Supporting Information

Total Synthesis of (±)-Mycothiazole and Formal Enantioselective Approach

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General Experimental Methods

^1H NMR spectra were recorded at 300 MHz in CDCl_3 and data are reported as follows: chemical shift in ppm from tetramethylsilane as an internal standard, multiplicity (s = singlet, d = doublet, t = triplet, q = quartet, m = multiplet or overlap of non-equivalent resonances), integration. ^{13}C NMR spectra were recorded at 75 MHz in CDCl_3 and data are reported as follows: chemical shift in ppm from tetramethylsilane with the solvent as an internal indicator (CDCl_3 δ 77.0 ppm), multiplicity with respect to proton (deduced from DEPT experiments, s = quaternary C, d = CH, t = CH_2 , q = CH_3). THF and diethyl ether were distilled from sodium/benzophenone. CH_2Cl_2 , benzene, toluene, NMP and HMPA were distilled from CaH_2 . Other reagents were obtained from commercial suppliers and used as received. TLC was performed on silica gel plates visualized either with a UV lamp (254 nm), or using solutions of *p*-anisaldehyde/sulfuric acid/acetic acid in EtOH or $\text{KMnO}_4/\text{K}_2\text{CO}_3$ in water followed by heating. Flash chromatography was performed on silica gel (230-400 mesh).

2-(4-Bromothiazol-2-yl)-2-methylhex-5-en-3-ol (4). To a solution of **3** (3.34 g, 14.3 mmol) in THF (25 mL) at -78°C , was added a solution of allylmagnesium bromide (21.5 mL, 1M in Et_2O , 21.5 mmol, 1.5 equiv.) in Et_2O (30 mL). After 1 h at rt, the reaction mixture was hydrolyzed with a 1M solution of hydrochloric acid and extracted with Et_2O . The combined organic extracts were dried over MgSO_4 , filtered and concentrated under reduced pressure. The crude material was purified by flash chromatography (Pentane/ Et_2O : 85/15 to 80/20) to afford 3.47 g (87%) of **4** as a colorless oil; IR (film) 3420, 3130, 1640, 1470, 1370, 1260, 1080, 1055, 920, 890, 845, 740 cm^{-1} ; ^1H NMR δ 7.14 (s, 1H), 5.86 (dddd, J = 17.6, 9.6, 7.7 and 6.3 Hz, 1H), 5.13-5.06 (m, 2H), 3.80 (m, 1H), 3.05 (m, 1H, OH), 2.31 (m, 1H), 1.98 (m, 1H), 1.45 (s, 6H); ^{13}C NMR δ 179.6 (s), 135.5 (d), 124.0 (s), 117.4 (t), 115.9 (d), 77.2 (d), 45.2 (s), 36.5 (t), 26.0 (q), 24.0 (q); MS-EI m/z (relative intensity) 277 ($\text{M}+2^+$, 0.4), 275 (M^+ , 0.4), 236 ($\text{M}+2\text{-allyl}^+$, 13), 234 (M-allyl^+ , 13), 207 (100), 206 (39), 205 (98), 204 (32), 192 (41), 190 (36).

Enantioselective synthesis of the homoallylic alcohol (*R*)-4

Synthesis of (*R*)-4 by an enantioselective allylboration: To a solution of (+)-DIPCl (390 mg, 1.20 mmol, 1.2 equiv.) in Et₂O (10 mL) at -78 °C was added dropwise allylmagnesium bromide (1.1 mL, 1M in Et₂O, 1.1 mmol, 1.1 equiv.). After 3 h at -78 °C, a solution of aldehyde **3** (230 mg, 1.00 mmol) in Et₂O (2 mL) was added. After 2 h at -78 °C, the reaction mixture was warmed to rt and hydrolyzed by addition of a 3M aqueous solution of NaOH (2 mL) and a 30% aqueous solution of H₂O₂ (1 mL). After 1 h at 40 °C, the reaction mixture was filtered through Celite (Et₂O) and the filtrate was extracted with EtOAc. The combined organic extracts were dried over MgSO₄, filtered and concentrated under reduced pressure. The residue was purified by flash chromatography (Pentane/Et₂O: 90/10 to 85/15) to afford 190 mg (70%) of (*R*)-4 as a colorless oil. The ee value (ee = 54%) was determined by HPLC: Chiral OD-H column, elution rate : 1 mL/min, eluent: hexane, detection: 230-260 nm, injection: 10 µL (of a 2 mg/mL solution), retention times: (*S*)-enantiomer 48.4 min, (*R*)-enantiomer 55.5 min.

