Supplementary information

Novel terpenes generated by heterologous expression of bacterial terpene synthase genes in an engineered *Streptomyces* host.

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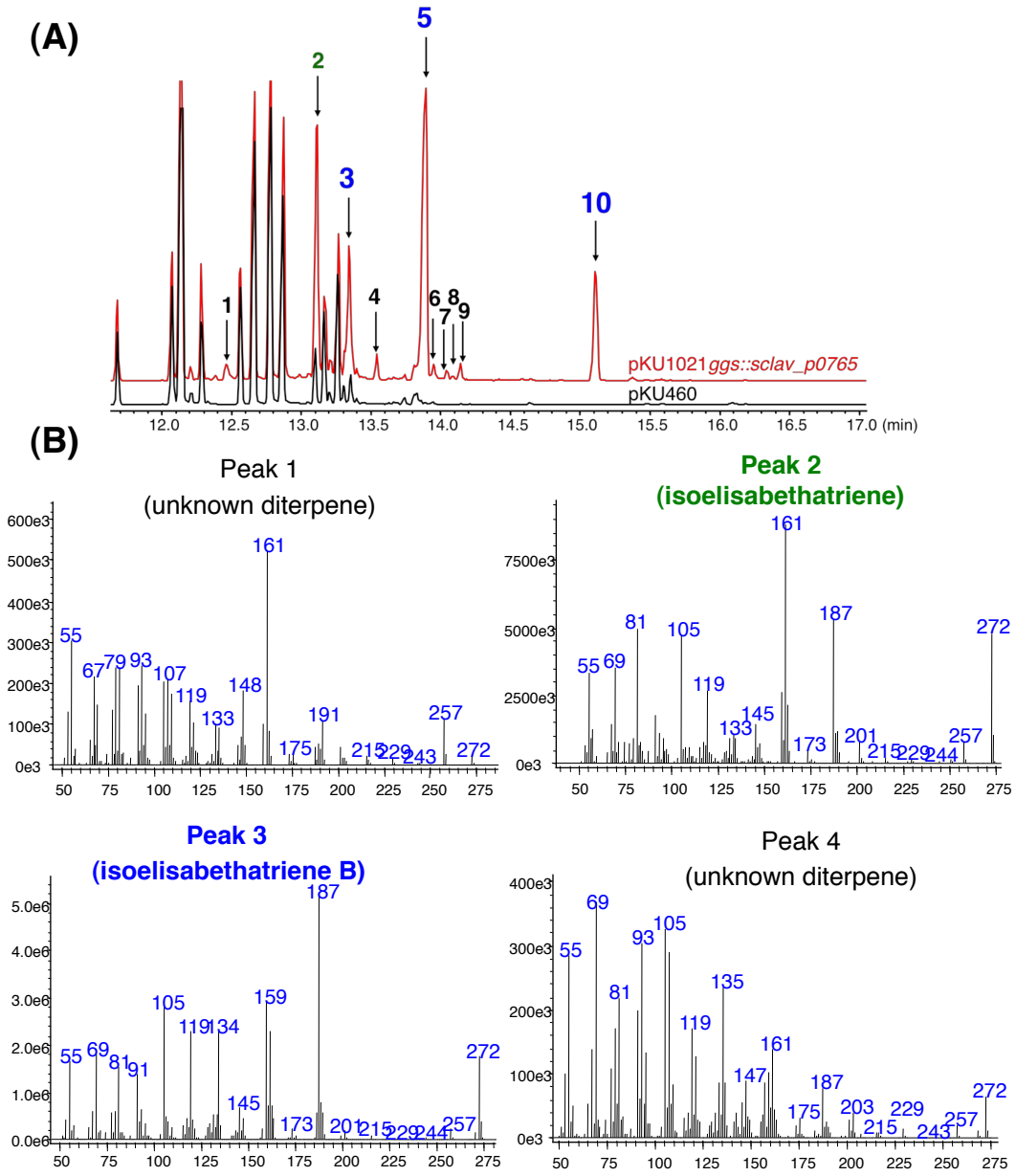


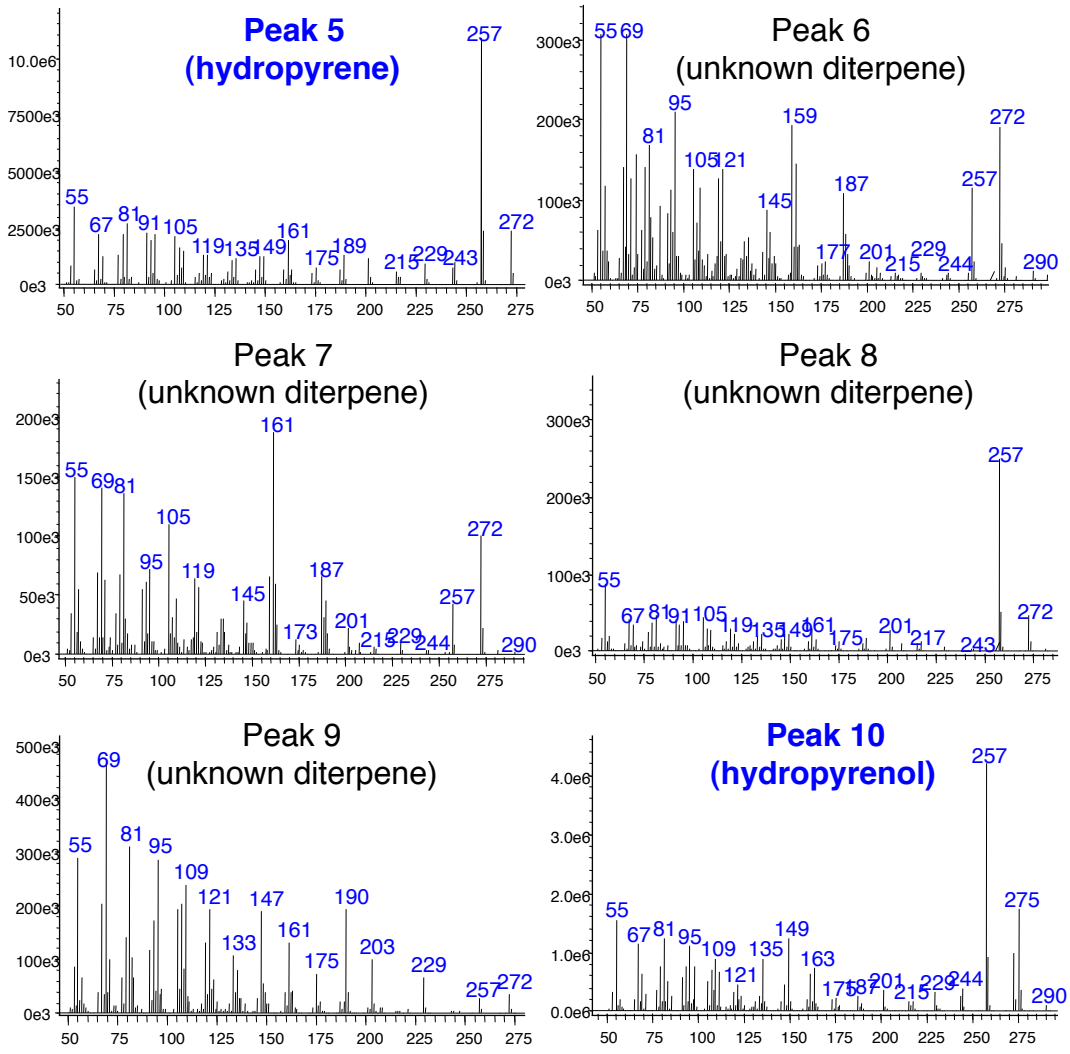


Figure S1. GC-MS of an *n*-hexane extract of *S. avermitilis* SUKA22 carrying *sclav_p0765* (A) and EI-MS fragmentation od each peak (B). Three peaks, 3, 5, and 10 correspond to isoelisabethatriene B (**3**), hydropyerene (**1**) and hydropyrenol (**2**), respectively. A peak 2 is isoelisabethatriene.

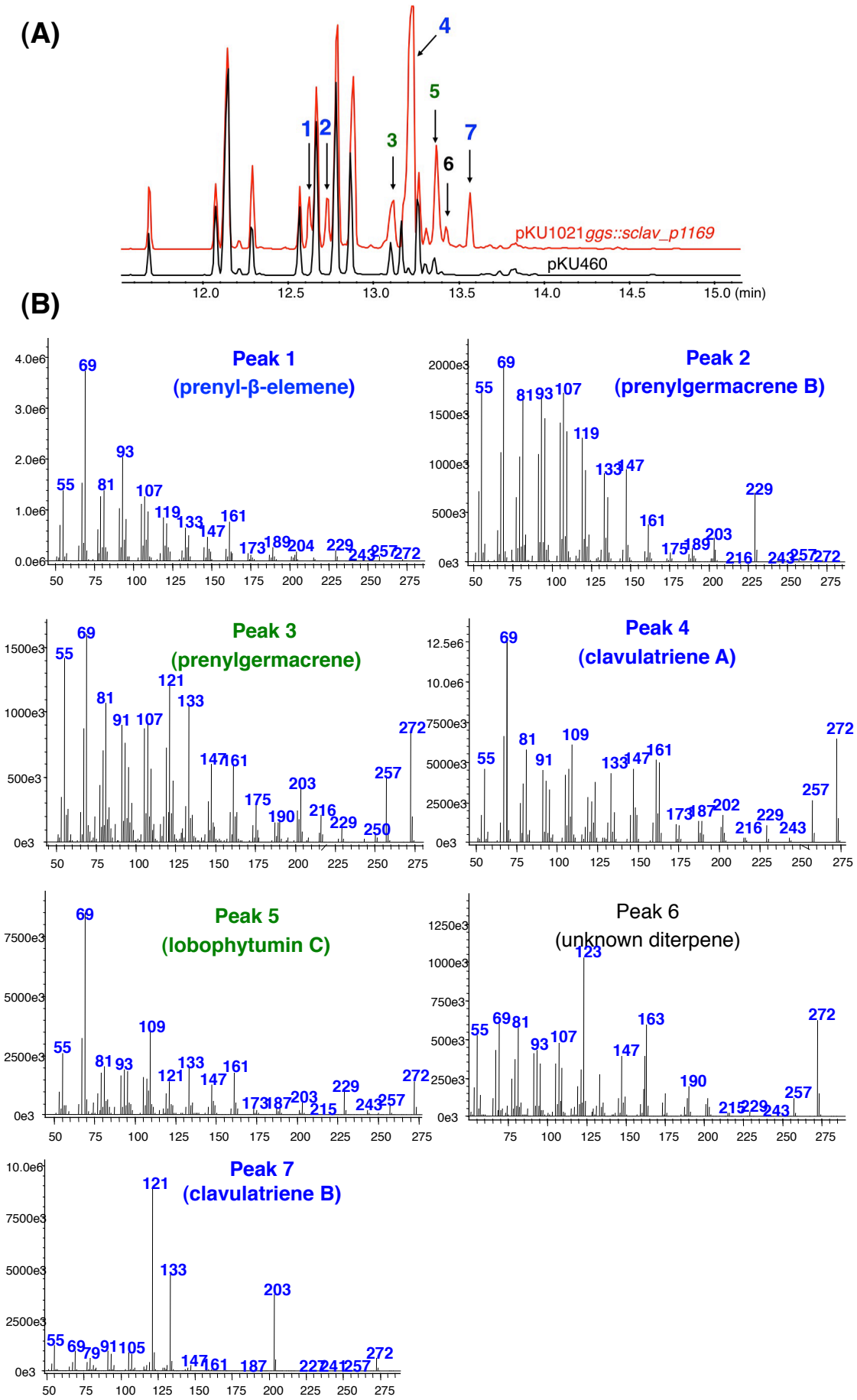
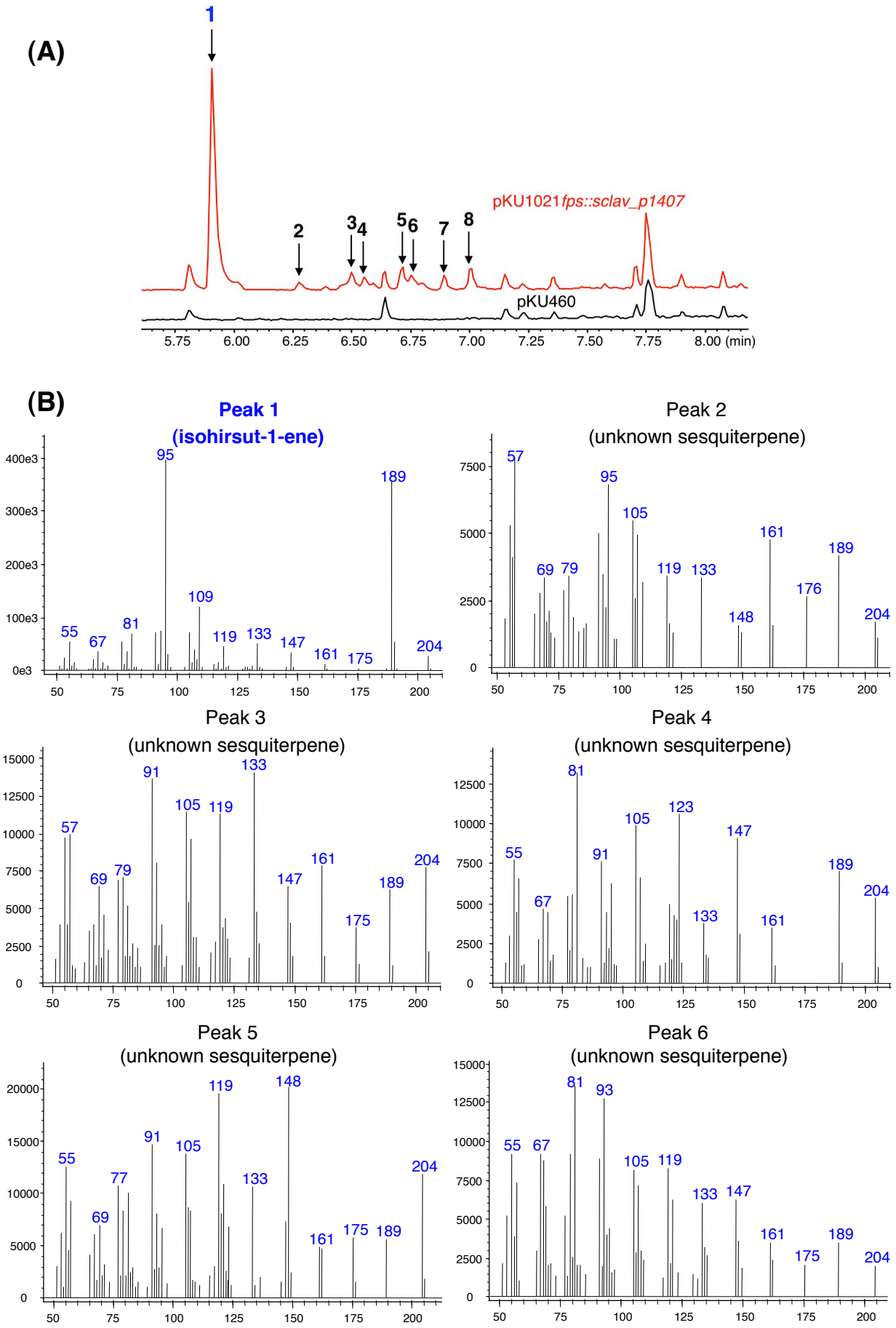


Figure S2. GC-MS of an *n*-hexane extract of *S. avermitilis* SUKA22 carrying *sclav_p1169* (A) and EI-MS fragmentation of each peak (B). Four peaks (in blue), 1, 2, 4, and 7 correspond to prenyl-β-elemene (**6**), prenylgermacrene (**7**), clavulatriene A (**4**) and clavulatriene B (**5**), respectively. Two peaks 3 and 5 are prenylgermacrene and lobophytumin C,


(A)
1
2
3
4
5
6
7
8
pKU1021fps::sclav_p1407
pKU460
5.75
6.00
6.25
6.50
6.75
7.00
7.25
7.50
7.75
8.00 (min)
(B)
Peak 1
(isohirsut-1-ene)
Peak 2
(unknown sesquiterpene)
Peak 3
(unknown sesquiterpene)
Peak 4
(unknown sesquiterpene)
Peak 5
(unknown sesquiterpene)
Peak 6
(unknown sesquiterpene)

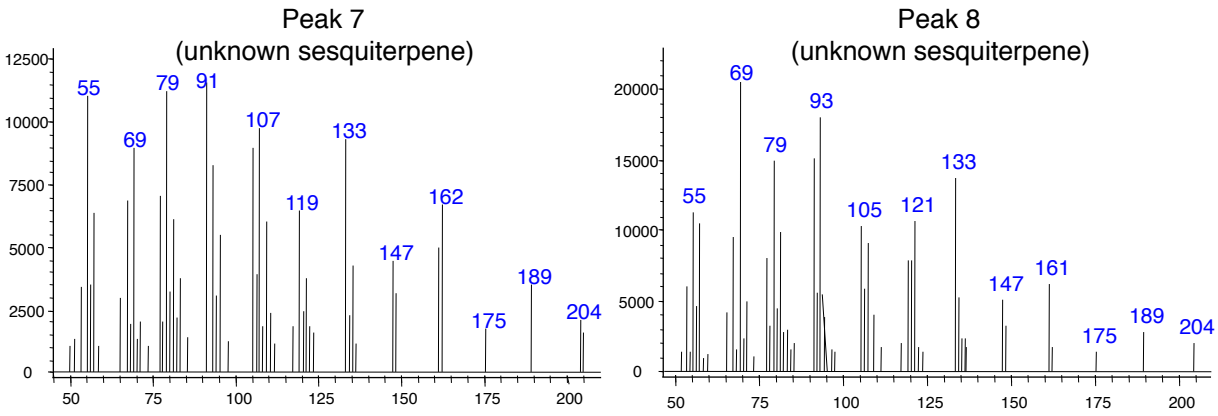


Figure S3. GC-MS of an *n*-hexane extract of *S. avermitilis* SUKA22 carrying *sclav_p1407* (A) and EI-MS fragmentation of each peak (B). A peak 1 corresponds to isohirsut-1-ene (**8**).

