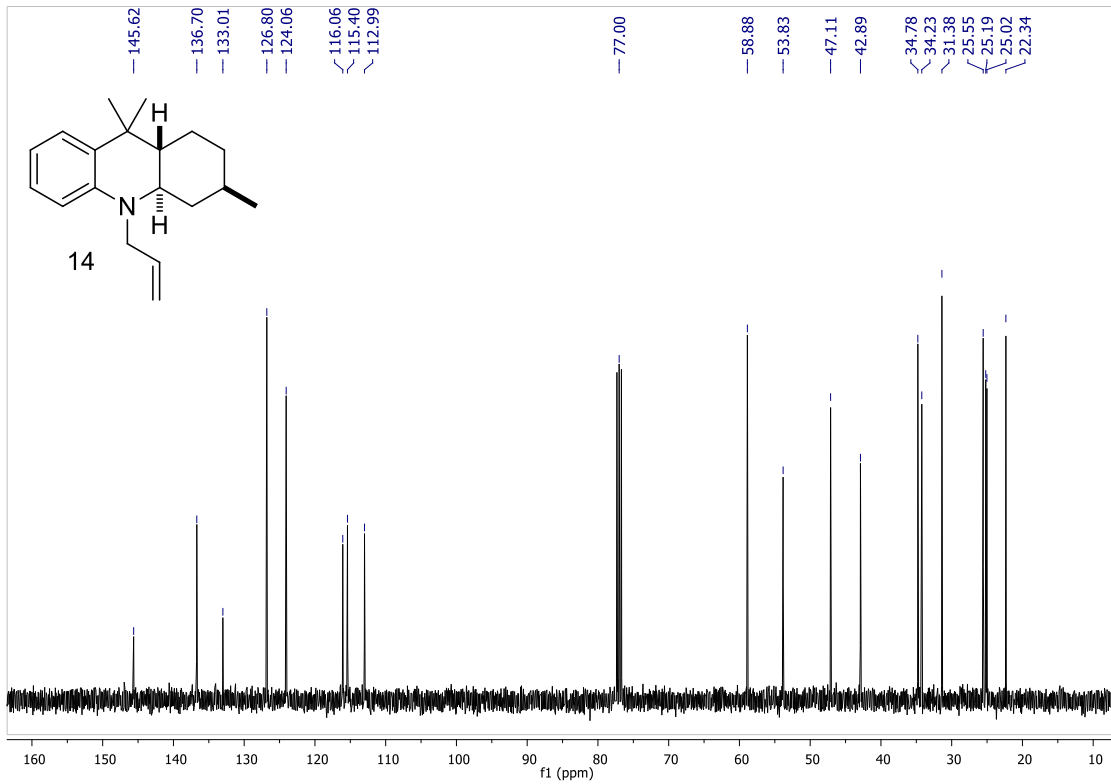


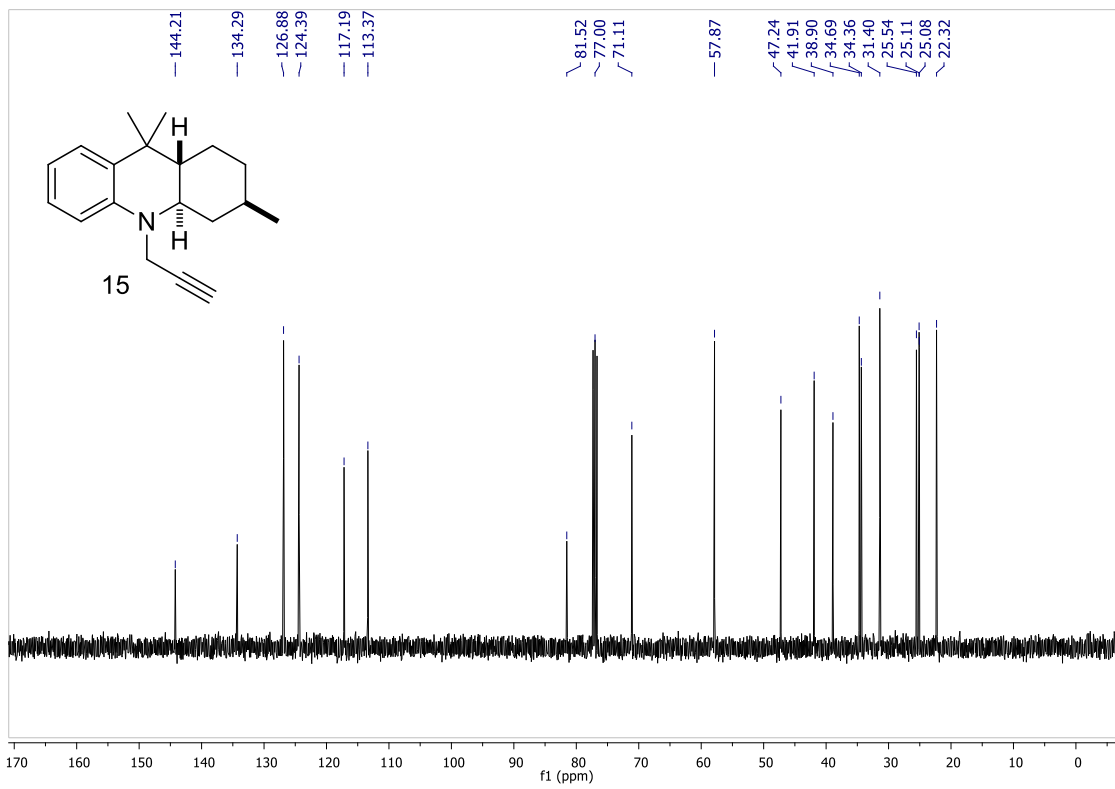
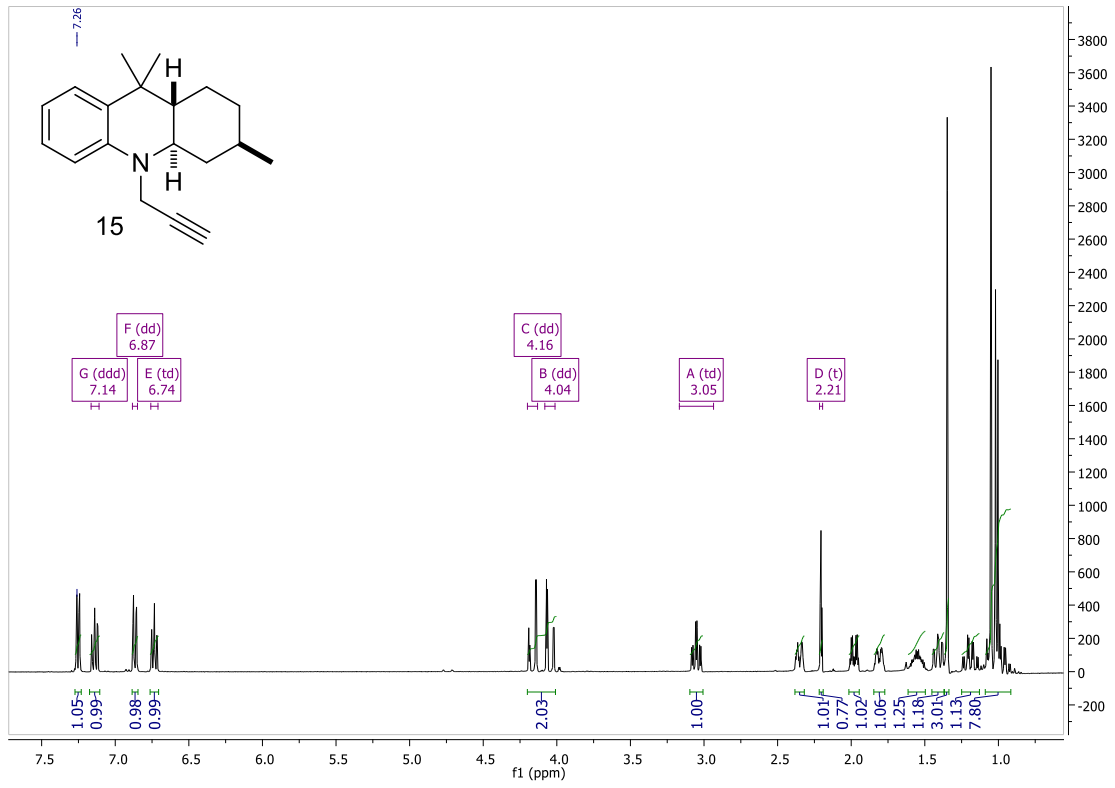


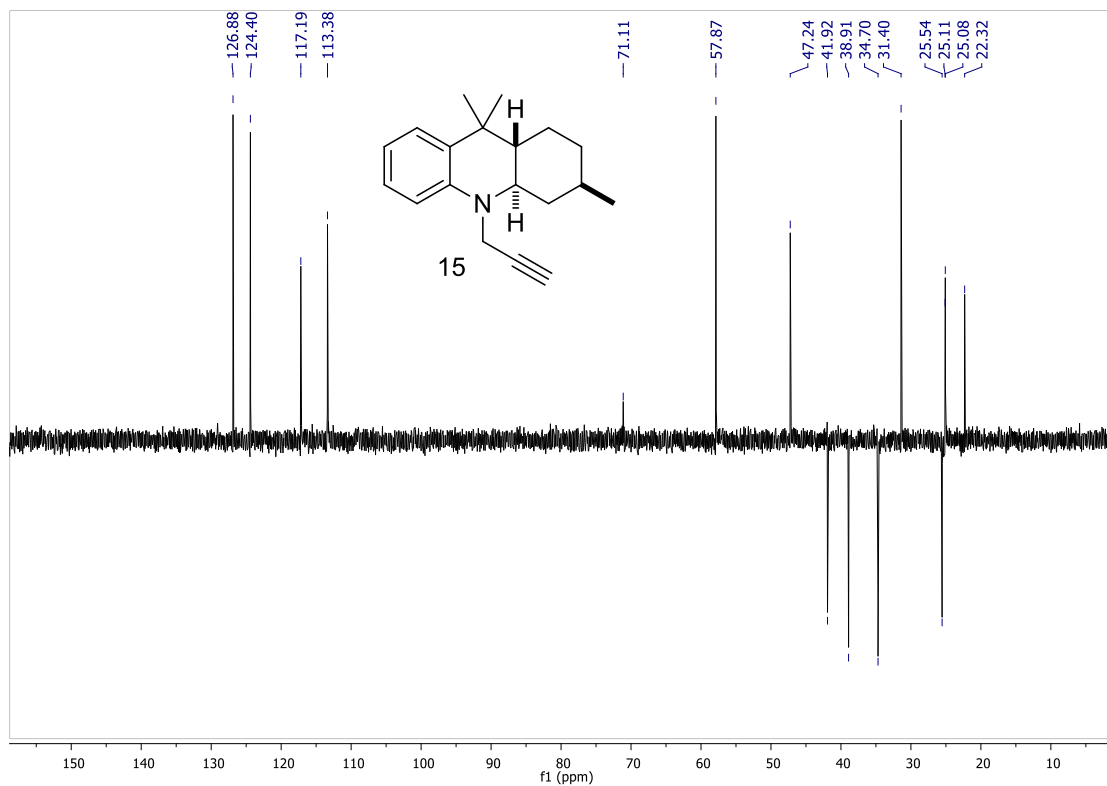




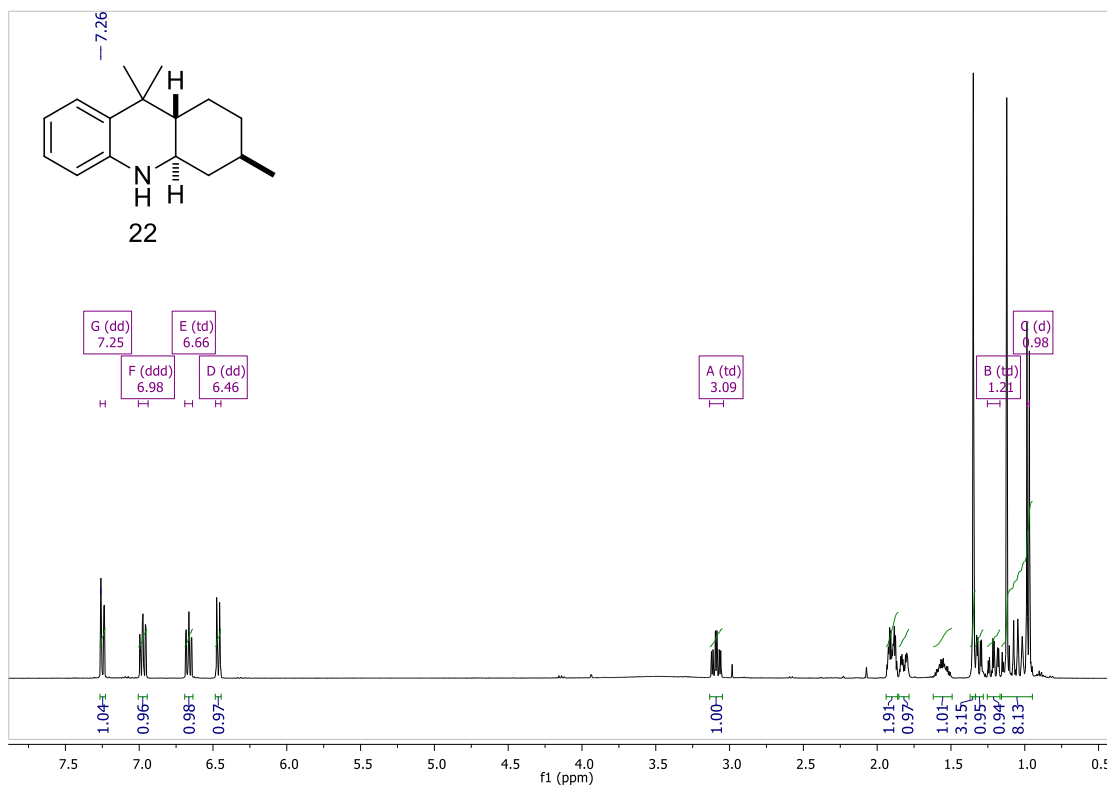