Synthesis of (*R*)-4 by an enantioselective allyltitanation: To a solution of ((*S,S*)-TADDOL)CpTiCl (980 mg, 1.60 mmol, 1.6 equiv.) in Et₂O (16 mL) at 0 °C was added dropwise allylmagnesium chloride (650 µL, 2M in THF, 1.30 mmol, 1.3 equiv.). After 3 h at 0 °C, a solution of aldehyde **3** (230 mg, 1.00 mmol) in Et₂O (4 mL) was added at -78 °C. After 5 h at -78 °C, the reaction mixture was warmed to rt and hydrolyzed with a 45% aqueous solution of NH₄F. After stirring overnight at rt, the reaction mixture was filtered through Celite (Et₂O). The organic layer was separated and washed with a saturated aqueous solution of NaCl, dried over MgSO₄, filtered and concentrated under reduced pressure. The residue was taken-up in pentane and the precipitated (*S,S*)-TADDOL (634 mg, 1.36 mmol, 85% recovery) was separated by filtration. The filtrate was evaporated under reduced pressure and the residue was purified by flash chromatography (Pentane/Et₂O: 90/10 to 85/15) to afford 226 mg (82%) of (*R*)-4 as a colorless oil. The ee value (ee = 99%) was determined by HPLC with chiral OD-H column.

$[\alpha]_D^{20} +20.2$ (*c* 1.0, MeOH).

2-{2-[(*tert*-Butyldimethylsilyl)oxy]-1,1-dimethylpent-4-enyl}-(2*E*)-4-(hexa-2,5-dienyl)thiazole (9). To a degassed solution of **8** (65 mg, 0.16 mmol) and (*E*)-1-tributylstannylpenta-1,4-diene (72 mg, 0.20 mmol, 1.25 equiv.) in NMP (2.5 mL) [argon bubbling, 10 min] at rt was added PdCl₂(CH₃CN)₂ (4 mg, 0.02 mmol, 0.1 equiv.). After 0.5 h at rt, the reaction mixture was hydrolyzed with a 28% aqueous solution of NH₄OH, stirred for 0.5 h and extracted with Et₂O. The combined organic extracts were washed with a 1M aqueous solution of KHSO₄, dried over MgSO₄, filtered and concentrated under reduced pressure. The residue was purified by flash chromatography (Pentane/Et₂O: 95/5) to give 62 mg (95%) of **9** as a colorless oil; IR (film) 3070, 1640, 1515, 1470, 1460, 1430, 1385, 1360, 1255, 1090, 1040, 1000, 970, 910, 835, 775, 740 cm⁻¹; ¹H NMR δ 6.74 (s, 1H), 5.86 (ddt, *J* = 16.6, 10.2 and 6.4 Hz, 1H), 5.77-5.52 (m, 3H), 5.10-4.98 (m, 2H), 4.96-4.85 (m, 2H), 4.07 (dd, *J* = 6.0 and 4.5 Hz, 1H), 3.50 (br d, *J* = 6.4 Hz, 2H), 2.81 (apparent br t, *J* = 6.4 Hz, 2H), 2.28 (m, 1H), 2.10 (m, 1H), 1.43 (s, 3H), 1.37 (s, 3H), 0.88 (s, 9H), 0.05 (s, 3H), -0.11 (s, 3H); ¹³C NMR δ 178.2 (s), 155.1 (s), 136.8 (d), 136.3 (d), 129.8 (d), 128.0 (d), 115.8 (t), 115.0 (t), 112.0 (d), 78.9 (d), 46.1 (s), 38.5 (t), 36.5 (t), 34.8 (t), 25.9 (q, 3C), 25.6 (q), 24.4 (q), 18.1 (s), -3.7 (q), -4.8 (q); MS-EI *m/z* (relative intensity) 391 (M⁺, 3), 376 (M-Me⁺, 4), 350 (M-allyl⁺, 15), 336 (12), 335 (27), 334 (M-*t*-Bu⁺, 100), 260 (20), 207 (41), 186 (12), 185 (72), 129 (13), 115 (14), 75 (10), 73 (54)