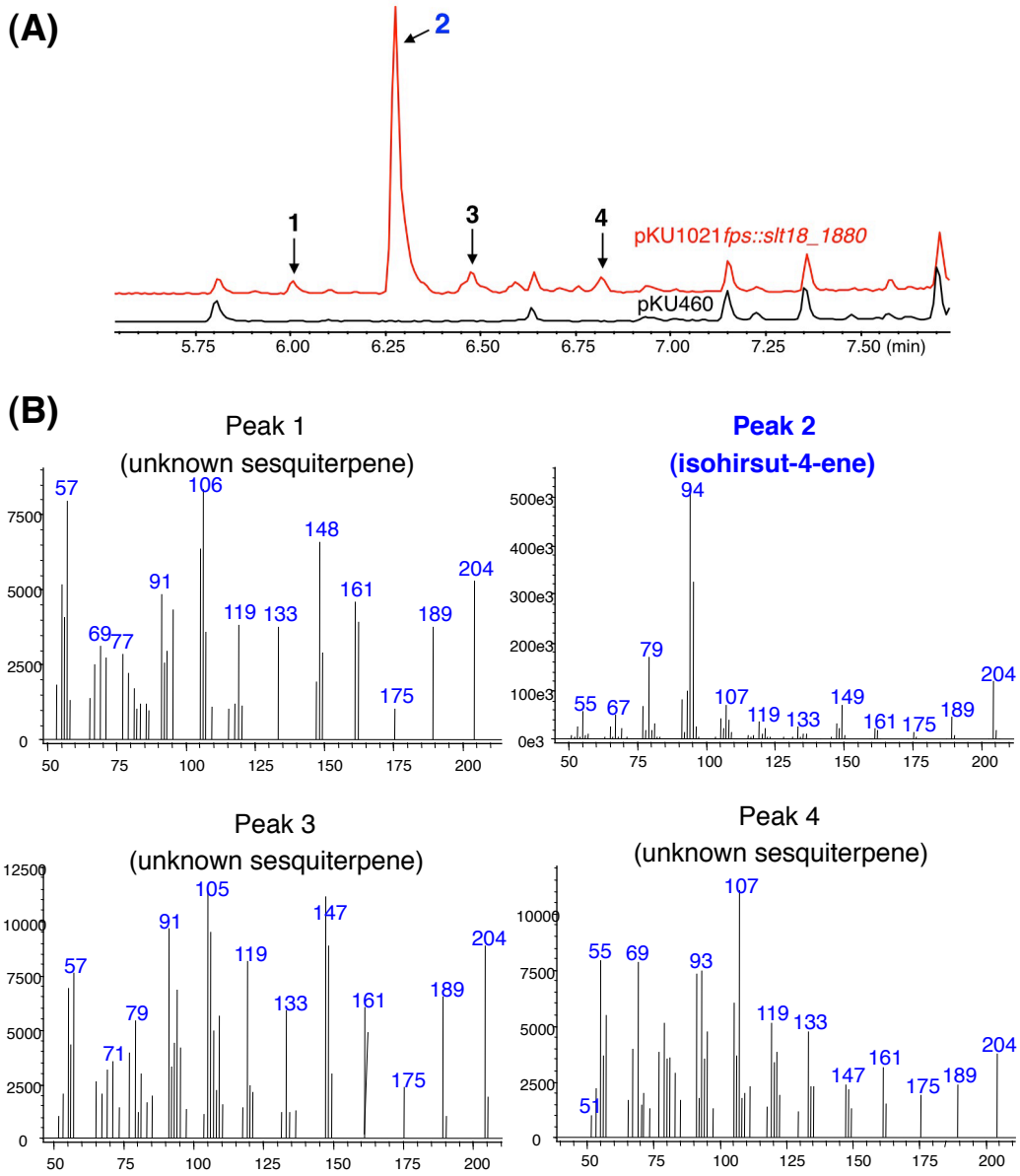


Figure S4. GC-MS of an *n*-hexane extract of *S. avermitilis* SUKA22 carrying *slt18_p1880* (A) and EI-MS fragmentation of each peak (B). A peak 2 corresponds to isohirsut-4-ene (**9**).

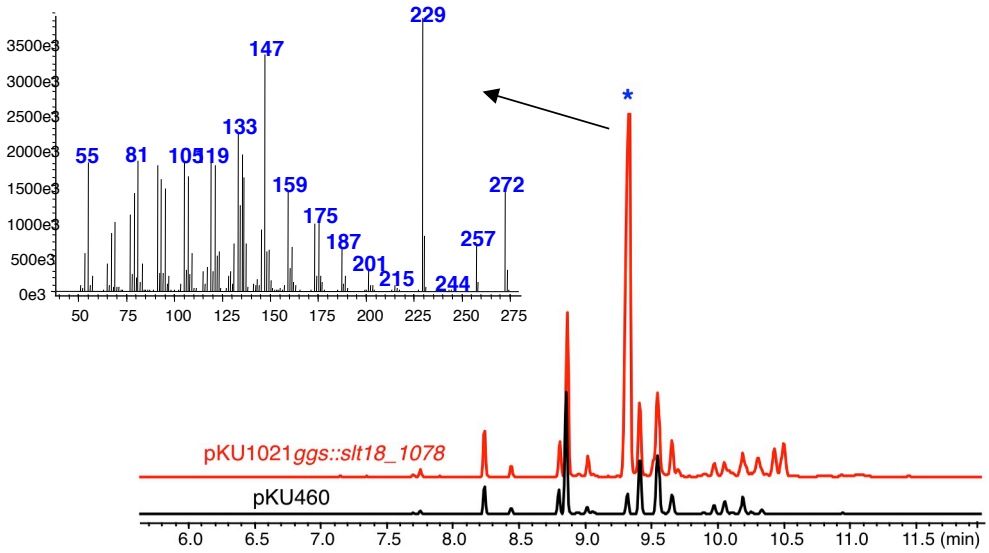
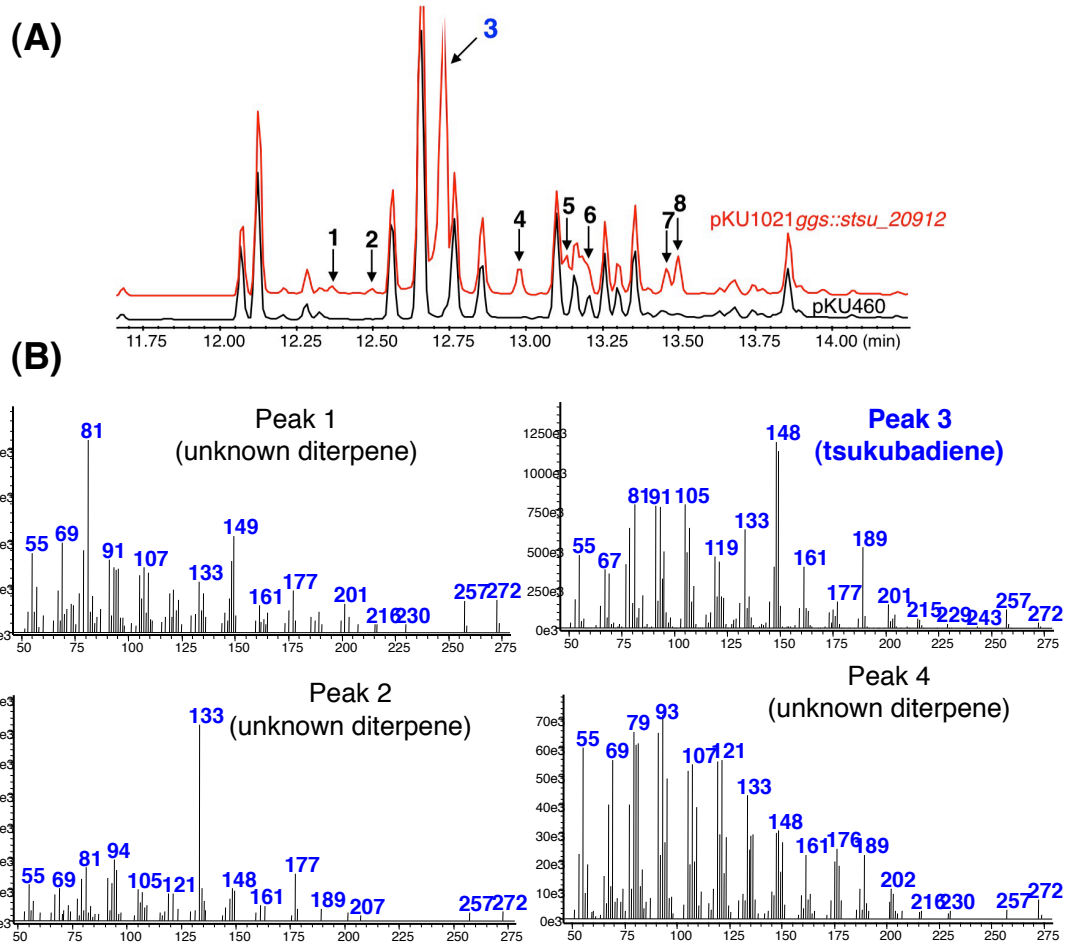


Figure S5. GC-MS of an *n*-hexane extract of *S. avermitilis* SUKA22 carrying *slt18_p1078* and EI-MS fragmentation. An asterisk corresponds to cyclooctat-7(8),10 (14)-diene (**10**).



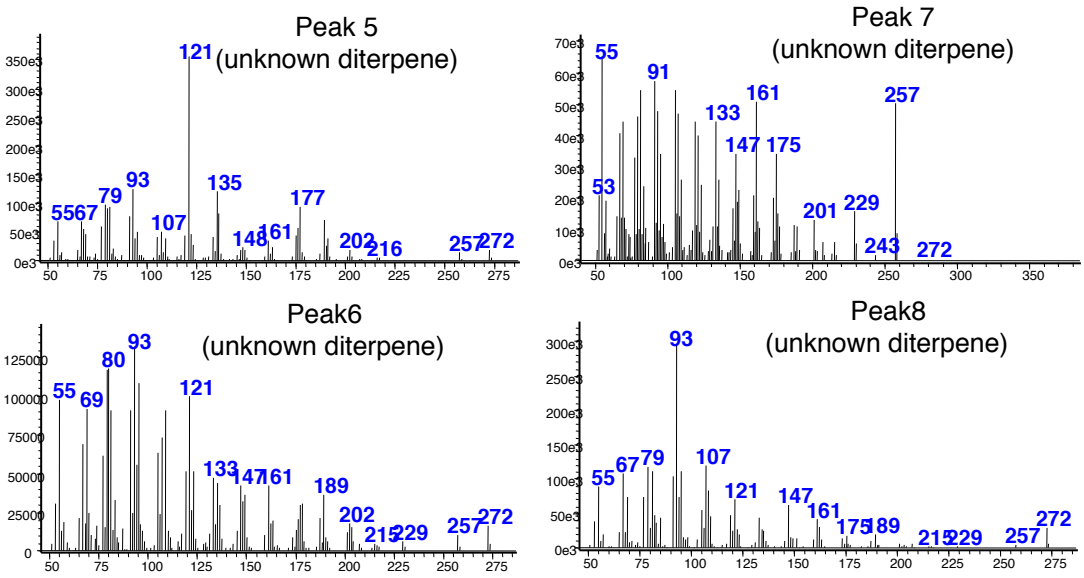


Figure S6. GC-MS of an *n*-hexane extract of *S. avermitilis* SUKA22 carrying *stsu_20912* (A) and EI-MS fragmentation of each peak (B). A peak 3 corresponds to tsukubadiene (**11**).

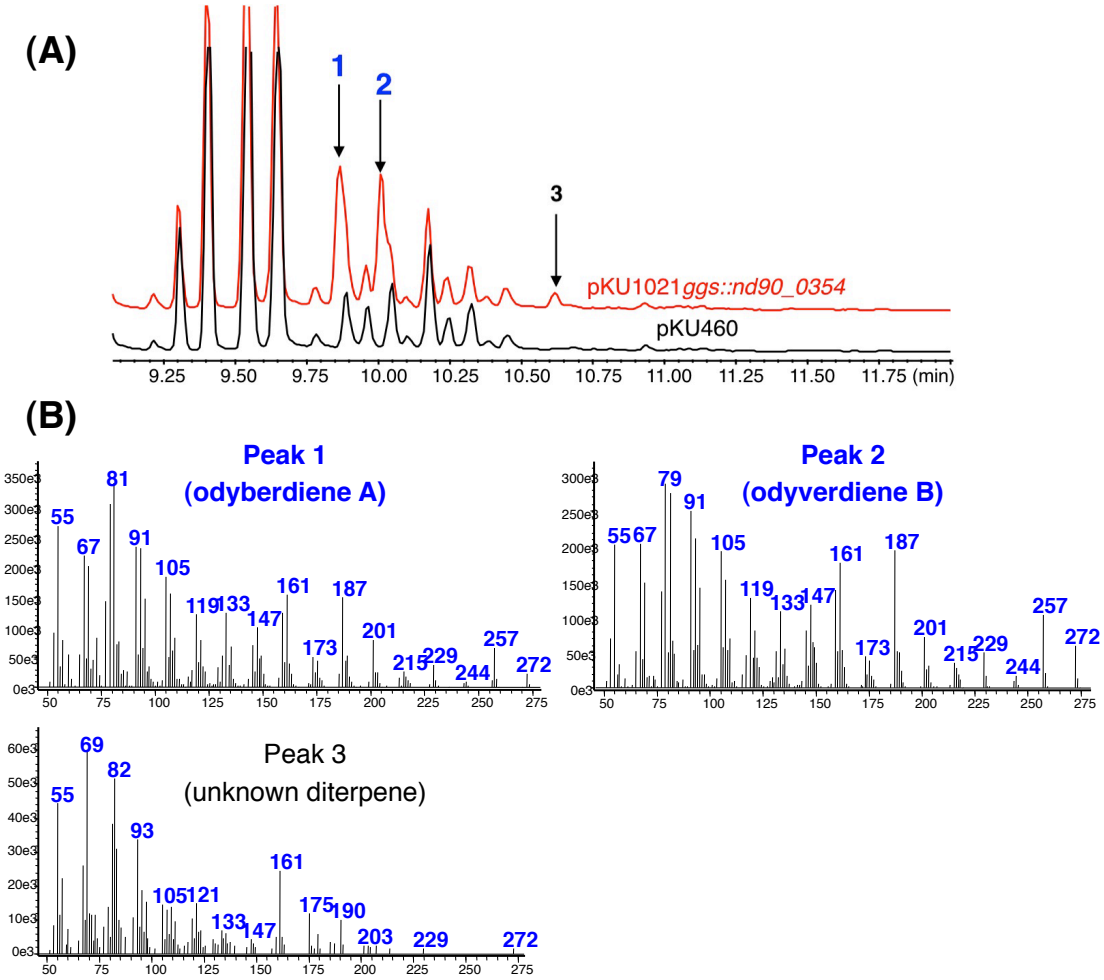


Figure S7. GC-MS of an *n*-hexane extract of *S. avermitilis* SUKA22 carrying *nd90_0354* (A) and EI-MS fragmentation of each peak (B). Two peaks, 1 and 2, correspond to odyverdienes A (**12**) and B (**13**), respectively

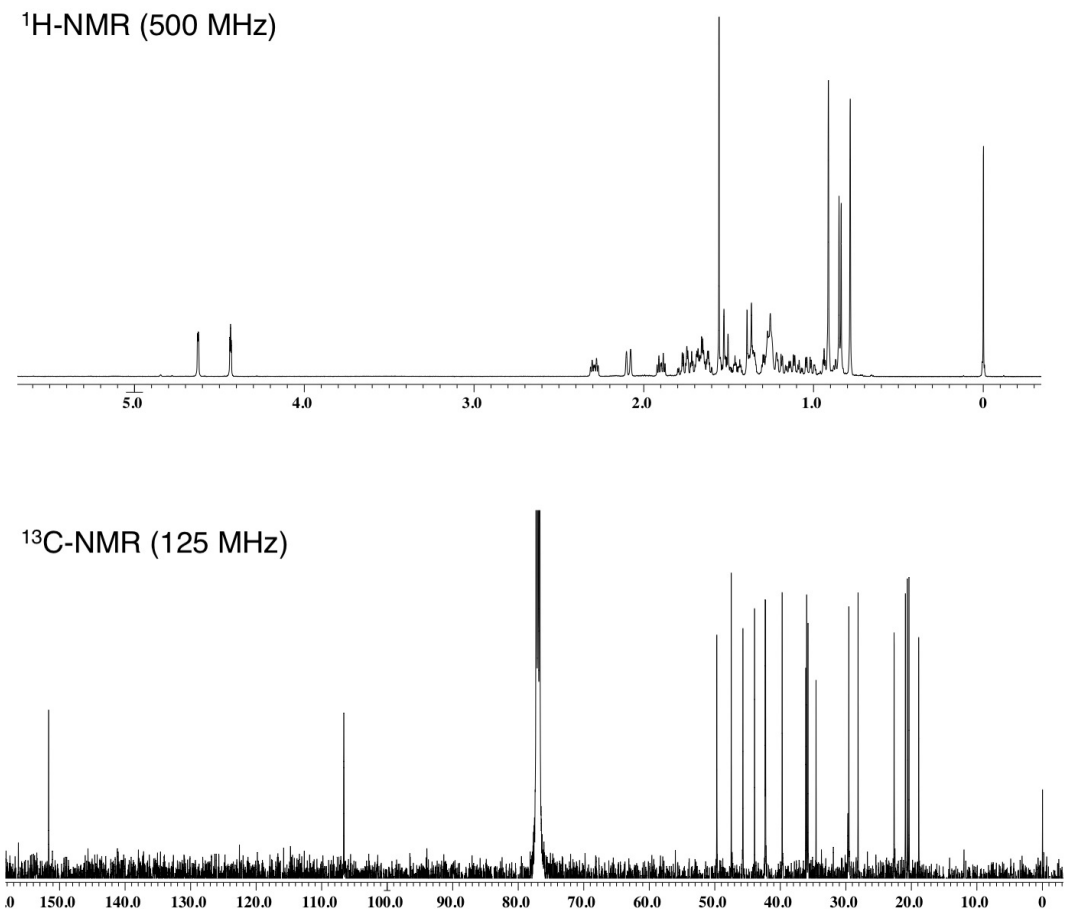


Figure S8. ^{1}H (upper) and ^{13}C (lower) NMR of hydropyrene (**1**).