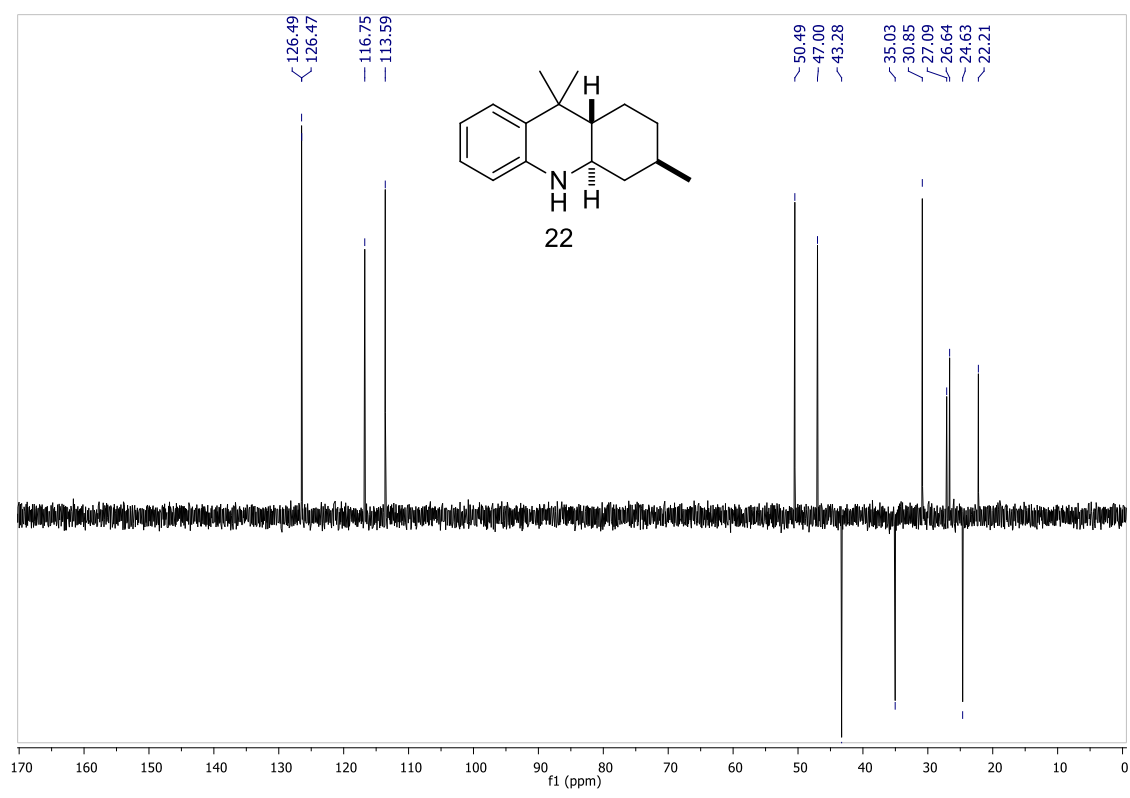
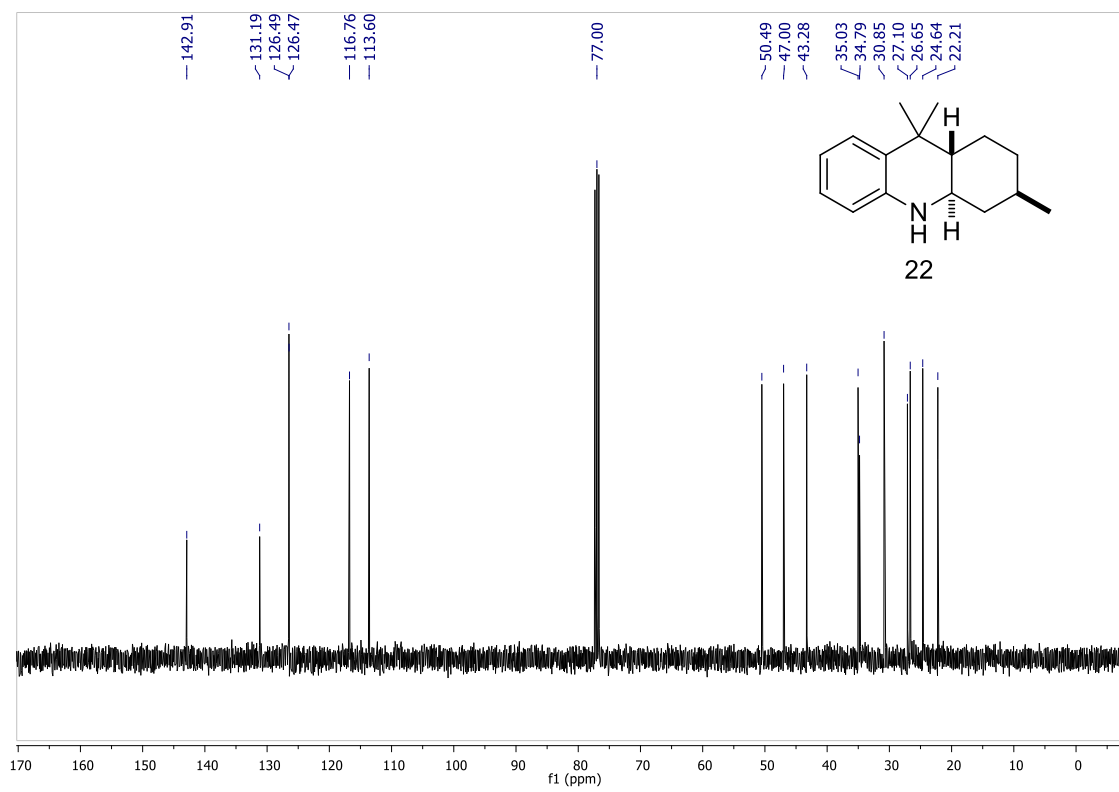


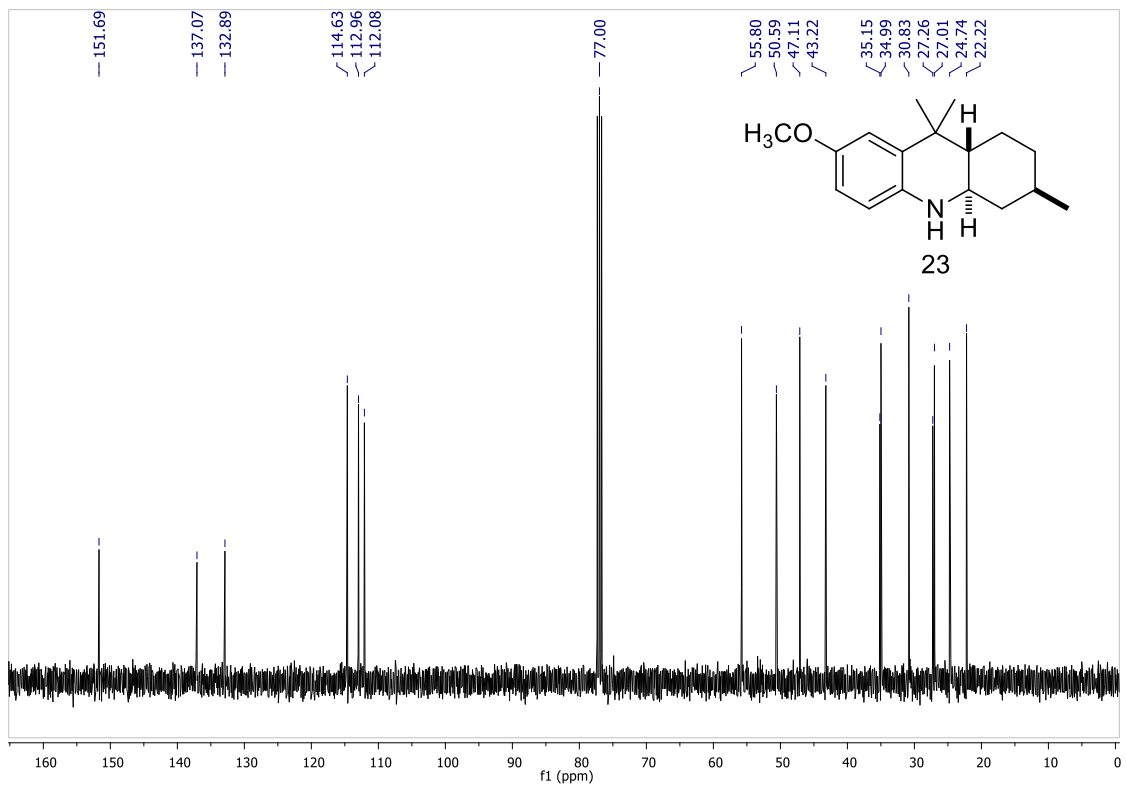
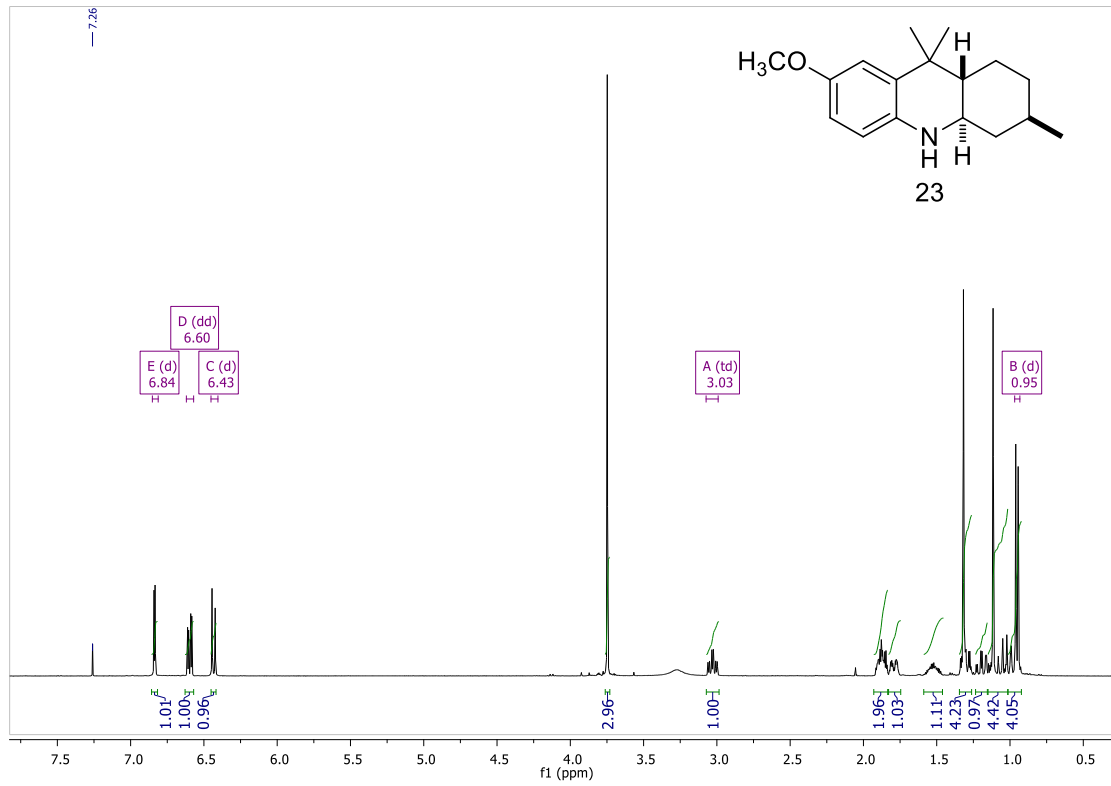


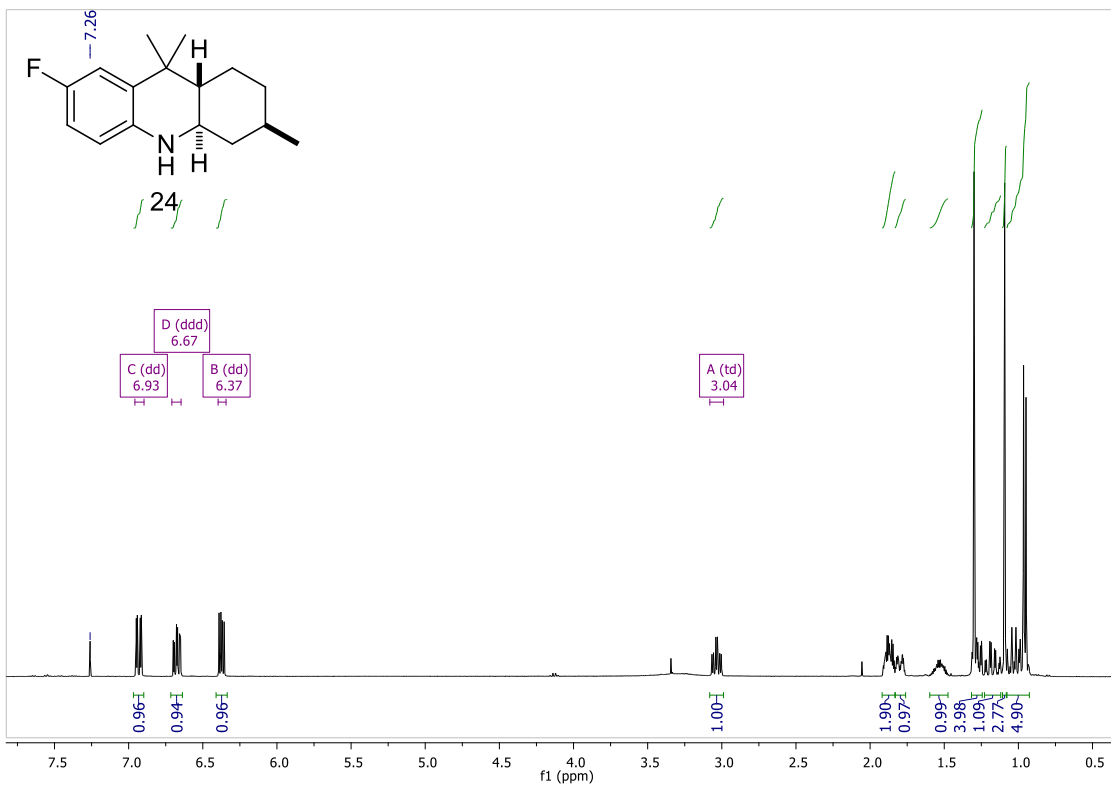