2-[1-(2,2-Dioxo-2,3,6,7-tetrahydro-2λ⁶-[1,2]oxathiepin-7-yl)-1-methylethyl]-4-((2*E*)-hexa-2,5-dienyl)thiazole (12). To a solution of **10** (110 g, 0.405 mmol) and DMAP (97 mg, 0.80 mmol, 2 equiv.) in THF (3 mL) at rt, was added dropwise a solution of allylsulfonyl chloride (84 mg, 0.60 mmol, 1.5 equiv.) in THF (2 mL). After 2 h at rt, a solution of DMAP (97 mg, 0.80 mmol, 2 equiv.) and allylsulfonyl chloride (84 mg, 0.60 mmol, 1.5 equiv.) in THF (2 mL) was added again. After 1 h at rt, the reaction mixture was hydrolyzed with a saturated aqueous solution of NaHCO₃ and extracted with Et₂O. The combined organic extracts were washed with an aqueous solution of

CuSO₄, brine, dried over MgSO₄, filtered and concentrated under reduced pressure. The residue was filtered through silica gel (Et₂O) and after evaporation of the solvent under reduced pressure, the crude sulfonate **11** was dissolved in benzene (40 mL). To the resulting degassed solution [argon bubbling, 15 min] at 70 °C, was added Grubbs II catalyst (51 mg, 0.06 mmol, 0.15 equiv.) in three portions at 1 h intervall. After a further 1 h at 70 °C, the reaction mixture was cooled to rt and concentrated under reduced pressure. The residue was purified by flash chromatography (Pentane/Et₂O: 70/30) to afford 98 mg (70%) of **12** as a colorless oil; IR (film) 3080, 3015, 3030, 1640, 1515, 1430, 1360, 1170, 1055, 970, 910, 875, 830, 740, 700, 690 cm⁻¹; ¹H NMR δ 6.85 (s, 1H), 6.09 (m, 1H), 5.87 (ddt, *J* = 16.6, 10.2 and 6.4 Hz, 1H), 5.80-5.52 (m, 3H), 5.12-5.00 (m, 3H), 4.14 (m, 1H), 3.90 (apparent br dd, *J* = 15.5 and 8.1 Hz, 1H), 3.58-3.48 (m, 2H), 2.84 (apparent br t, *J* = 6.4 Hz, 2H), 2.59 (m, 1H), 2.42 (dd, *J* = 16.2 and 8.5 Hz, 1H), 1.55 (s, 3H), 1.54 (s, 3H); ¹³C NMR δ 174.5 (s), 156.0 (s), 136.9 (d), 134.5 (d), 130.3 (d), 127.8 (d), 119.1 (d), 115.2 (t), 113.1 (d), 90.1 (d), 50.5 (t), 44.6 (s), 36.6 (t), 34.8 (t), 29.8 (t), 26.9 (q), 22.4 (q); MS-EI *m/z* (relative intensity) 353 (M⁺, 39), 338 (M-Me⁺, 7), 324 (10), 313 (19), 312 (M-allyl⁺, 100), 272 (M-(CH₂=CH-CH₂-CH=CH)⁺, 12), 218 (37), 207 (58), 206 (95), 192 (22), 164 (28), 152 (22), 139 (28), 138 (58), 97 (19), 71 (23), 55 (21).

2-{1-[3-(3,3-Dimethoxypropyl)-2,2-dioxo-2,3,6,7-tetrahydro-2 λ ⁶-[1,2]oxathiepin-7-yl]-1-methylethyl}-4-((2*E*)-hexa-2,5-dienyl)thiazole (13**).** To a solution of **12** (142 mg, 0.402 mmol), 3,3-dimethoxy-1-iodopropane (111 mg, 0.482 mmol, 1.2 equiv.) and HMPA (280 μ L, 1.61 mmol, 4 equiv.) in THF (10 mL) at -78 °C was added dropwise LiHMDS (0.48 mL, 1M in THF, 0.48 mmol, 1.2 equiv.). After 20 min at -78 °C, the reaction mixture was hydrolyzed with a saturated aqueous solution of NH₄Cl and extracted with EtOAc. The combined organic extracts were dried over MgSO₄, filtered and concentrated under reduced pressure. The residue was purified by flash chromatography (Pentane/Et₂O: 65/35) to afford 139 mg (76%) of **13** as a colorless oil and as a 1/1 mixture of diastereomers. The two diastereomers could be partially separated when an analytical