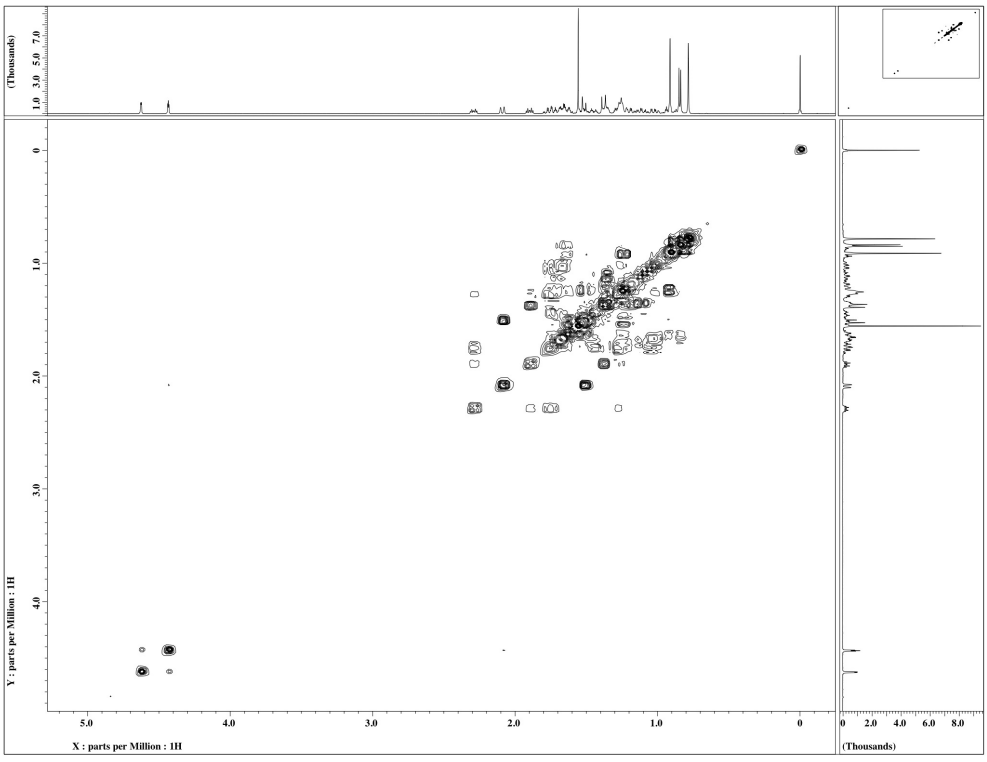


Figure S9. ^{1}H-^{1}H COSY of **1**

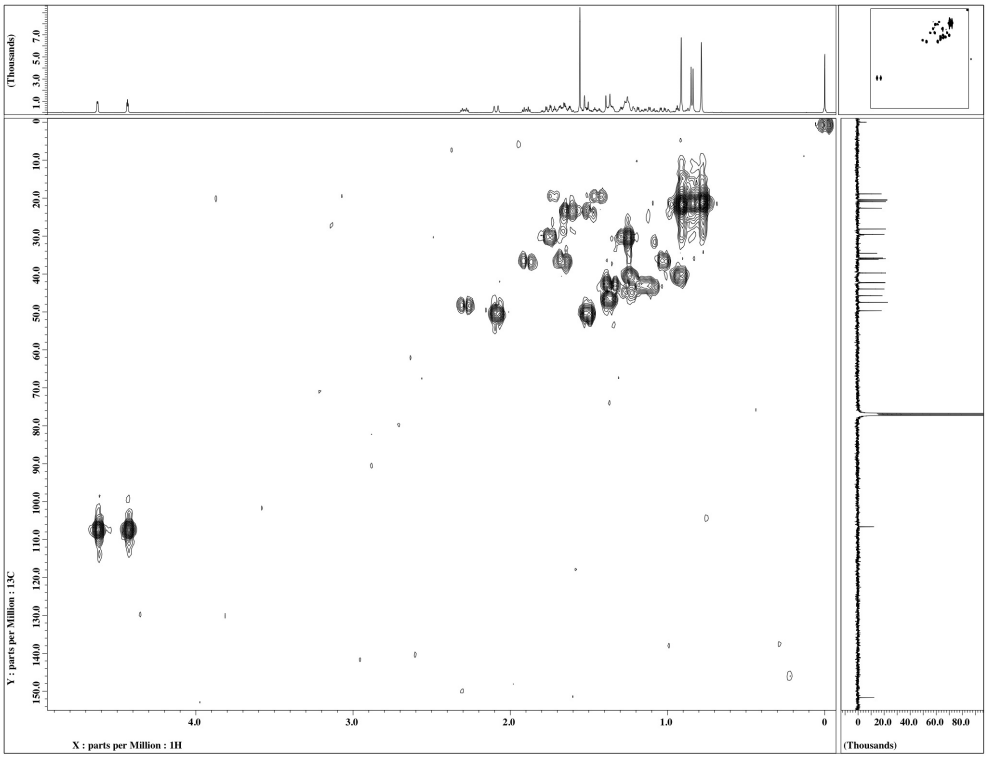


Figure S10. ^{1}H-^{13}C HMQC of **1**.

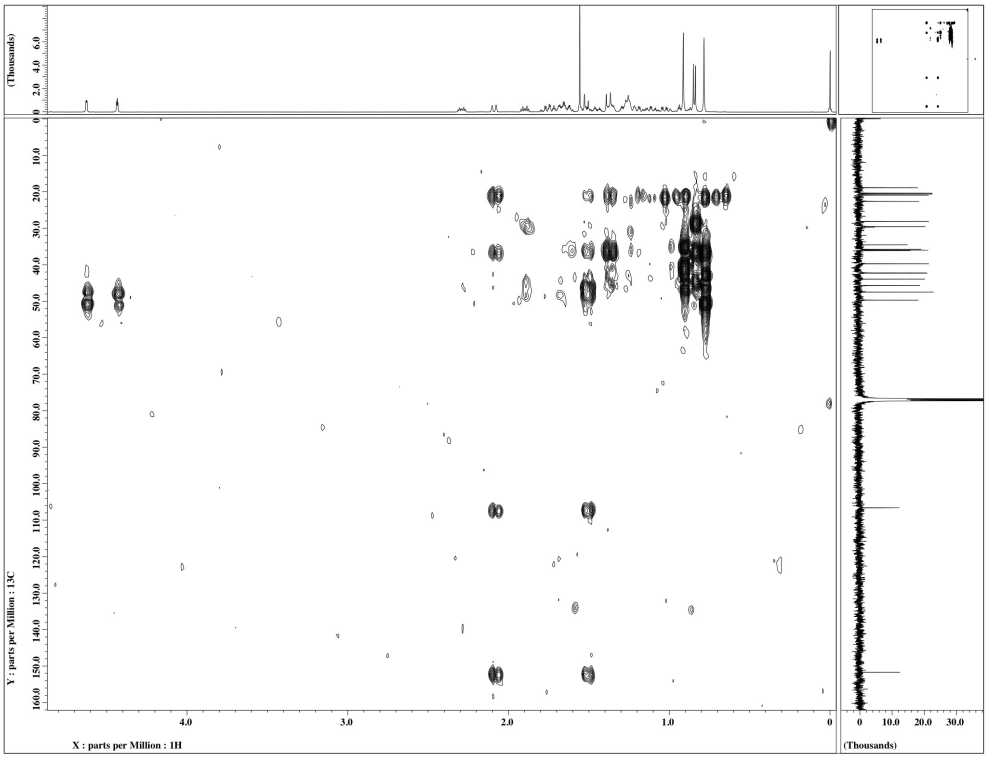


Figure S11. ^{1}H-^{13}C HMBC of **1.**

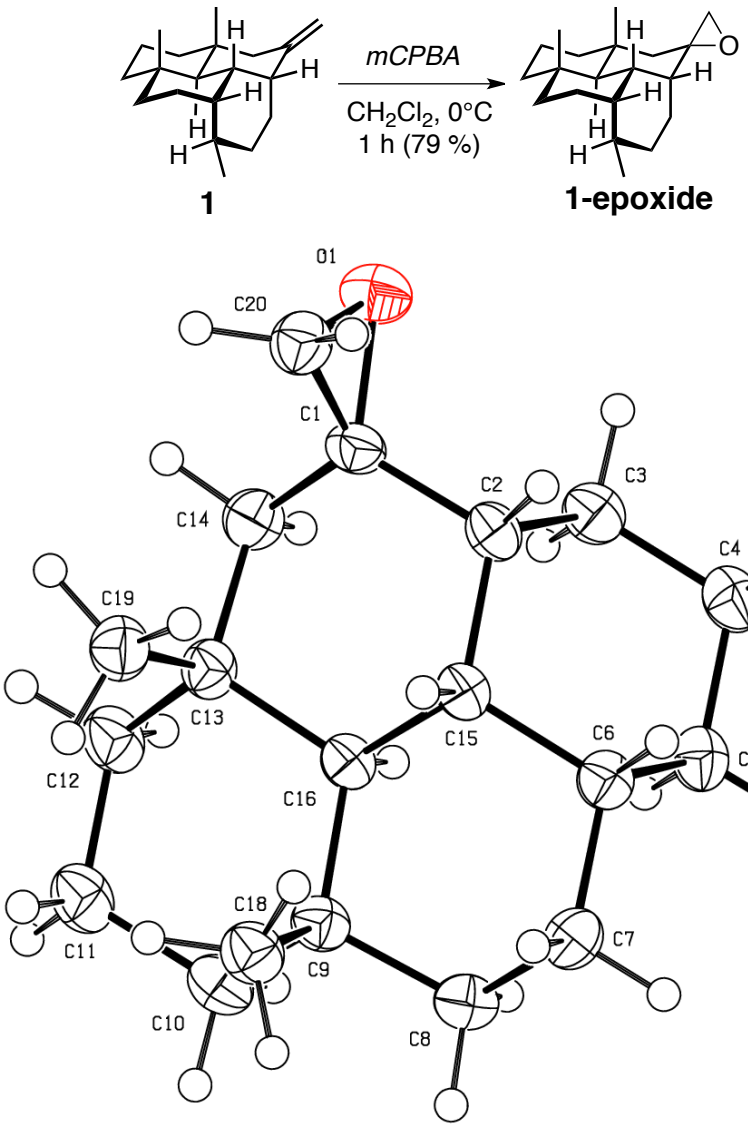


Figure S12. Crystal structure of **1-epoxide**.

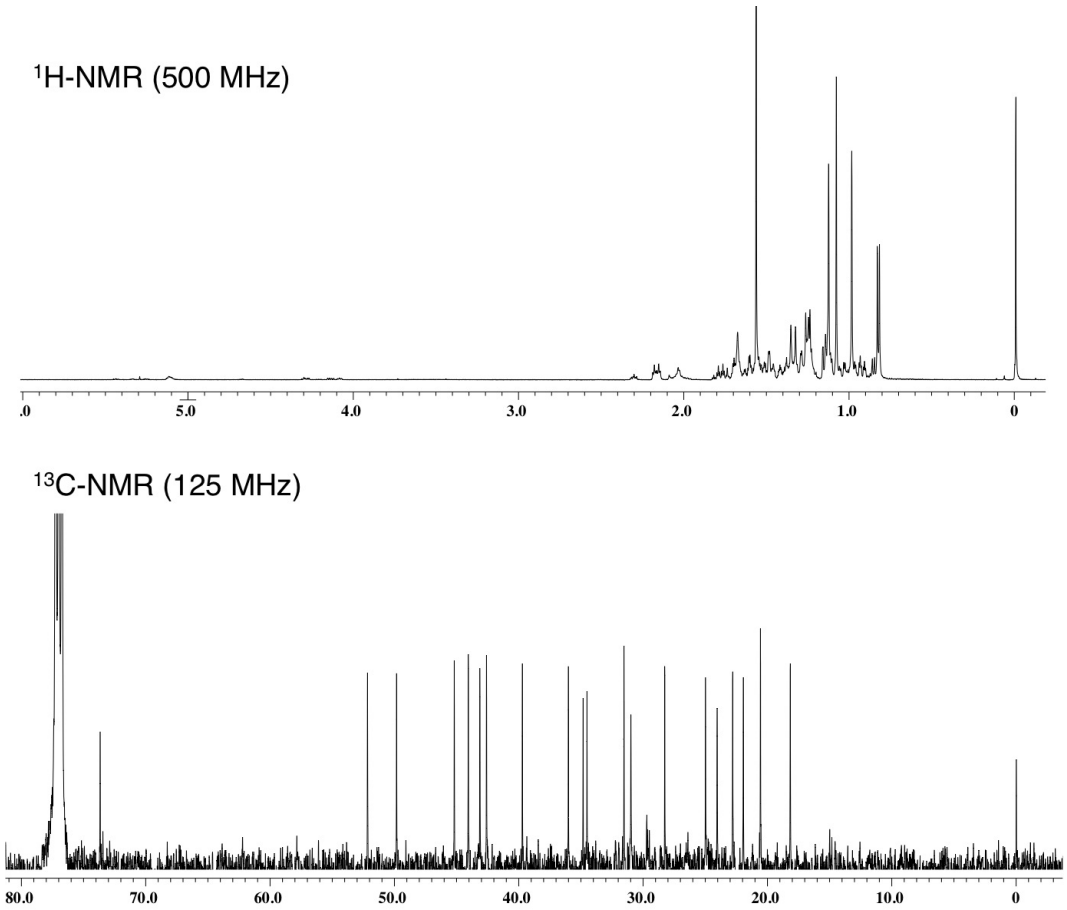


Figure S13. ^{1}H (upper) and ^{13}C (lower) NMR of hydropyrenol (**2**).