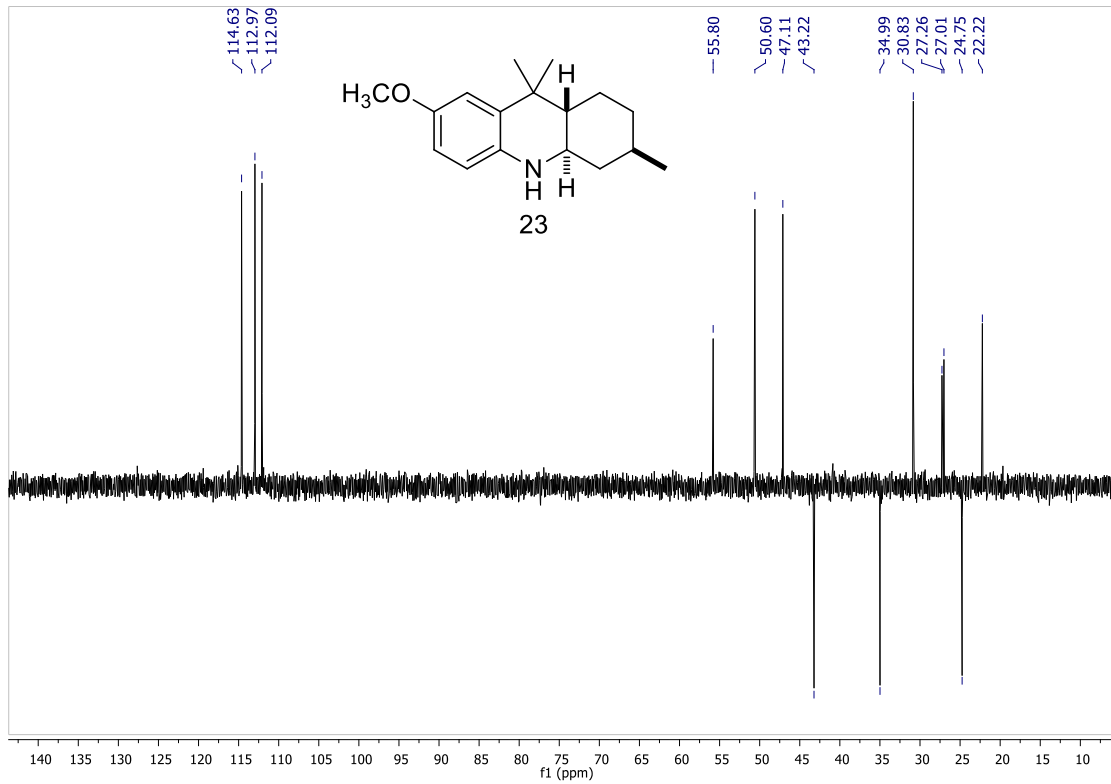


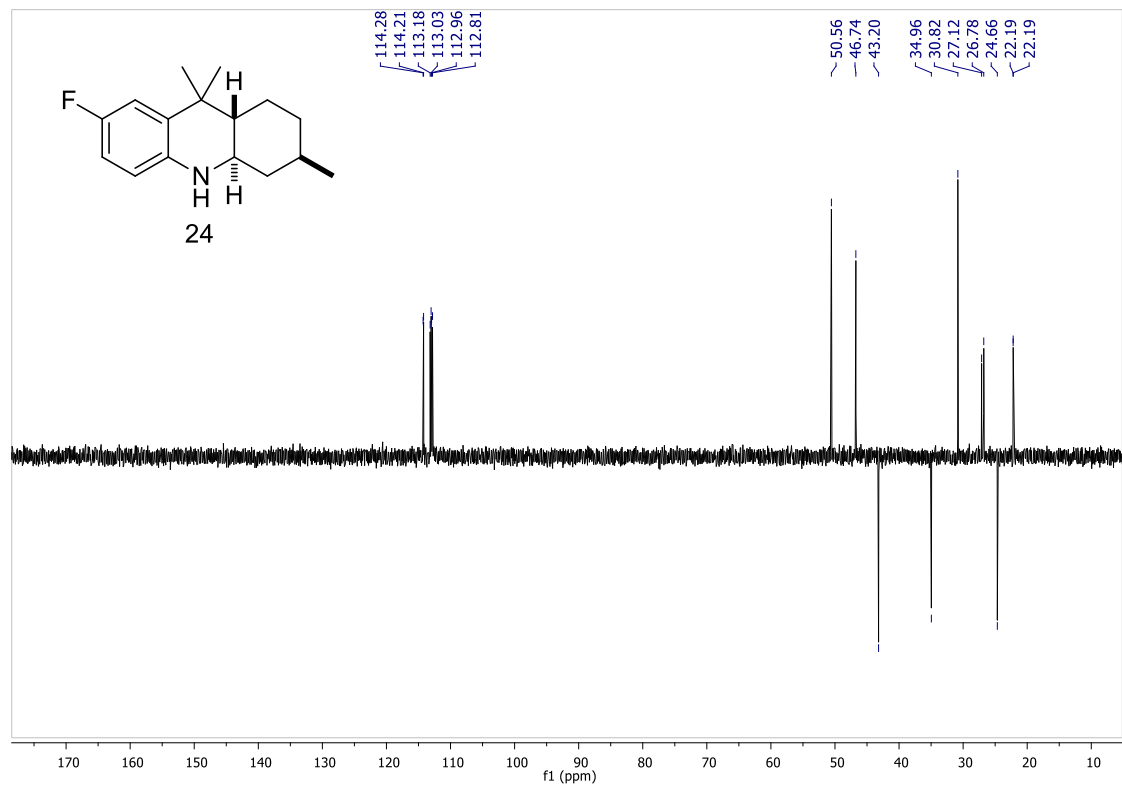
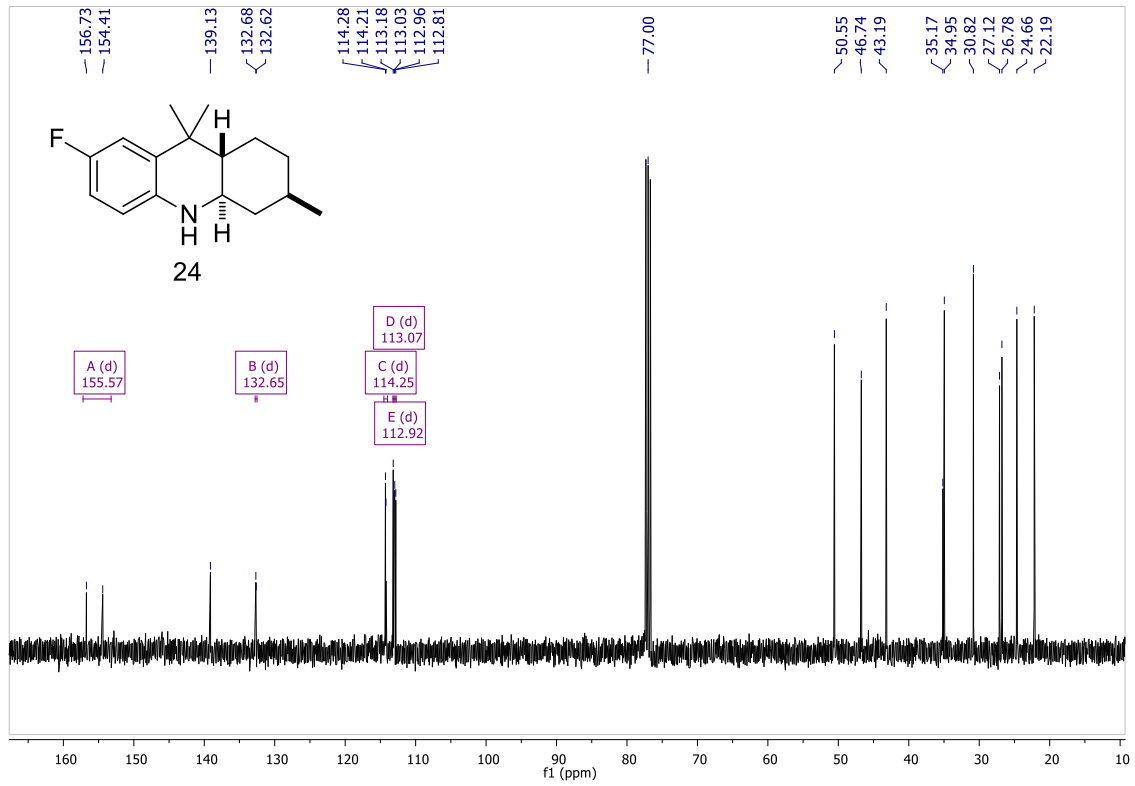
4. ¹H NMR and ¹³C NMR spectra of *trans*-3,9,9-trimethyl-1,2,3,4,4a,9,9a,10-octahydroacridines 22-24.











5. Single crystal X-Ray diffraction data for *N*-benzyl octahydroacridine 16

Crystal data and refinement ^a	<i>N</i> -benzyl OHA
<i>Data crystal</i>	
Empirical Formula	C ₂₃ H ₂₉ N
Formula weight	319.49
Temperature (°C)	20
Wavelength (Å)	0.71073 Å
Crystal system	Monoclinic
Space group	Cc (N ^o 9)
<i>Unit cell dimensions</i>	
<i>a</i> (Å)	12.145 (6) Å
<i>b</i> (Å)	17.583 (9) Å
<i>c</i> (Å)	17.840 (8) Å
$\alpha = \gamma$ (°)	90°
β (°)	99.111 (17)
Volume (Å ³)	3762 (3) Å ³
<i>Z</i>	8
Density (calculated) (Mg/m ³)	1.128
Reflections collected	25310
Independent reflections	6370 [$R_{\text{int}} = 0.127$]
Refinement methods	Full-matrix least-squares on F^2
Final <i>R</i> indices [$I > 2\sigma(I) = 3759$ data]	$R_1 = 0.086$, $wR_2 = 0.218$

^a The data can be obtained free of charge (CCDC 1434457) via <http://www.ccdc.cam.ac.uk/products/csd/request/> (or from the CCDC, 12 Union Road, Cambridge CB2, UK; Fax: +44 1223 336033; e-mail: deposit@ccdc.cam.ac.uk).