sample was resubjected to purification by flash chromatography, in order to facilitate their individual characterization. First eluting diastereomer: IR (film) 1640, 1520, 1460, 1360, 1170, 1130, 1055, 970, 905, 740, 690 cm^{-1} ; ^1H NMR δ 6.82 (s, 1H), 6.08 (m, 1H), 5.94-5.47 (m, 4H), 5.18-4.96 (m, 3H), 4.38 (apparent td, $J = 5.5$ and 2.0 Hz, 1H), 4.09 (m, 1H), 3.49 (br d, $J = 6.4$ Hz, 2H), 3.33 (s, 6H), 2.81 (apparent br t, $J = 6.4$ Hz, 2H), 2.57-2.15 (m, 4H), 2.08-1.67 (m, 2H), 1.51 (s, 6H); ^{13}C NMR δ 174.6 (s), 155.9 (s), 136.9 (d), 133.8 (d), 130.3 (d), 127.8 (d), 126.9 (d), 115.2 (t), 113.0 (d), 104.0 (d), 91.4 (d), 61.0 (d), 53.2 (q, 2C), 44.7 (s), 36.6 (t), 34.8 (t), 29.7 (t), 29.1 (t), 27.0 (q), 24.6 (t), 22.5 (q); MS-EI m/z (relative intensity) 424 (M-MeO^+ , 10), 423 (38), 382 (31), 344 (20), 326 (12), 316 (15), 288 (13), 235 (13), 218 (12), 208 (15), 207 (70), 206 (57), 194 (13), 192 (15), 139 (15), 138 (27), 97 (13), 91 (14), 79 (14), 77 (13), 71 (100); HRMS (CI^+ , CH_4) Calcd for $\text{C}_{22}\text{H}_{34}\text{NO}_5\text{S}_2$ ($\text{M}+\text{H}^+$): 456.1878. Found: 456.1875. Second eluting diastereomer: IR (film) 1640, 1520, 1460, 1420, 1360, 1170, 1125, 1060, 970, 905, 740, 690 cm^{-1} , ^1H NMR δ 6.82 (s, 1H), 5.95-5.77 (m, 2H), 5.74-5.50 (m, 3H), 5.17-4.97 (m, 3H), 4.38 (br t, $J = 5.5$ Hz, 1H), 3.96 (m, 1H), 3.50 (br d, $J = 6.4$ Hz, 2H), 3.34 (s, 3H), 3.33 (s, 3H), 2.81 (apparent br t, $J = 6.4$ Hz, 2H), 2.56 (m, 1H), 2.39-2.17 (m, 2H), 2.00 (m, 1H), 1.80-1.69 (m, 2H), 1.55 (s, 3H), 1.52 (s, 3H); ^{13}C NMR δ 174.5 (s), 156.0 (s), 136.9 (d), 132.2 (d), 130.3 (d), 127.8 (d), 124.1 (d), 115.2 (t), 113.1 (d), 104.0 (d), 88.2 (d), 60.4 (d), 53.2 (q), 53.1 (q), 44.5 (s), 36.6 (t), 34.8 (t), 29.7 (t), 29.6 (t), 27.0 (q), 25.0 (t), 22.5 (q); MS-EI m/z (relative intensity) 384 (21), 383 (16), 336 (20), 168 (13), 167 (75), 166 (100), 97 (13), 75 (31), 71 (64); HRMS (CI^+ , CH_4) Calcd for $\text{C}_{22}\text{H}_{34}\text{NO}_5\text{S}_2$ ($\text{M}+\text{H}^+$): 456.1878. Found: 456.1875.

(5Z)-2-[(4-(2E)-Hexa-2,5-dienyl)thiazol-2-yl]-10,10-dimethoxy-2-methyl-7-methylenedec-5-en-3-ol (14). To a solution of **13** (139 mg, 0.305 mmol) in THF (10 mL) at -78 $^\circ\text{C}$ was added a solution of *n*-BuLi (0.25 mL, 2.5M in hexanes, 0.625 mmol, 2.5 equiv.). After 30 min to -78 $^\circ\text{C}$, a solution of ICH_2MgCl [prepared from CH_2I_2 (576 mg, 2.15 mmol, 7 equiv.) and *i*-PrMgCl (1.1 mL, 2M in THF, 2.2 mmol, 7 equiv.) in THF (10 mL), -80 $^\circ\text{C}$, 1 h] was added via cannula to the reaction