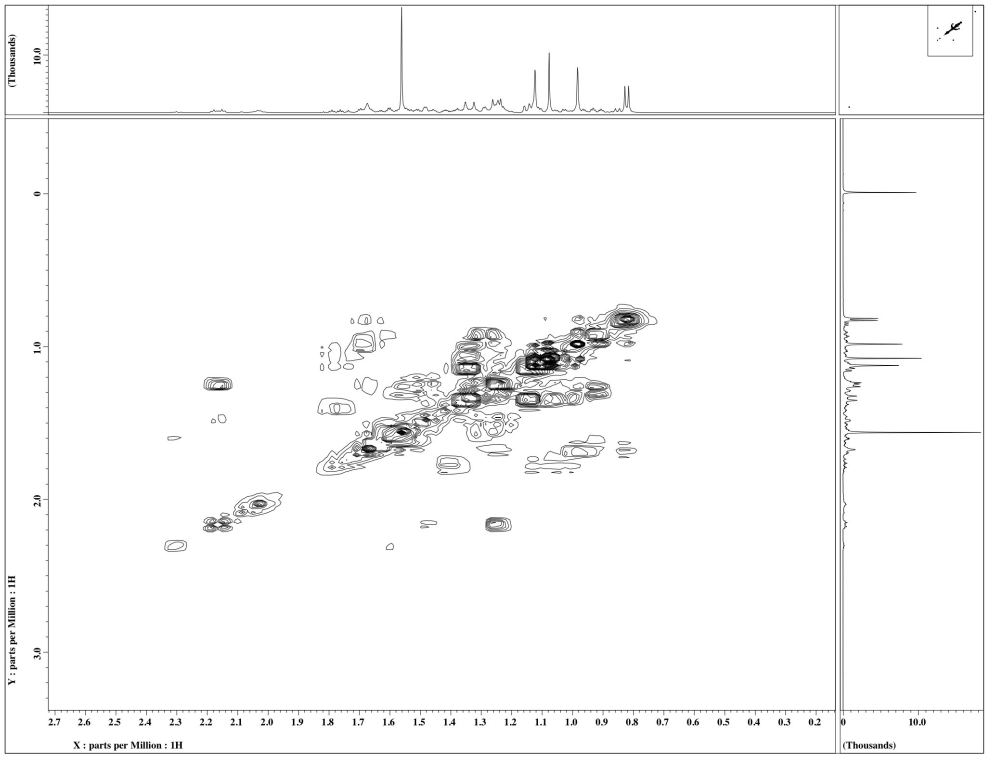


Figure S14. ^{1}H-^{1}H COSY of **2.**

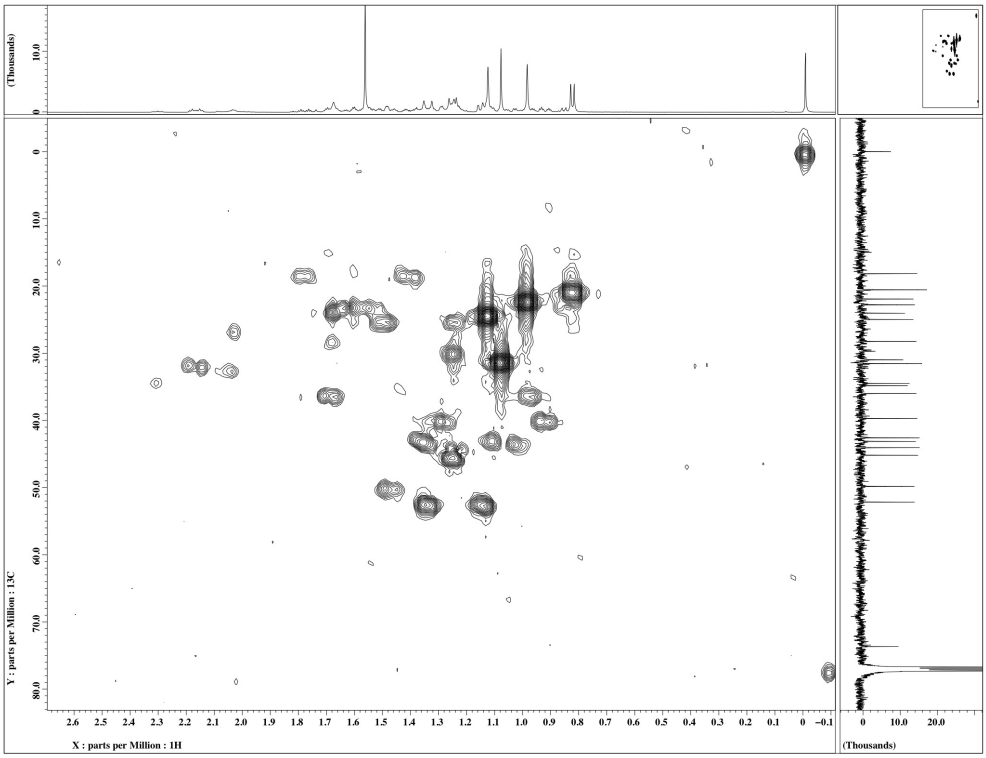


Figure S15. ^{1}H-^{13}C HMQC of **2.**

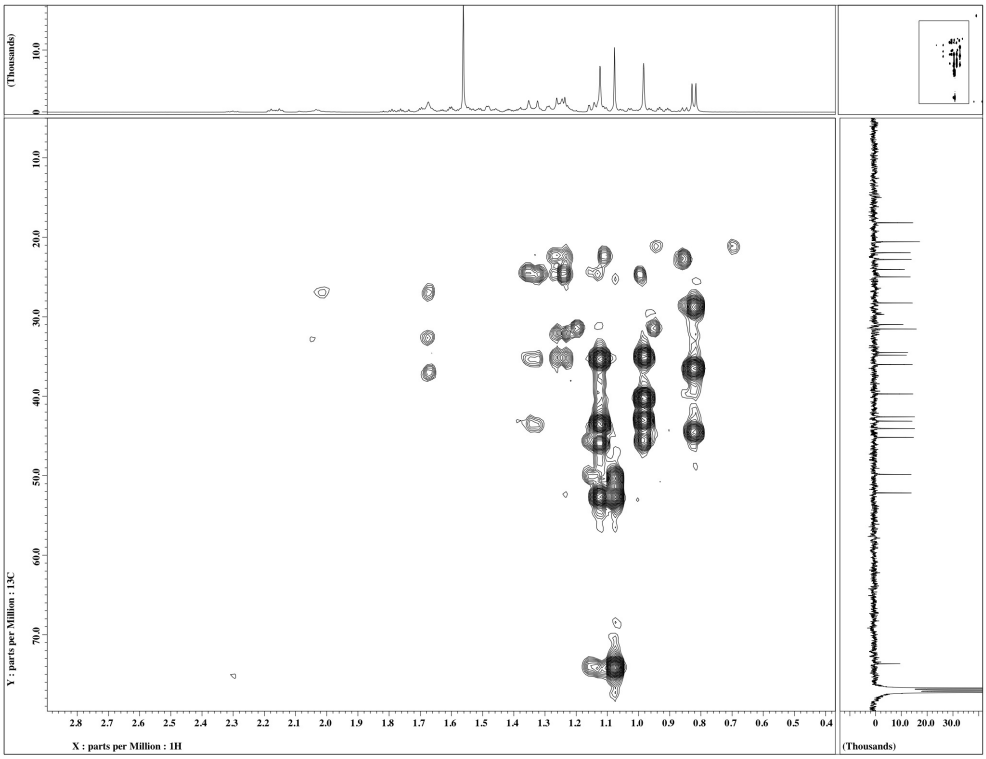


Figure S16. ^{1}H-^{13}C HMBC of **2.**

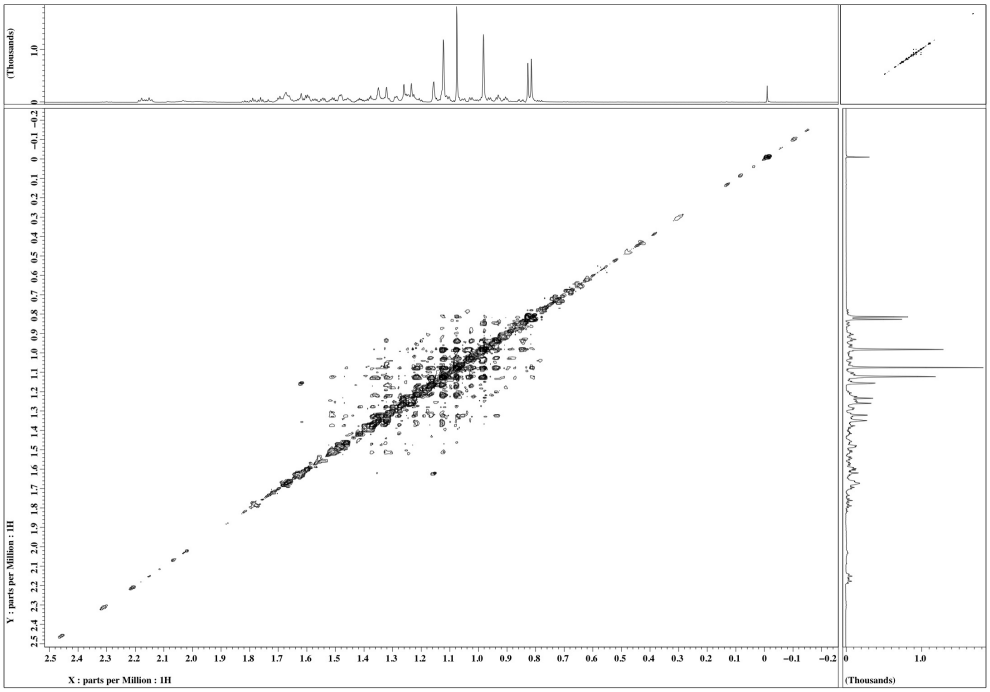


Figure S17. ^{1}H-^{1}H NOESY of **2.**

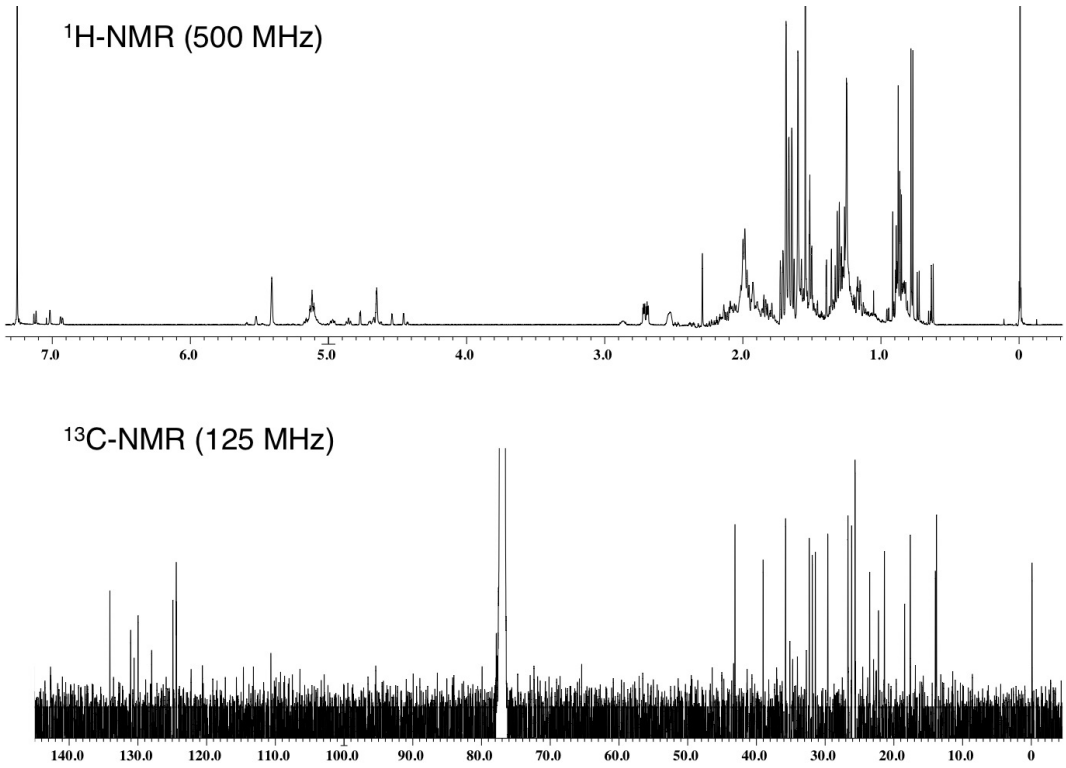


Figure S18. ^{1}H (upper) and ^{13}C (lower) NMR of isoelisabethatriene B (**3**).

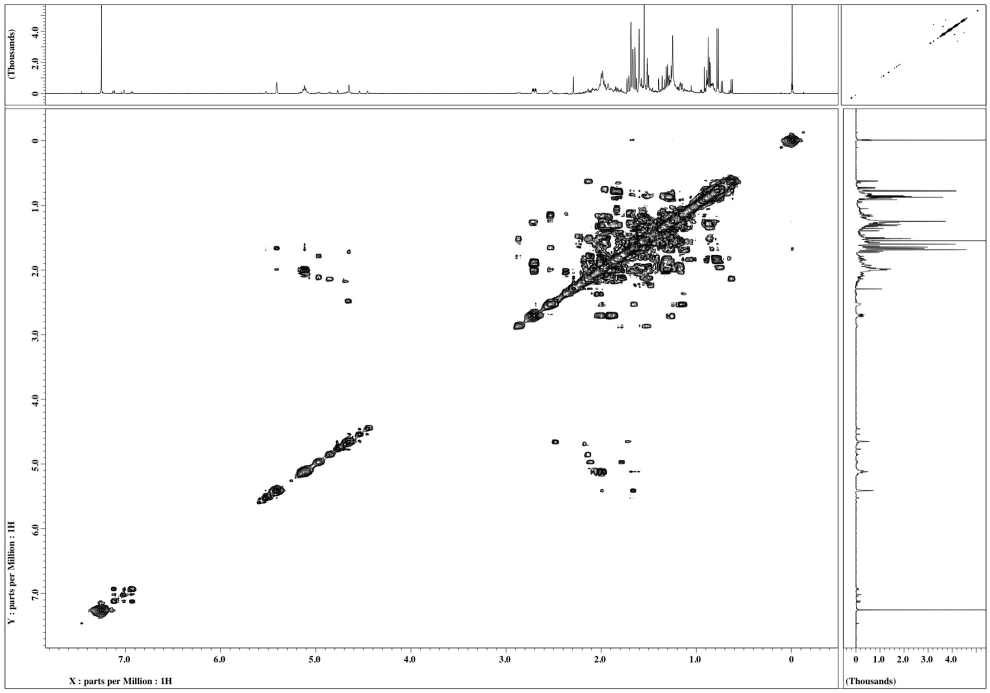


Figure S19. ^{1}H-^{1}H COSY of **3.**

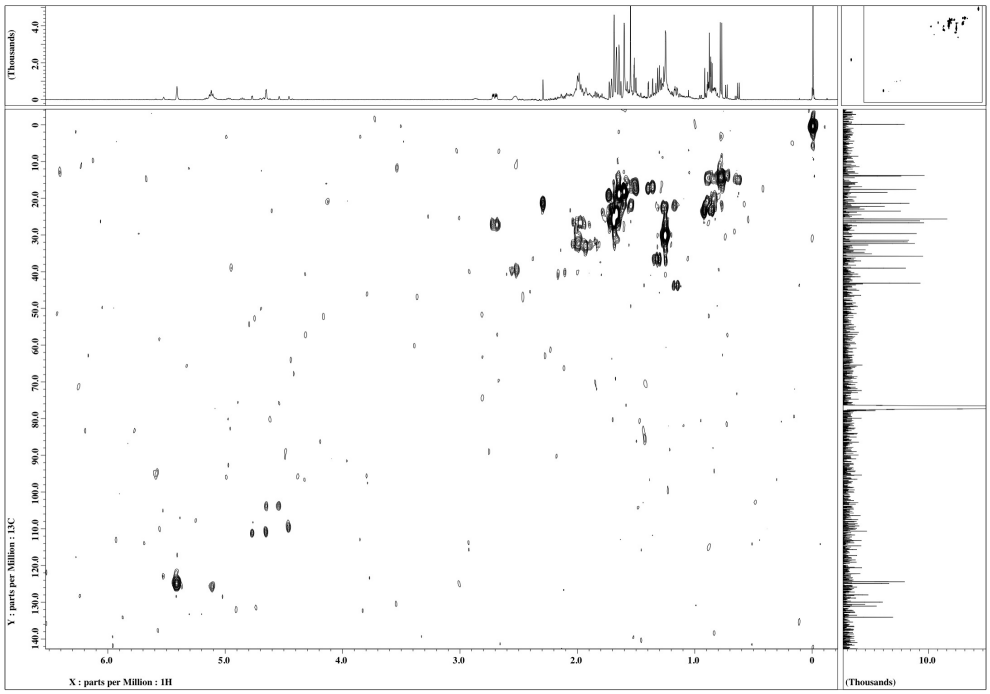


Figure S20. ^{1}H-^{13}C HMQC of **3**.

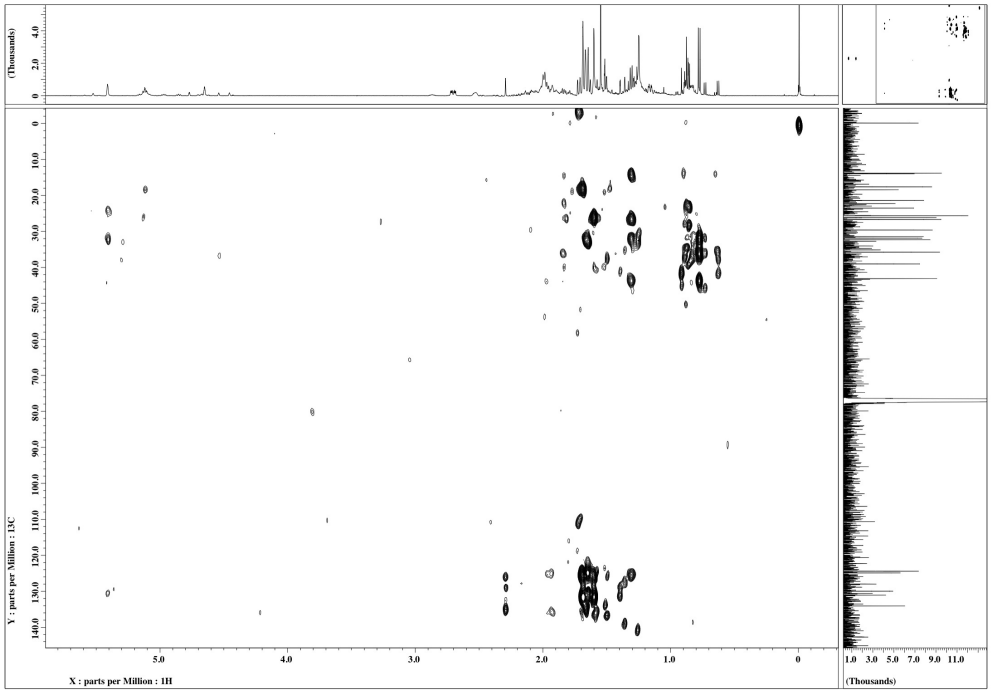


Figure S21. ^{1}H-^{13}C HMBC of **3**.

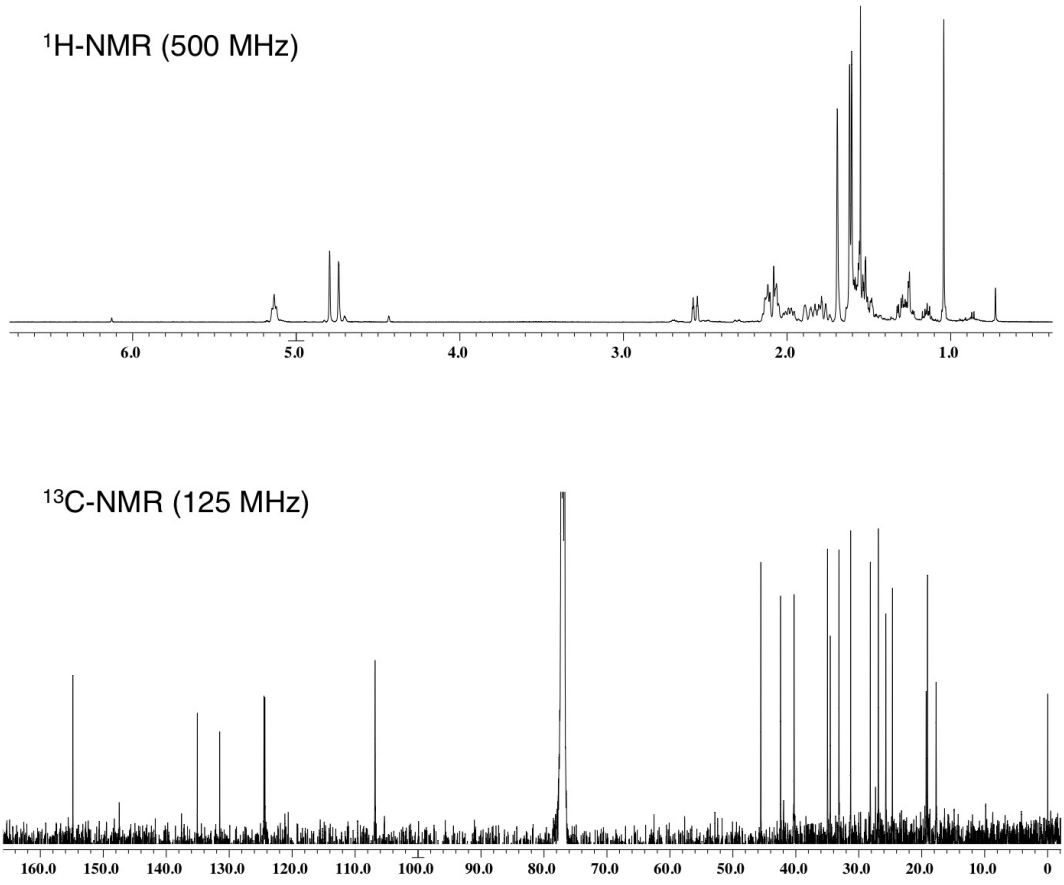


Figure S22. ^{1}H (upper) and ^{13}C (lower) NMR of clavulatriene A (**4**).

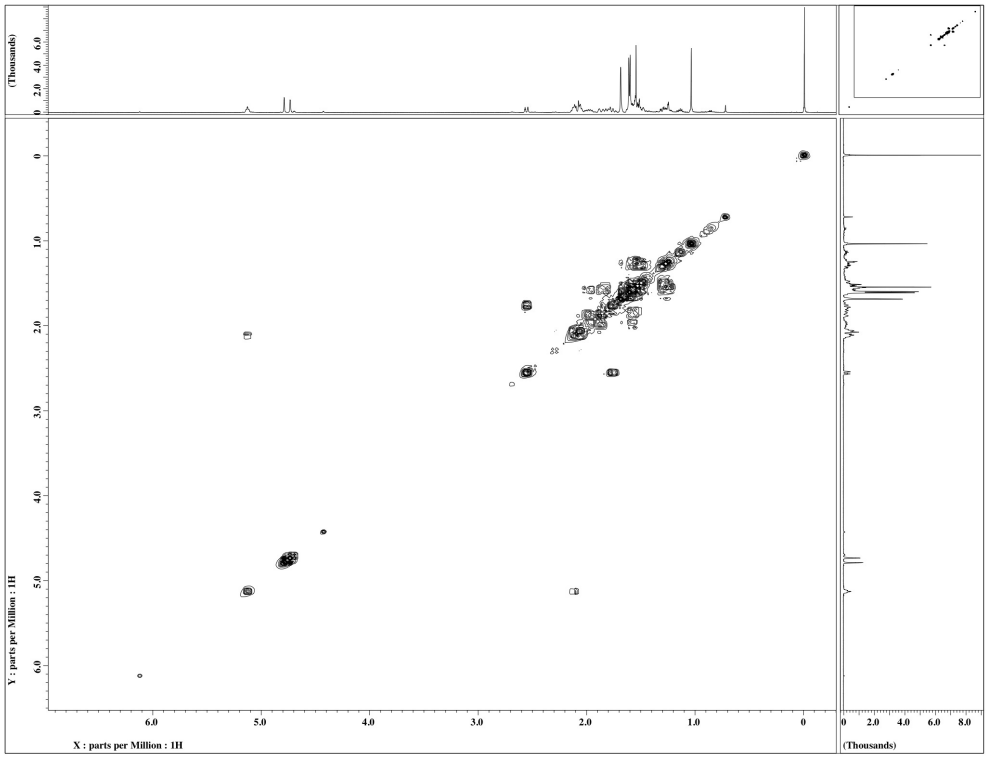


Figure S23. ^{1}H-^{1}H COSY of **4.**

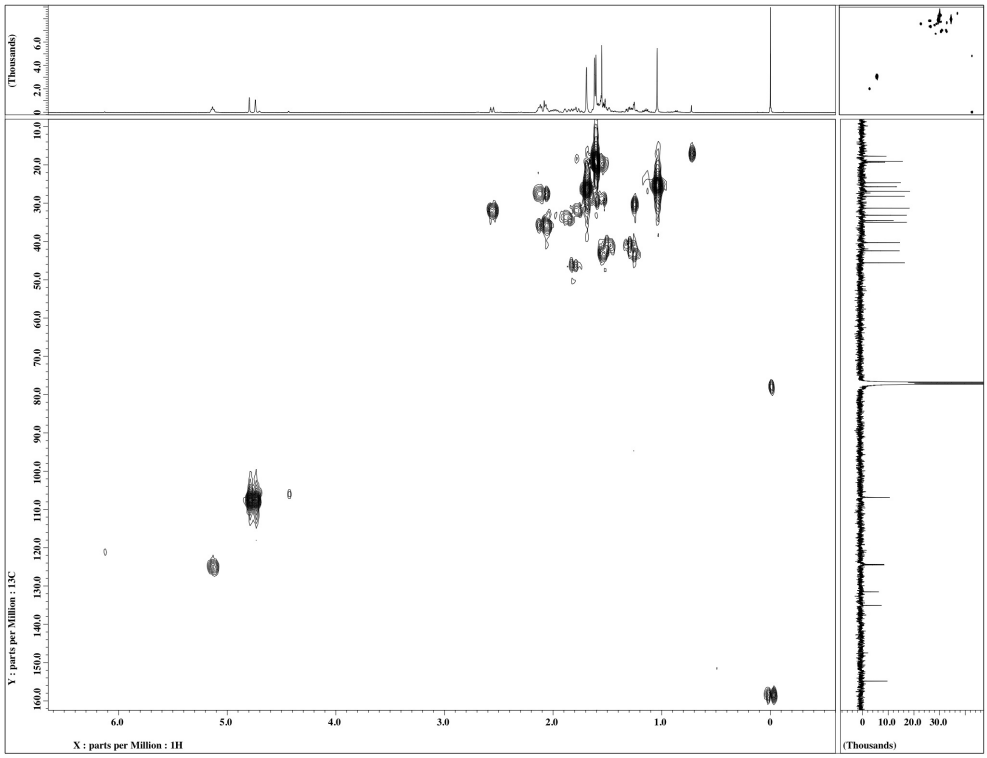


Figure S24. ^{1}H-^{13}C HMQC of **4**.

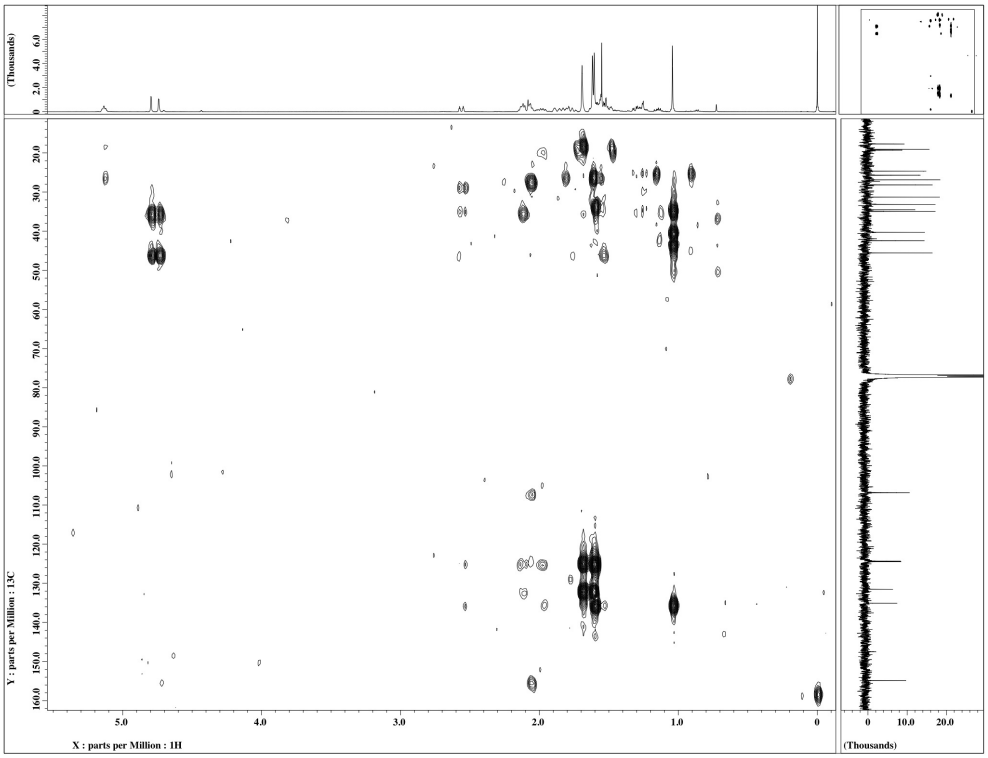


Figure S25. ^{1}H-^{13}C HMBC of **4.**

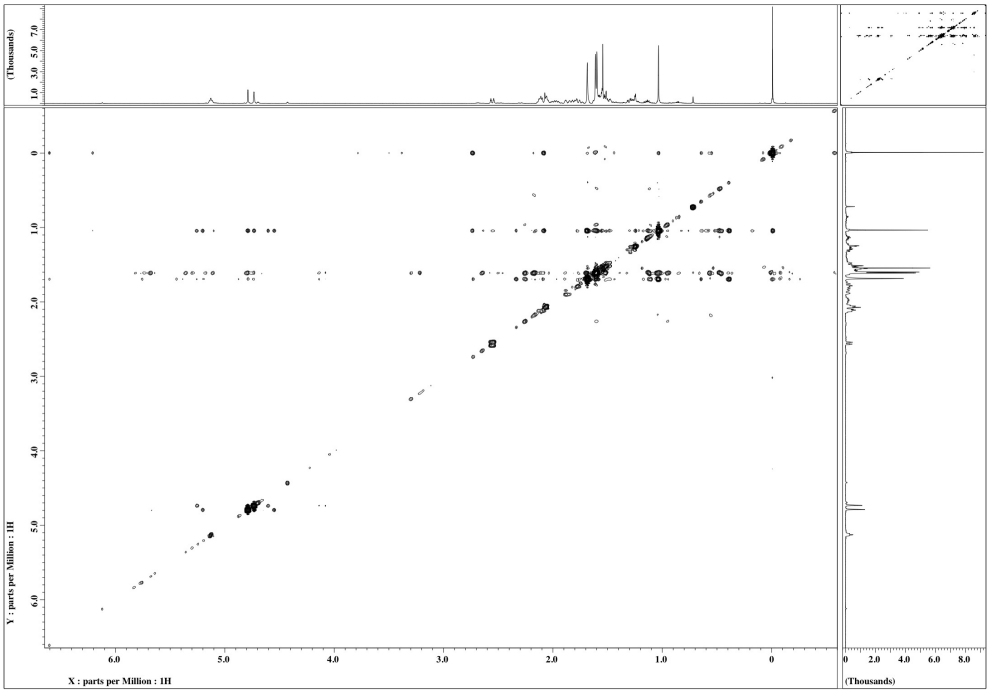


Figure S26. ^{1}H-^{1}H NOESY of **4**.

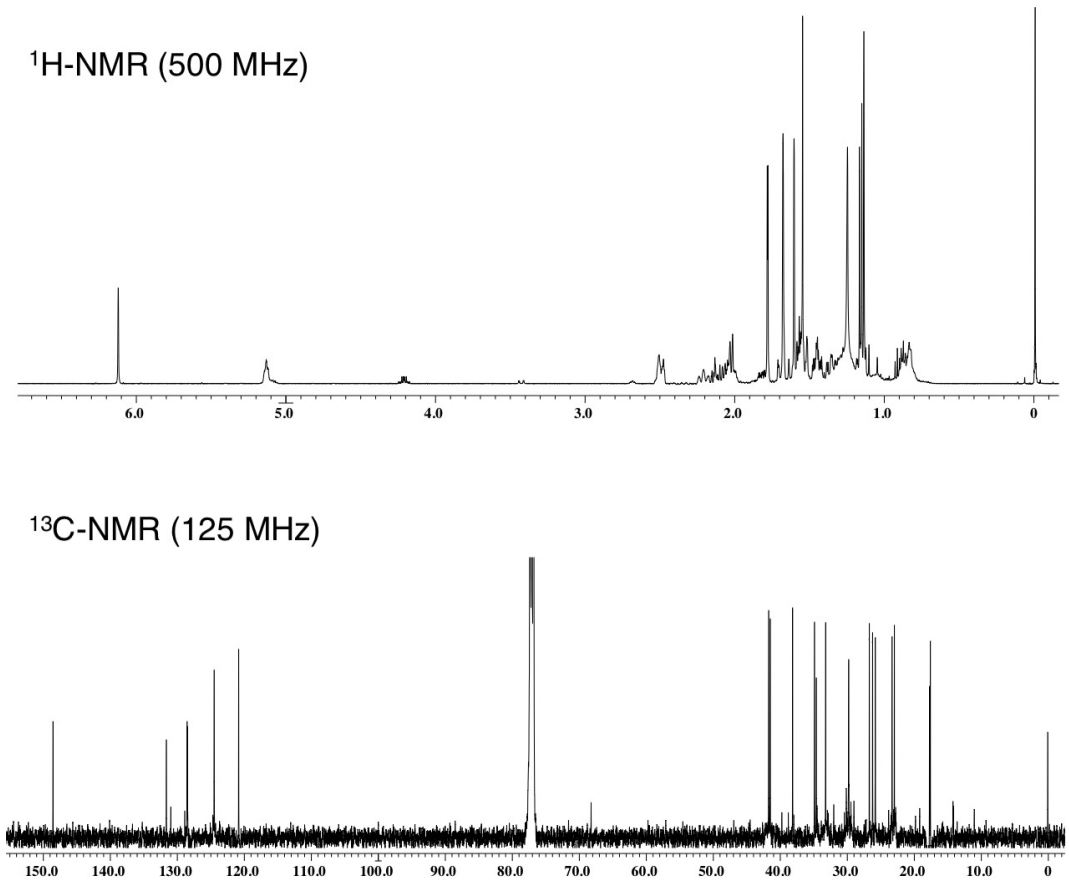


Figure S27. ^{1}H (upper) and ^{13}C (lower) NMR of clavulatriene B (**5**).

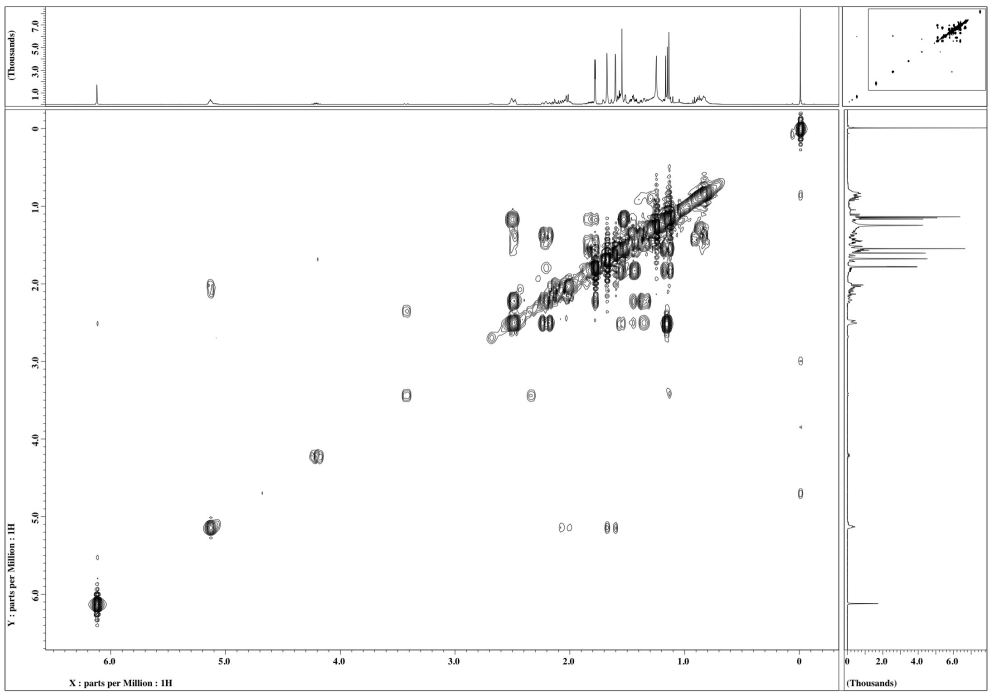


Figure S28. ^{1}H-^{1}H COSY of **5.**

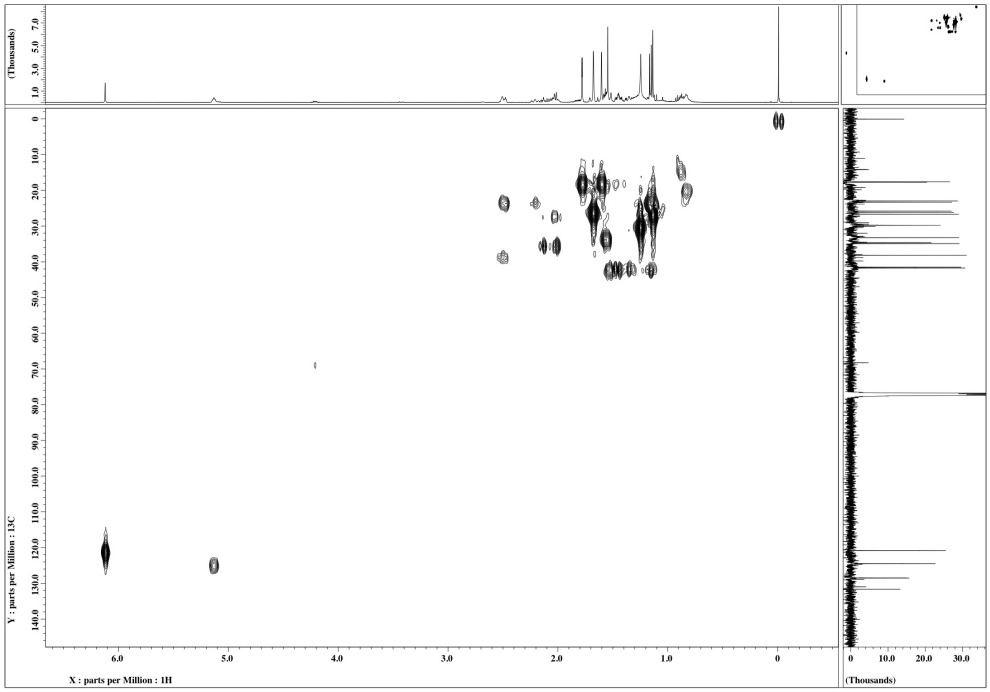


Figure S29. ^{1}H-^{13}C HMQC of **5**.

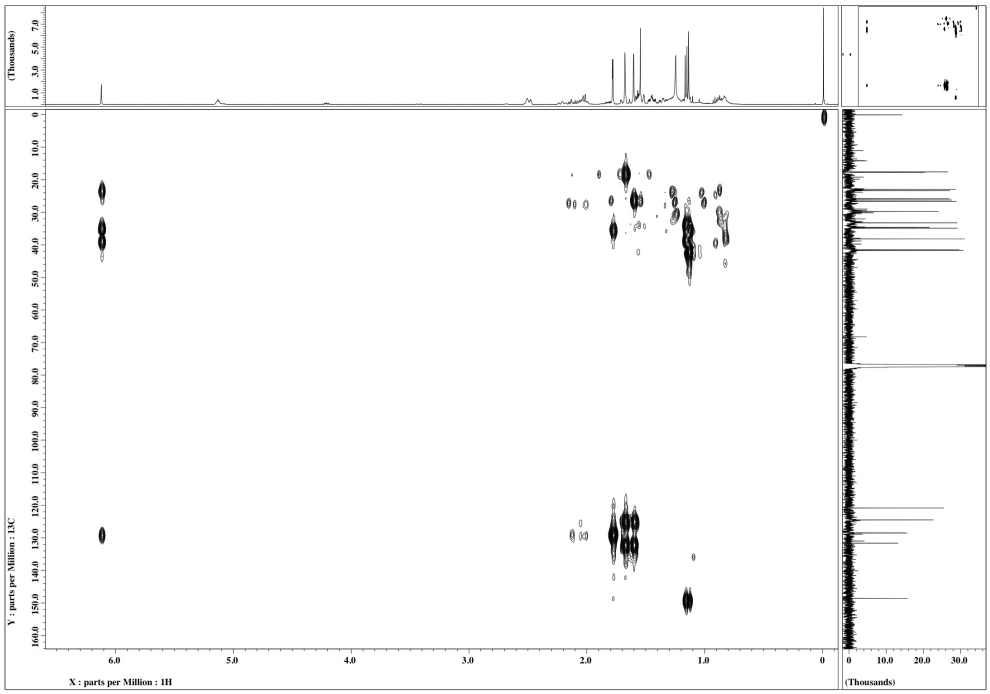


Figure S30. ^{1}H-^{13}C HMBC of **5**.