mixture. After 15 min at -78 °C, the reaction mixture was hydrolyzed with a saturated aqueous solution of NH₄Cl and extracted with EtOAc. The combined organic extracts were dried over MgSO₄, filtered and concentrated under reduced pressure. The residue was purified by flash chromatography (Pentane/Et₂O: 70/30) to afford 74 mg (60%) of **14** as a colorless oil; IR (film) 3420, 1640, 1520, 1450, 1380, 1365, 1125, 1055, 970, 910 cm⁻¹; ¹H NMR δ 6.77 (s, 1H), 5.92-5.53 (m, 5H), 5.18-4.98 (m, 2H), 4.98 (br s, 1H), 4.85 (br s, 1H), 4.63 (m, 1H), 4.35 (apparent t, *J* = 5.8 Hz, 1H), 3.73 (m, 1H), 3.47 (apparent br d, *J* = 6.4 Hz, 2H), 3.32 (s, 6H), 2.80 (apparent br t, *J* = 6.4 Hz, 2H), 2.49 (m, 1H), 2.24-2.09 (m, 3H), 1.75-1.66 (m, 2H), 1.44 (s, 3H), 1.40 (s, 3H); ¹³C NMR δ 179.0 (s), 155.4 (s), 144.7 (s), 136.9 (d), 131.0 (d), 130.4 (d), 129.7 (d), 127.7 (d), 115.2 (t), 113.7 (t), 111.9 (d), 104.1 (d), 78.7 (d), 52.8 (q, 2C), 44.7 (s), 36.6 (t), 34.7 (t), 32.2 (t), 31.2 (t), 31.1 (t), 27.0 (q), 24.2 (q); MS (CI⁺, CH₄) *m/z* (relative intensity) 406 (M+H⁺, 74), 390 (M-Me⁺, 64), 374 (37), 368 (38), 358 (35), 318 (30), 280 (26), 236 (36), 183 (28), 169 (33), 127 (29), 70 (100); HRMS (CI⁺, CH₄) Calcd for C₂₃H₃₆NO₃S (M+H⁺): 406.2416. Found: 406.2422.

(4Z)-8-(((2E)-4-Hexa-2,5-dienyl)thiazol-2-yl)-7-hydroxy-8-methyl-3-methylenenon-4-enyl]methyl carbamate (Mycothiazole). To a solution of **14** (15 mg, 37 μ mol) in THF/H₂O (1/1, 6 mL) at rt, was added PPTS (19 mg, 74 μ mol, 2 equiv.). After 18 h at 50 °C, the reaction mixture was hydrolyzed with H₂O and extracted with EtOAc. The combined organic extracts were dried over MgSO₄, filtered and concentrated under reduced pressure. The crude aldehyde **15** was dissolved in *t*-BuOH/H₂O (3/1, 2 mL) and to the resulting solution at 0 °C, were successively added 2-methylbut-2-ene (43 μ L, 0.41 mmol, 11 equiv.), NaH₂PO₄·H₂O (69 mg, 0.44 mmol, 12 equiv.) and NaClO₂ (24 mg, 0.22 mmol, 6 equiv.). After 1 h at 0 °C, the reaction mixture was extracted with EtOAc. The combined organic extracts were dried over Na₂SO₄, filtered and concentrated under reduced pressure to afford the crude sensitive carboxylic acid **16**, which was immediately dissolved in toluene (5 mL). To the resulting solution at rt, were successively added Et₃N (20 μ L, 0.14 mmol, 3.9 equiv.) and diphenylphosphoryl azide (24 μ L, 0.11 mmol, 3 equiv.). After 1 h at rt, the reaction mixture was heated at 110 °C. After 1 h, MeOH (3 mL) was added and the reaction mixture was further heated at reflux for 1 h. After concentration under reduced pressure, the residue was purified by preparative chromatography on silica gel (Pentane/Et₂O: 50/50) to afford 10 mg of the isocyanate **18**. This compound (which was initially mistaken with the amine **19**) was dissolved in CH₂Cl₂ (3 mL), and to the resulting solution at rt were successively added Et₃N (20 μ L, 0.14 mmol) and ClCO₂Me (8 μ L, 0.10 mmol). After 0.5 h, additional quantities of Et₃N (50 μ L, 0.36 mmol) and ClCO₂Me (28 μ L, 0.36 mmol) were added. As no reaction was apparently observed, MeOH (2 mL) was added to the reaction mixture. After 1 h at rt, the reaction mixture was concentrated under reduced pressure and the residue was purified by preparative chromatography on silica gel (Petroleum Ether/EtOAc: 50/50) to afford 5 mg (33%) of mycothiazole; *R*_f = 0.5 (Petroleum Ether/EtOAc); ¹H NMR δ 6.77 (s, 1H), 5.92-5.52 (m, 5H), 5.43 (br s, 1H, NH), 5.09-4.86 (m, 4H+OH), 3.79 (br d, *J* = 9.8 Hz, 1H), 3.63 (s, 3H), 3.46 (d, *J* = 6.4 Hz, 2H), 3.35-3.14 (m, 2H), 2.80 (t, *J* = 6.0 Hz, 2H), 2.48-2.17 (m, 4H), 1.43 (s, 3H), 1.39 (s, 3H); MS (EI) 404 (M⁺, 5),