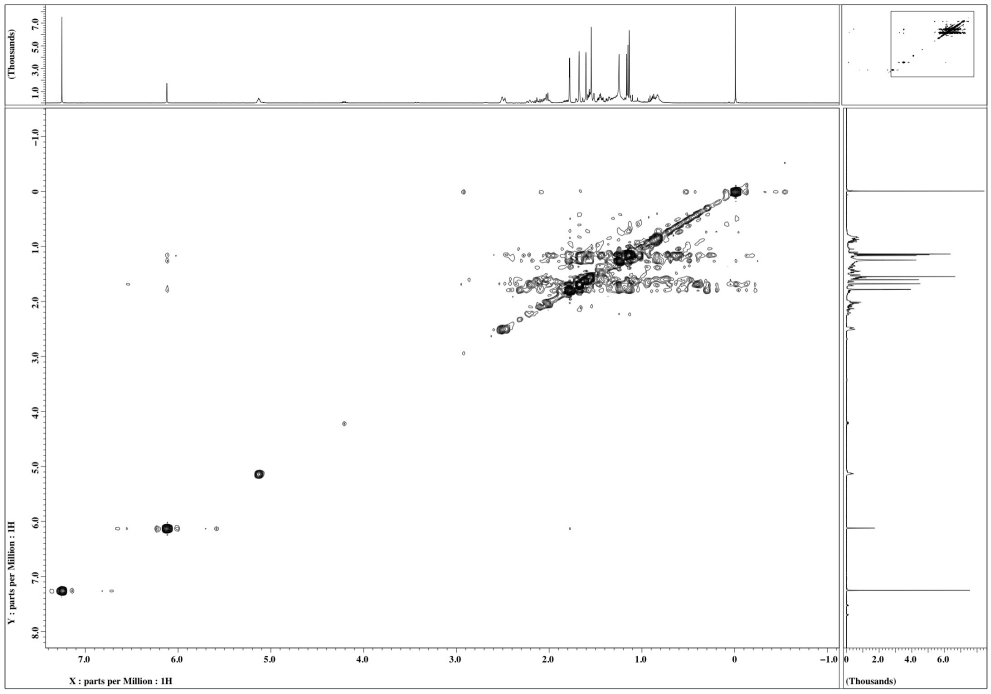


Figure S31. ^{1}H-^{1}H NOESY of **5.**

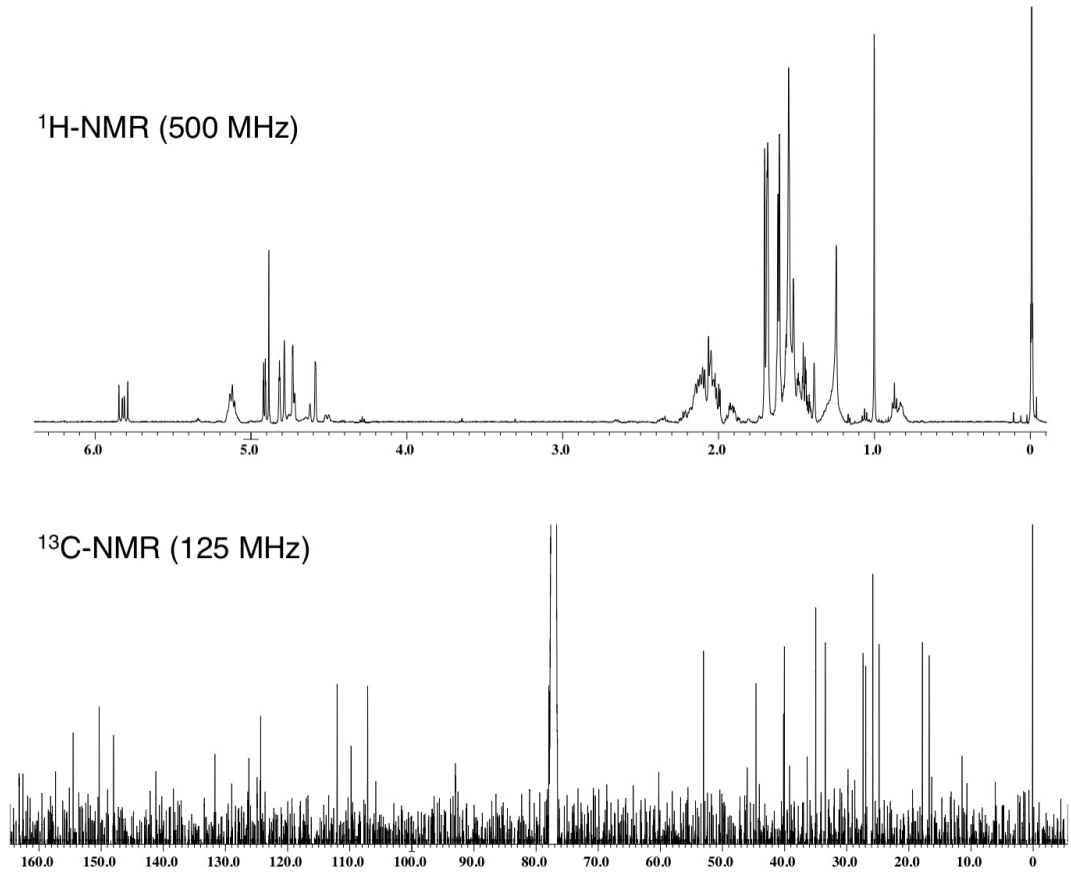


Figure S32. ^{1}H (upper) and ^{13}C (lower) NMR of prenyl-β-elemene (**6**).

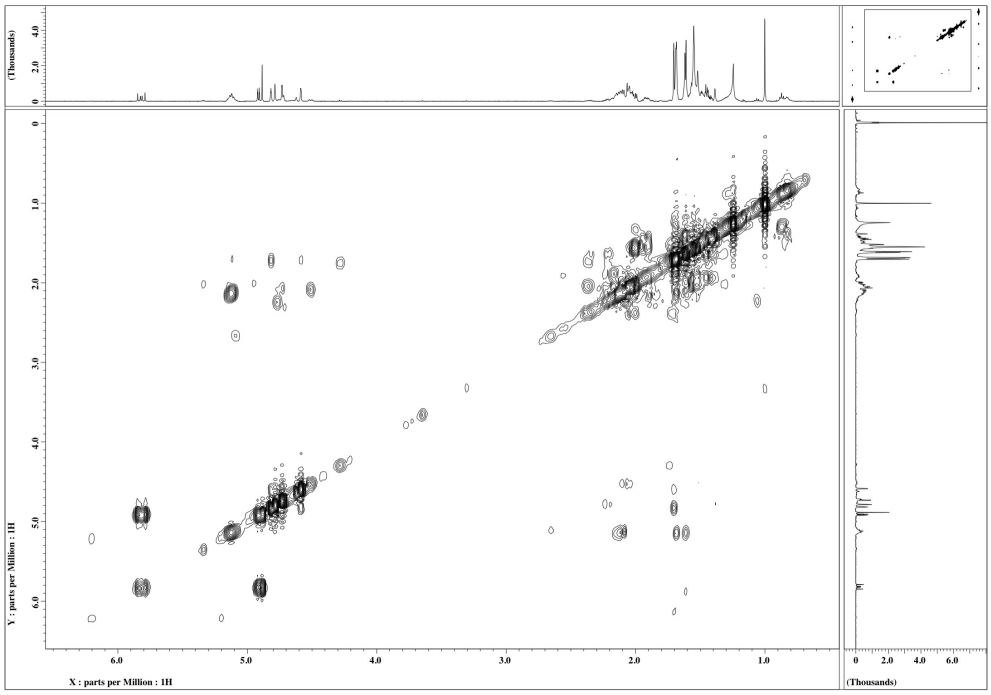


Figure S33. ^{1}H-^{1}H COSY of **6.**

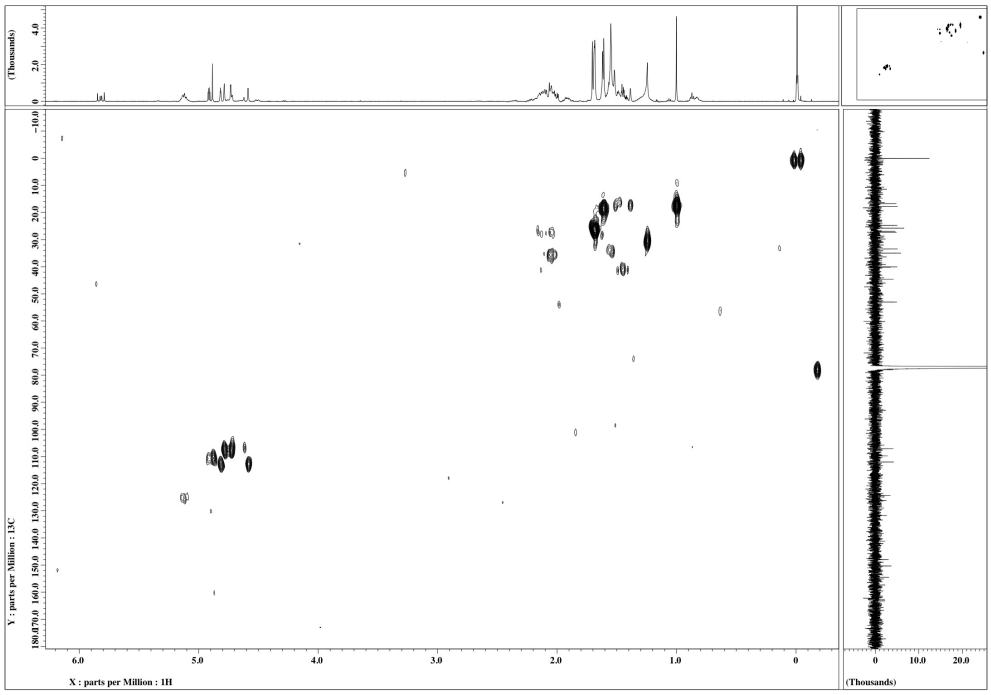


Figure S34. ^{1}H-^{13}C HMQC of **6**.

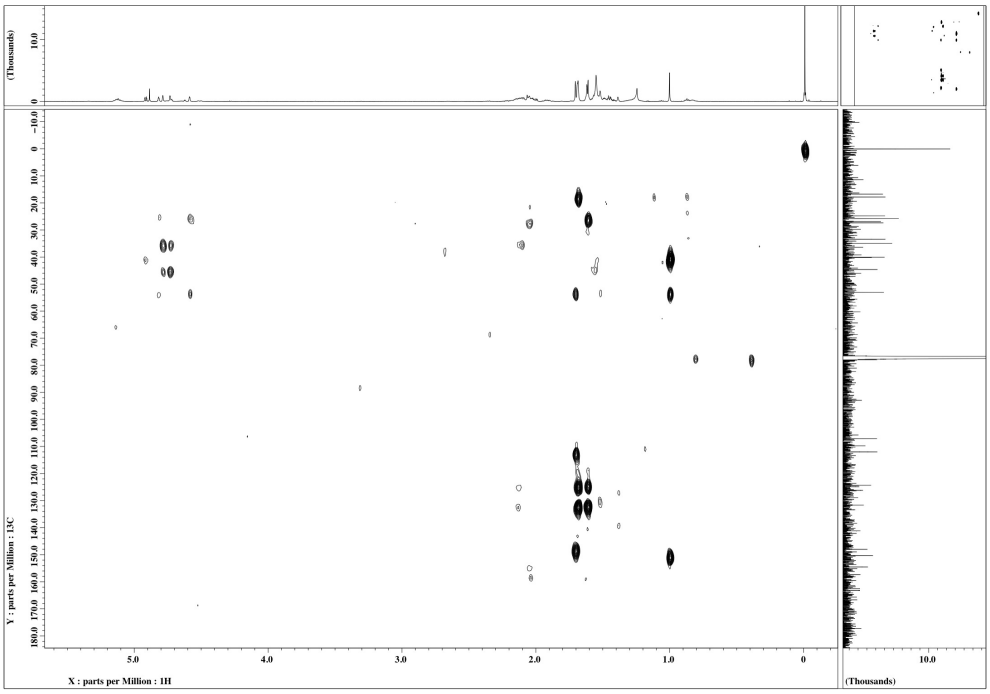


Figure S35. ^{1}H-^{13}C HMBC of **6**.

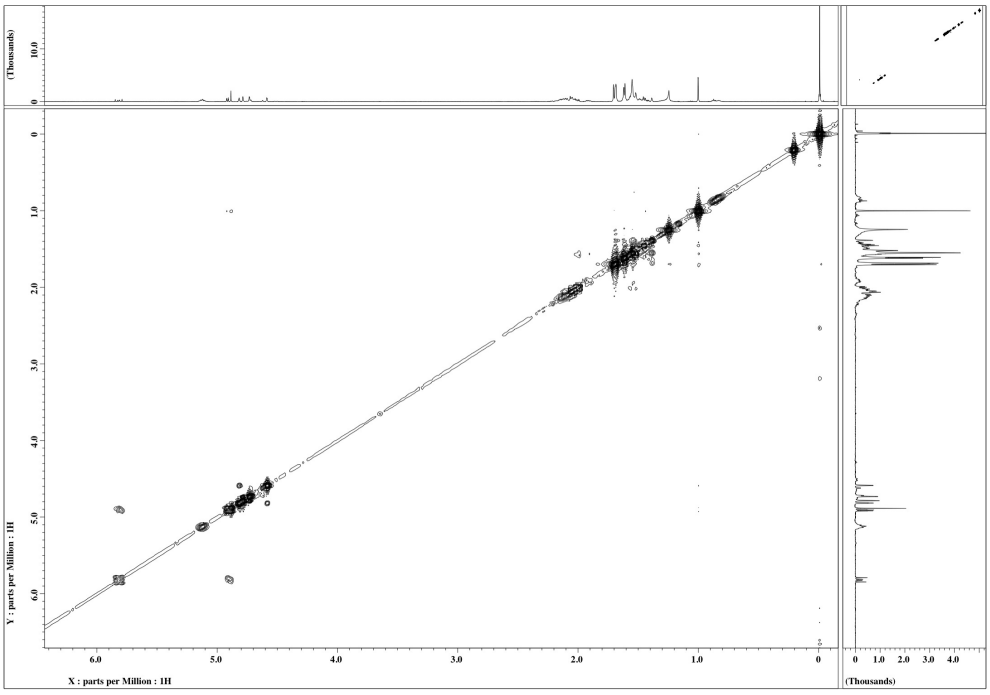


Figure S36. ^{1}H-^{1}H NOESY of **6.**

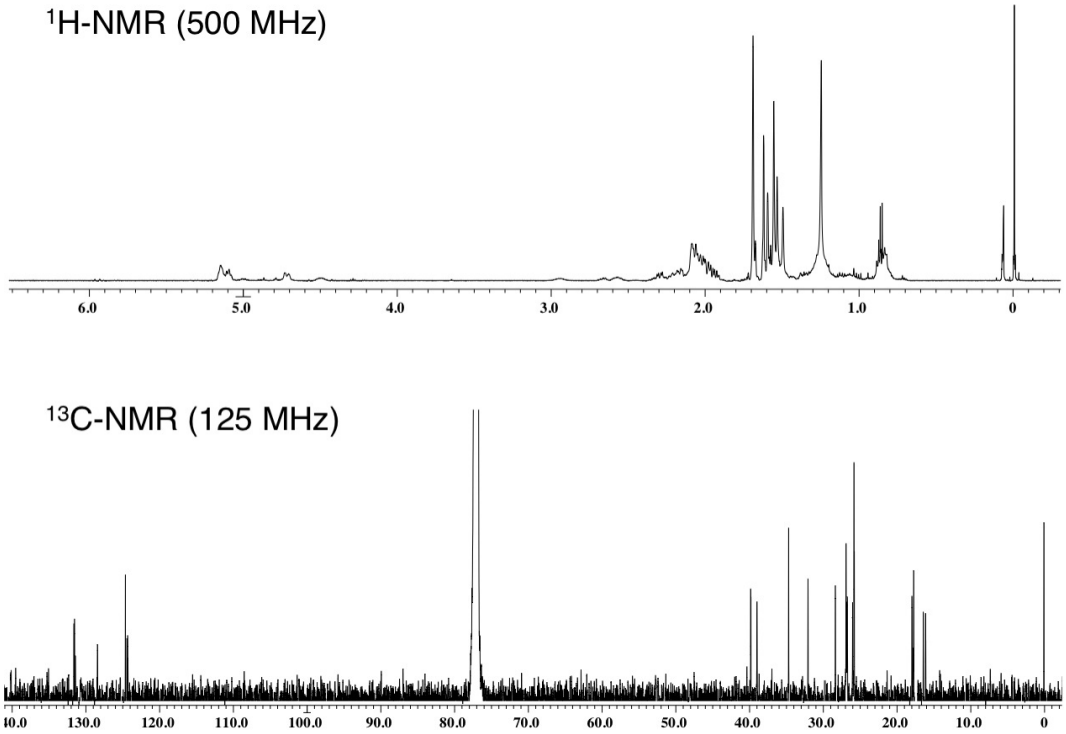


Figure S37 ^{1}H (upper) and ^{13}C (lower) NMR of prenylgermacrene B (**7**).

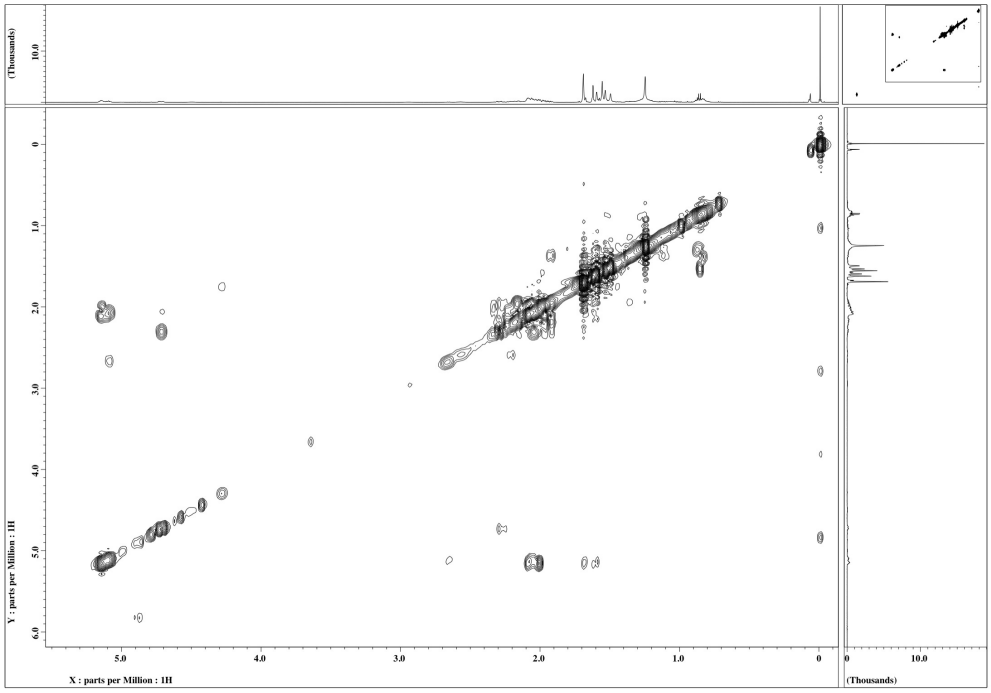


Figure S38. ^{1}H-^{1}H COSY of **7.**

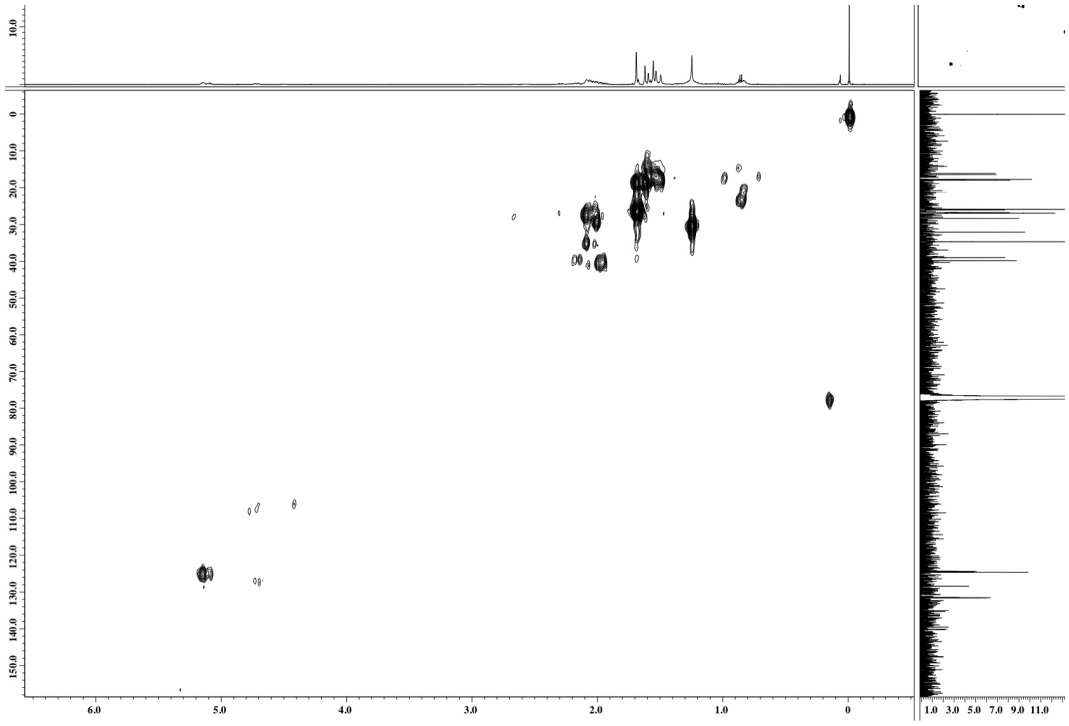


Figure S39. ^{1}H-^{13}C HMQC of **7.**

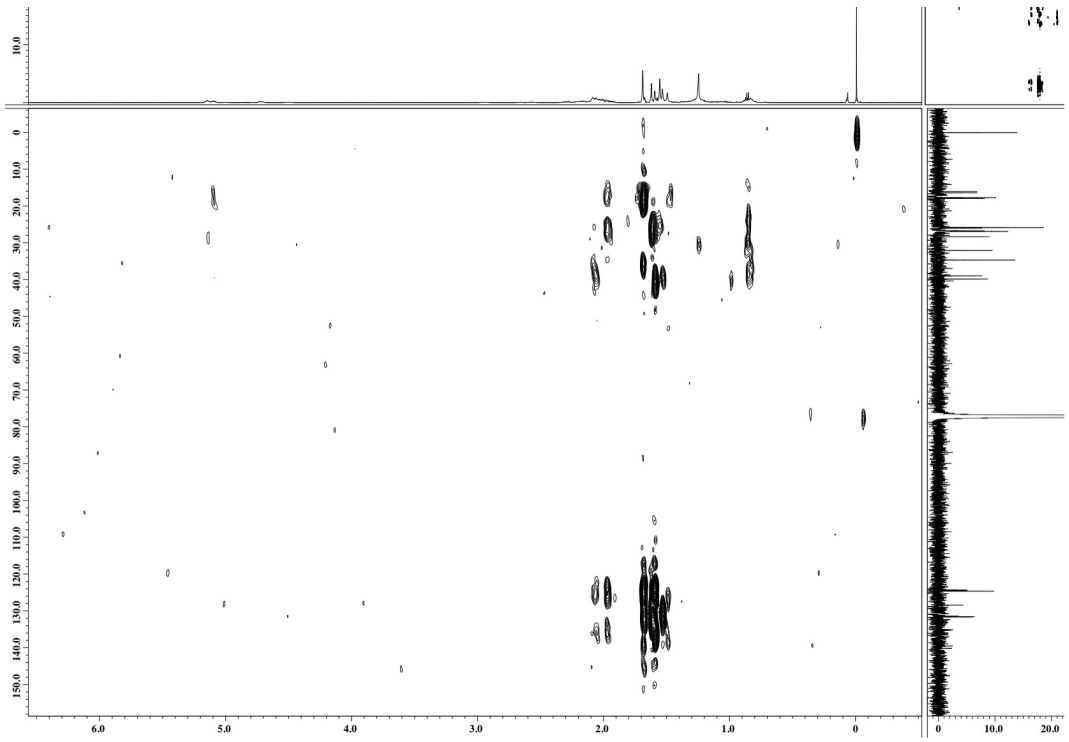


Figure S40. ^{1}H-^{13}C HMBC of **7**.

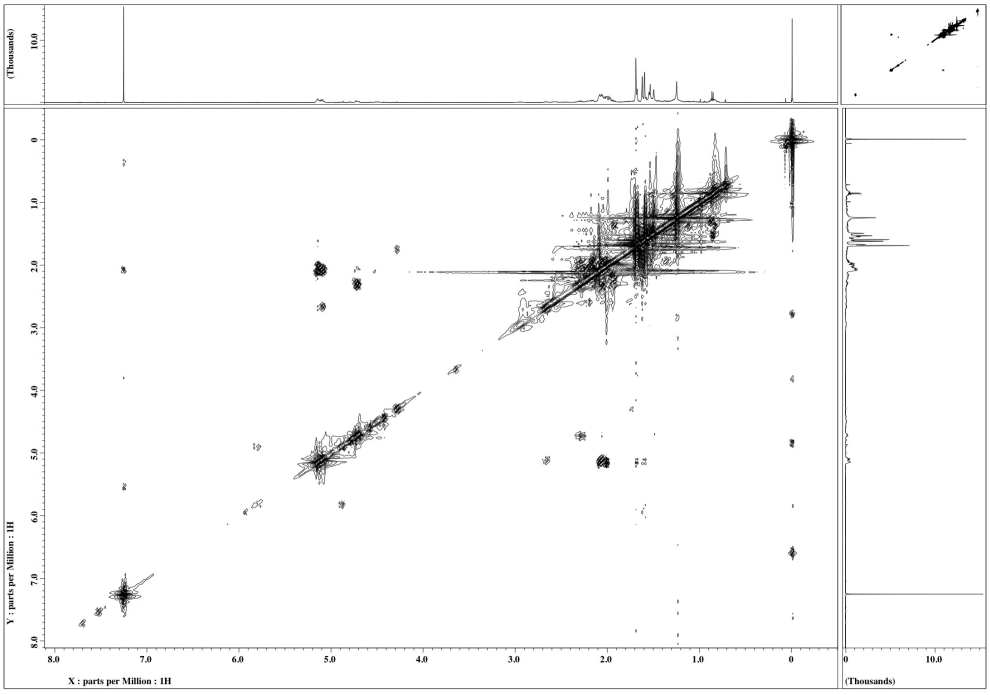


Figure S41. ^{1}H-^{1}H ROESY of **7.**

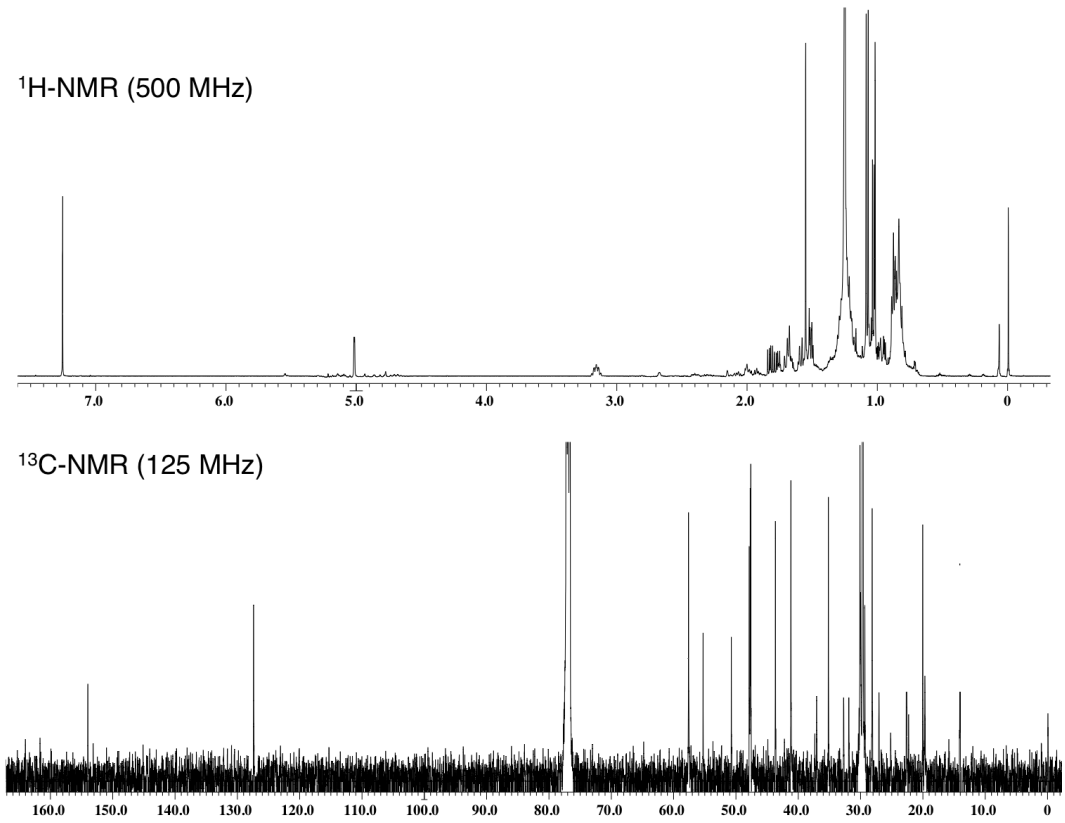


Figure S42. ^{1}H (upper) and ^{13}C (lower) NMR of isohirsut-1-ene (**8**).

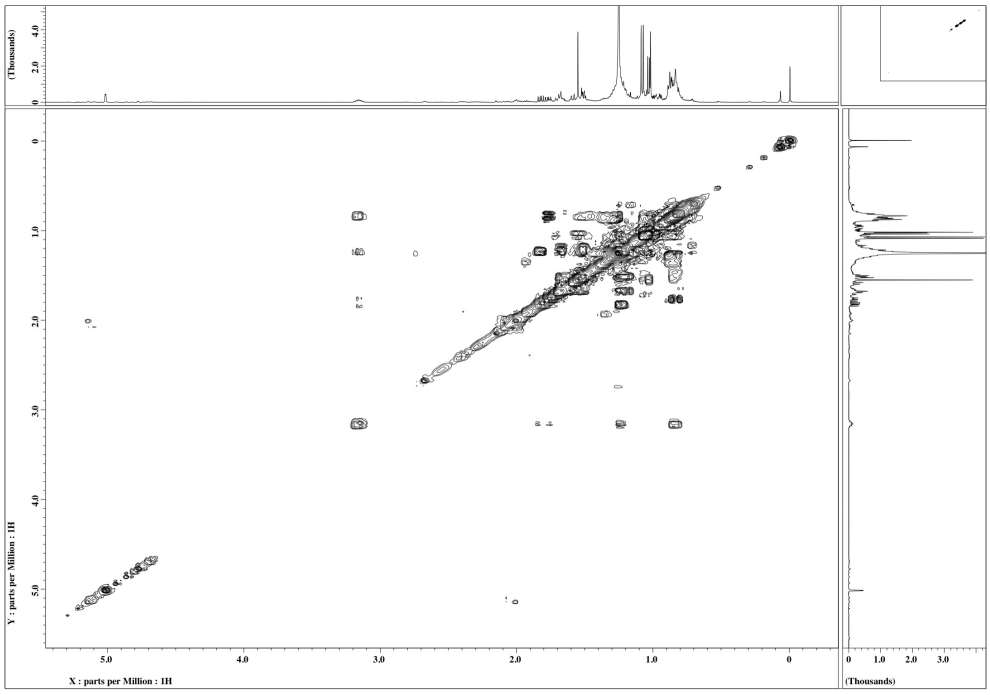


Figure S43. ^{1}H-^{1}H COSY of **8.**

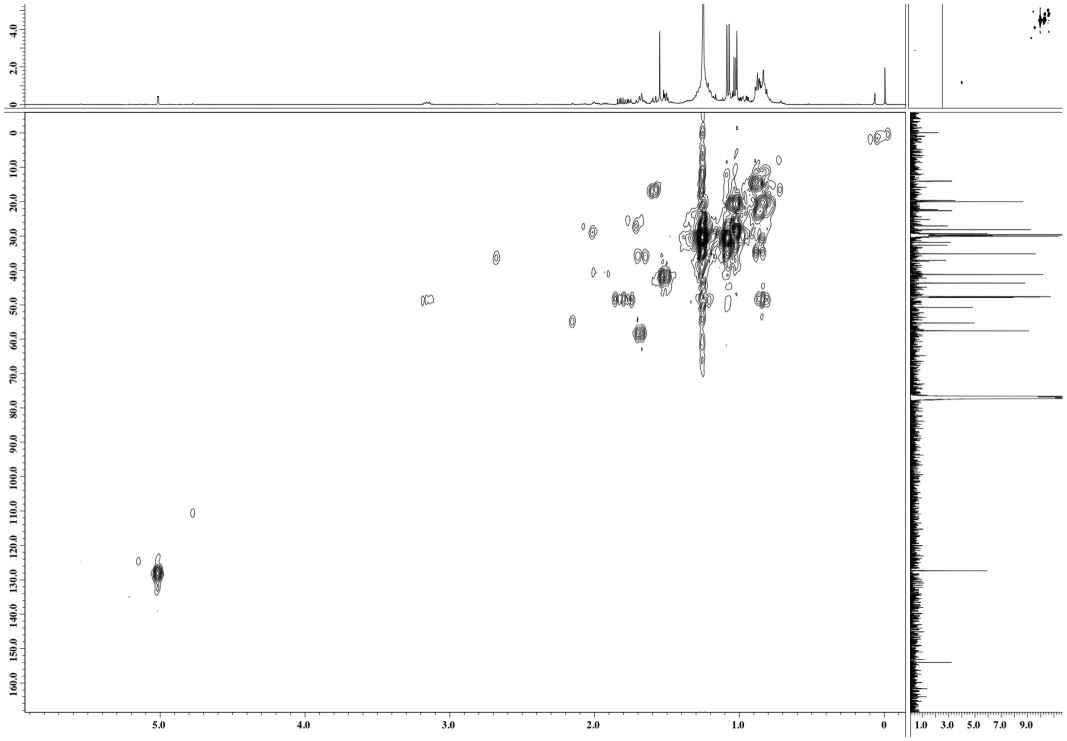


Figure S44. ^{1}H-^{13}C HMQC of **8**.

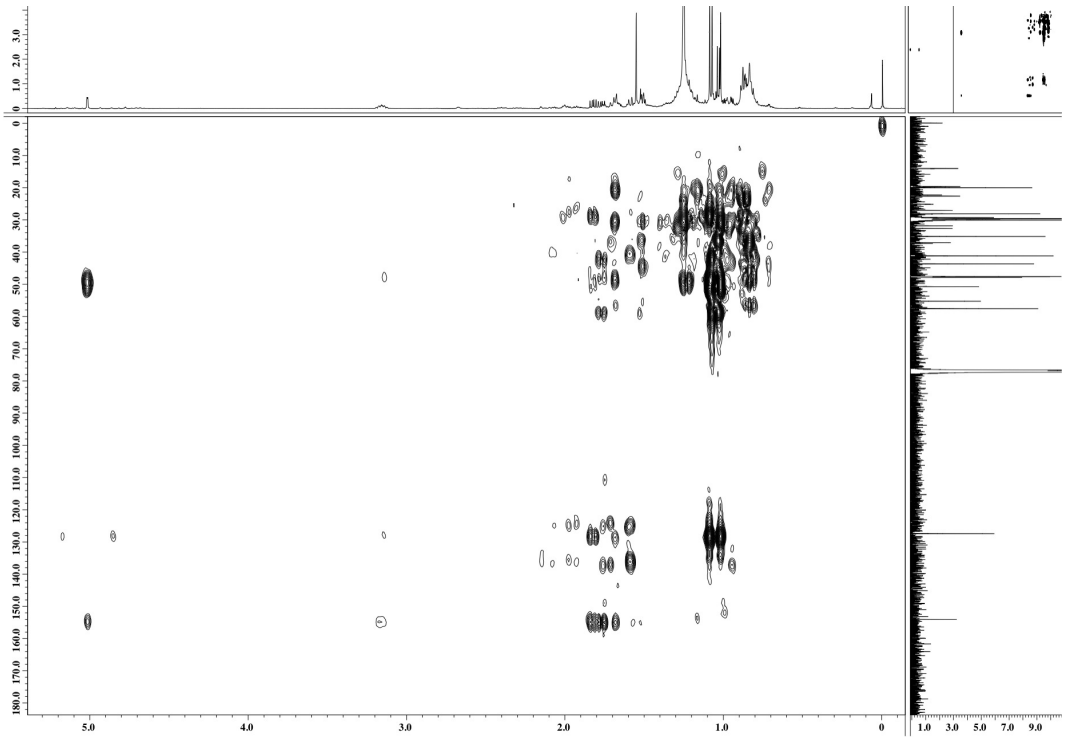


Figure S45. ^{1}H-^{13}C HMBC of **8**.