373 (M-OMe⁺, 2), 316 (21), 236 (42), 208 (15), 207 (100), 206 (10), 192 (6), 138 (5), 105 (8), 88 (9); HRMS (EI) Calcd for C₂₂H₃₂N₂O₃S (M⁺): 404.2134. Found: 404.2133.

The ¹H NMR and ¹³C NMR data were in perfect agreement with those reported by Shioiri and coll. who completed the first total synthesis of (-)-mycothiazole: (a) Sugiyama, H.; Yokokawa, F.; Shioiri, T. *Org. Lett.* **2000**, 2, 2149-2152; (b) Sugiyama, H.; Yokokawa, F.; Shioiri, T. *Tetrahedron* **2003**, 59, 6579-6593. A few differences were observed with the ¹³C NMR chemical shifts initially reported for natural mycothiazole by Crews, P.; Kakou, Y.; Quinoa, E. *J. Am. Chem. Soc.* **1988**, 110, 4365-4368. These were due to the fact that the sample of natural mycothiazole was contaminated by impurities which led to some slight misassignments in the ¹³C NMR spectrum. We thank Profs. Sugiyama and Shioiri for sharing this piece of information with us.

Tables of comparison of the NMR data of mycothiazole

Comparison with the ^1H NMR data reported in the literature

H atom	observed	synthetic (-)-mycothiazole
5	6.77 (s)	6.77 (s)
7	3.79 (br d, $J = 9.8$ Hz)	3.78 (dd, $J = 9.6, 3.0$ Hz)
8	2.48-2.17 (m)	2.43-2.18 (m)
9	5.92-5.52 (m)	5.91-5.52 (m)
10	5.92-5.52 (m)	5.91-5.52 (m)
12	2.48-2.17 (m)	2.43-2.18 (m)
13	3.35-3.14 (m)	3.33-3.16 (m)
14	3.46 (d, $J = 6.4$ Hz)	3.46 (d, $J = 5.6$ Hz)
15	5.92-5.52 (m)	5.91-5.52 (m)
16	5.92-5.52 (m)	5.91-5.52 (m)
17	2.80 (br t, $J = 6.0$ Hz)	2.80 (t, $J = 6.0$ Hz)
18	5.92-5.52 (m)	5.91-5.52 (m)
19	5.09-4.86 (m)	5.09-4.88 (m)
20	5.09-4.86 (m)	5.09-4.88 (m)
21	1.43 (s)	1.43 (s)
22	1.39 (s)	1.39 (s)
24	3.63 (s)	3.63 (s)
NH	5.43 (br s)	5.43 (br s)
OH	5.09-4.86 (m)	5.09-4.88 (m)

Comparison with the ^{13}C NMR data reported in the literature

Atoms	Observed	Synthetic (-)-mycothiazole
2	^a	179.4 (s)
4	155.4	155.4 (s)
5	112.0	112.0 (d)
6	44.6	44.5 (s)
7	78.1	78.1 (d)
8	30.6	30.6 (t)
9	130.6	130.6 (d)
10	130.9	130.9 (d)
11	^a	142.5 (s)
12	37.1	37.1 (t)
13	39.4	39.4 (t)
14	34.7	34.7 (t)
15	127.6	127.6 (d)
16	130.5	130.4 (d)
17	36.6	36.6 (t)
18	136.8	136.8 (d)
19	115.2	115.2 (t)
20	115.9	115.8 (t)
21	26.7	26.7 (q)
22	23.9	23.9 (q)
23	157.2	157.1 (s)
24	51.8	51.8 (q)

^a The corresponding signals could not be attributed accurately due to a weak signal/noise ratio.