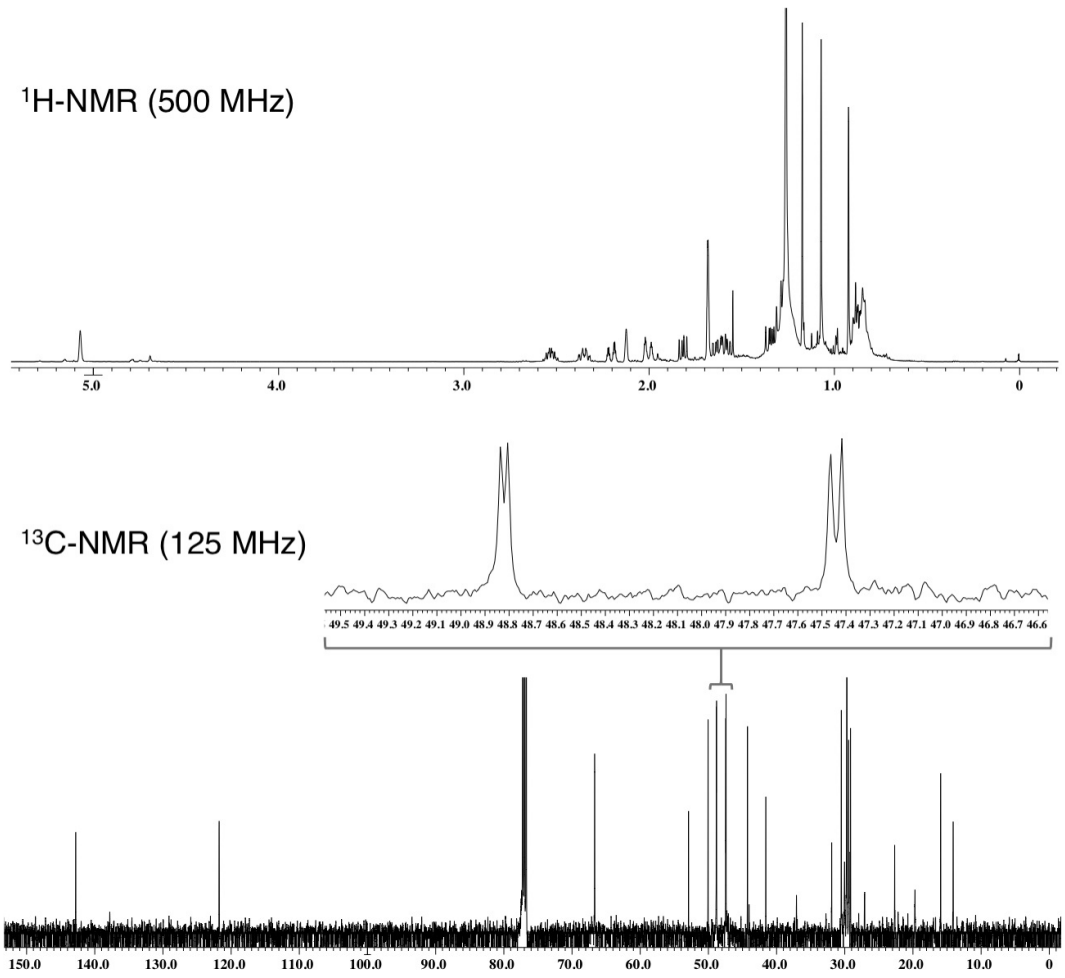


Figure S46. ^{1}H (upper) and ^{13}C (lower) NMR of isohirsut-4-ene (**9**).

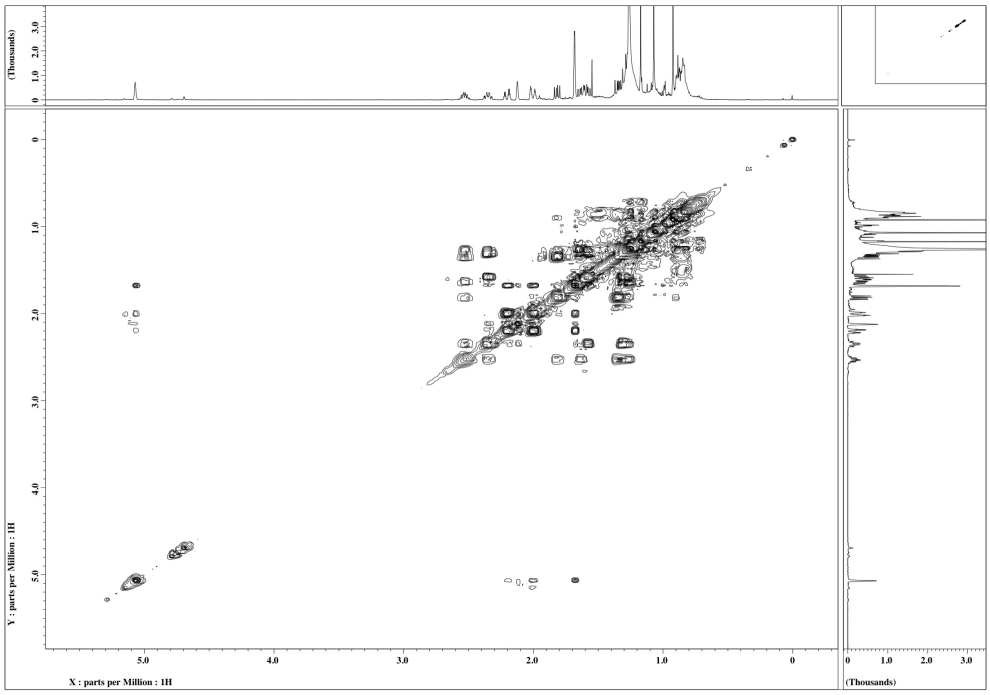


Figure S47. ^{1}H-^{1}H COSY of **9.**

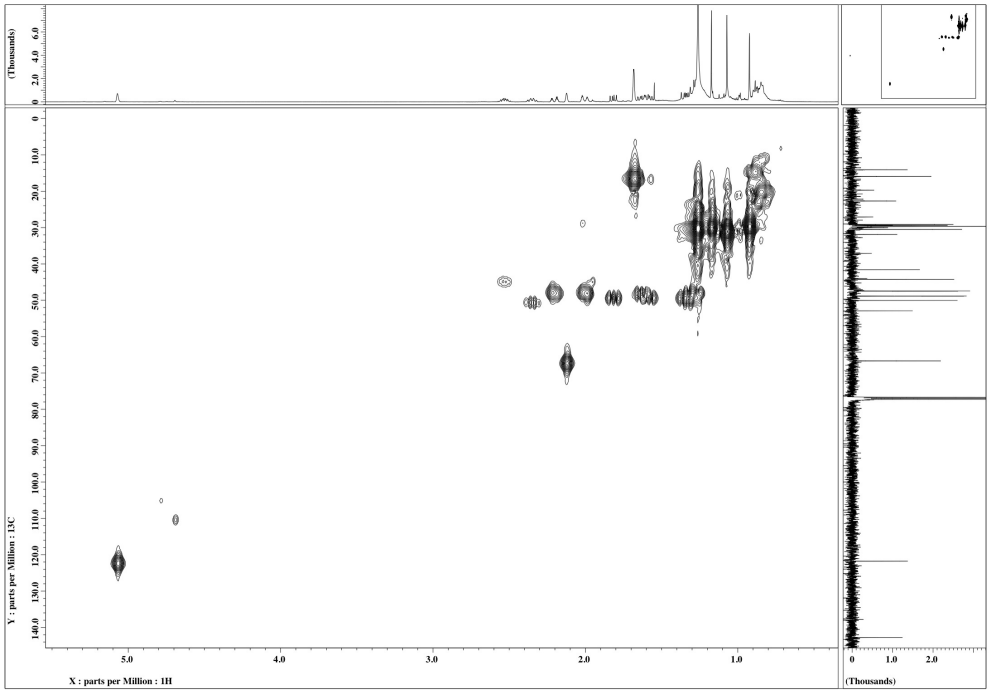


Figure S48. ^{1}H-^{13}C HMQC of **9**.

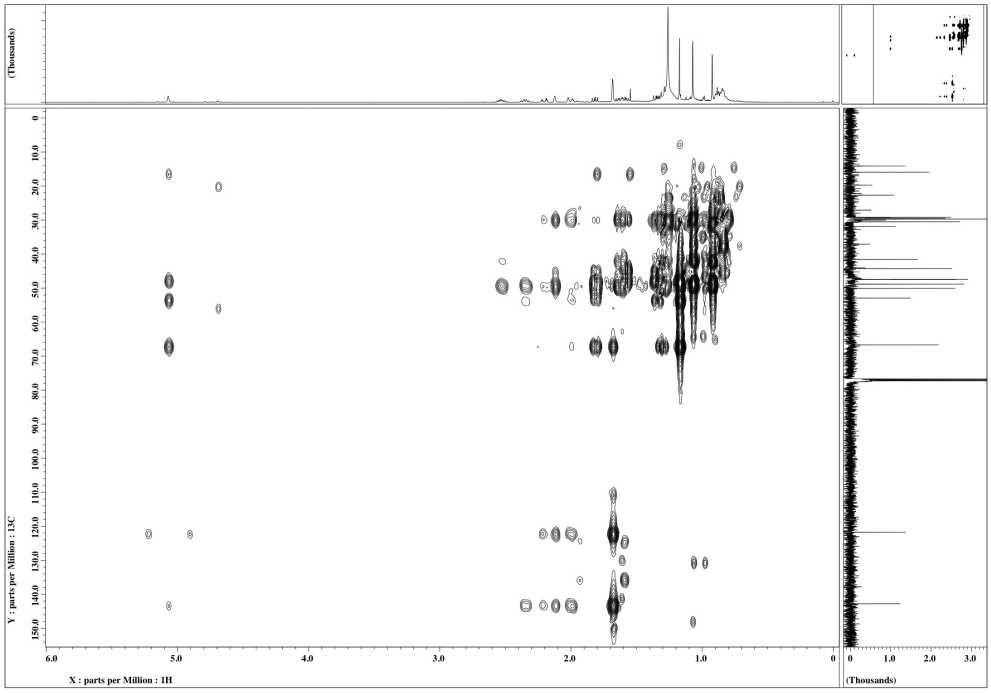


Figure S49. ^{1}H-^{13}C HMBC of **9.**

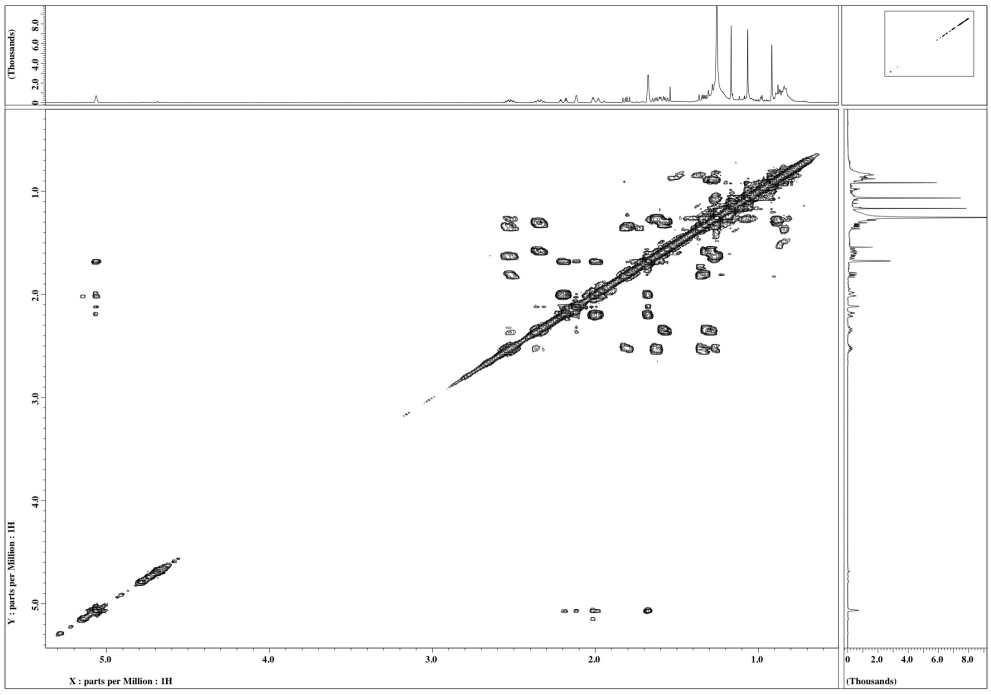


Figure S50. ^{1}H-^{1}H ROESY of **9.**

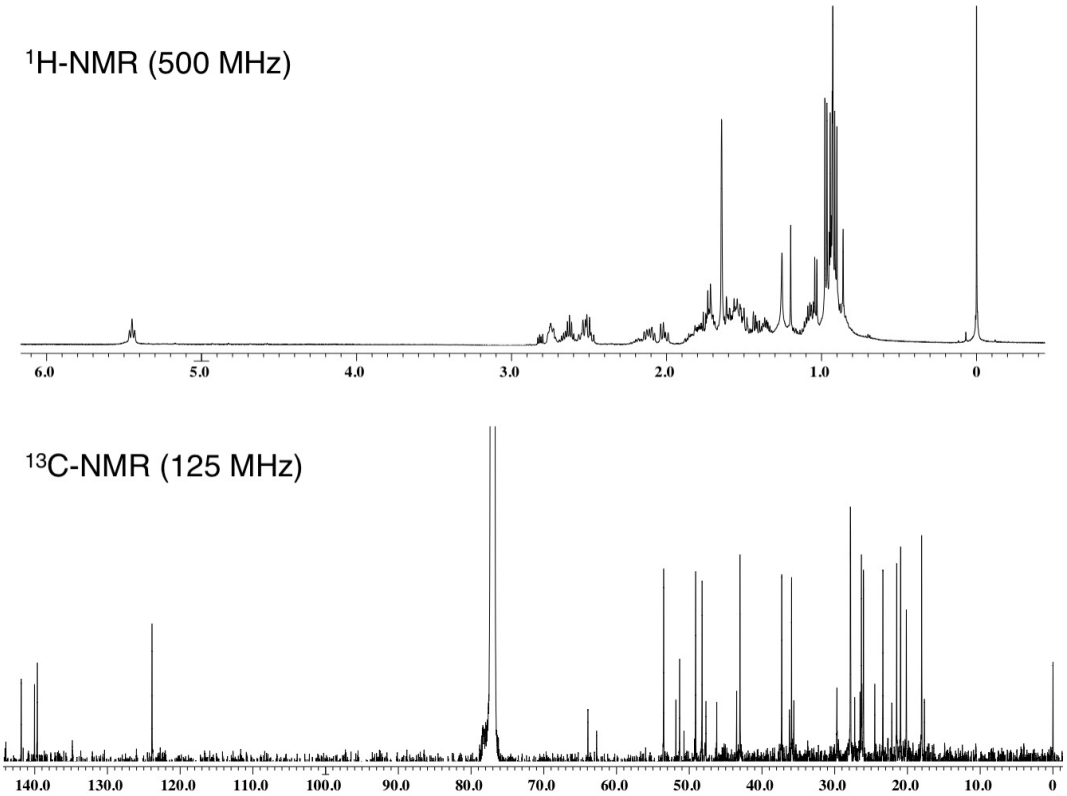


Figure S51. ^{1}H (upper) and ^{13}C (lower) NMR of cyclooctat-7(8),10(14)-diene (**10**).

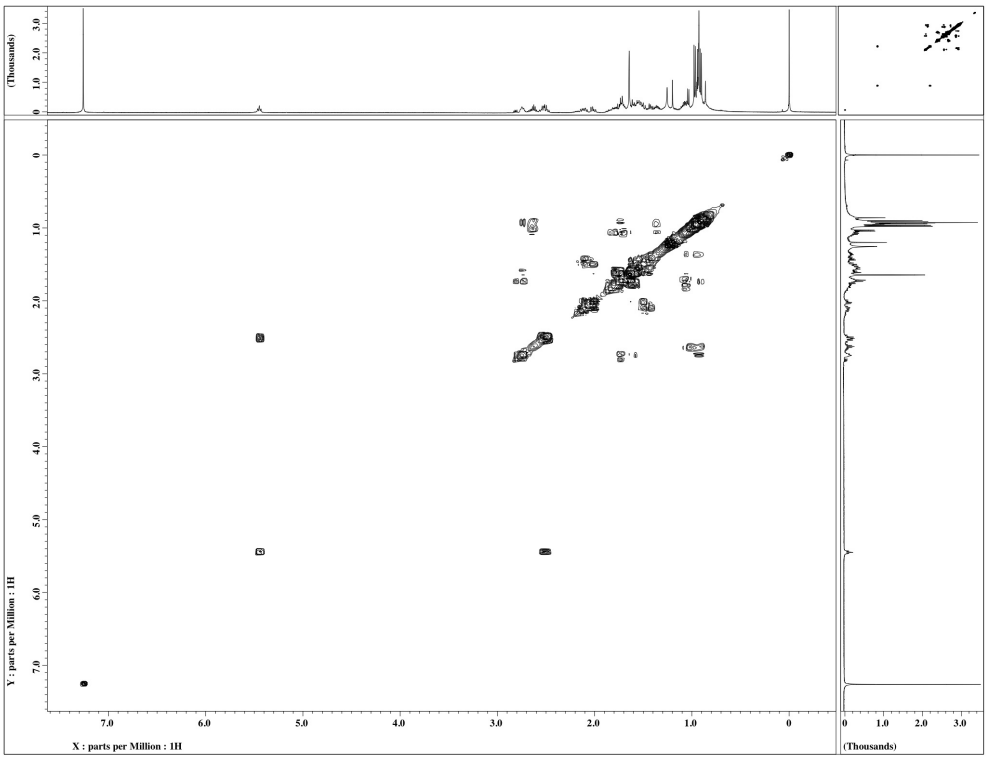


Figure S52. ^{1}H-^{1}H COSY of **10**.

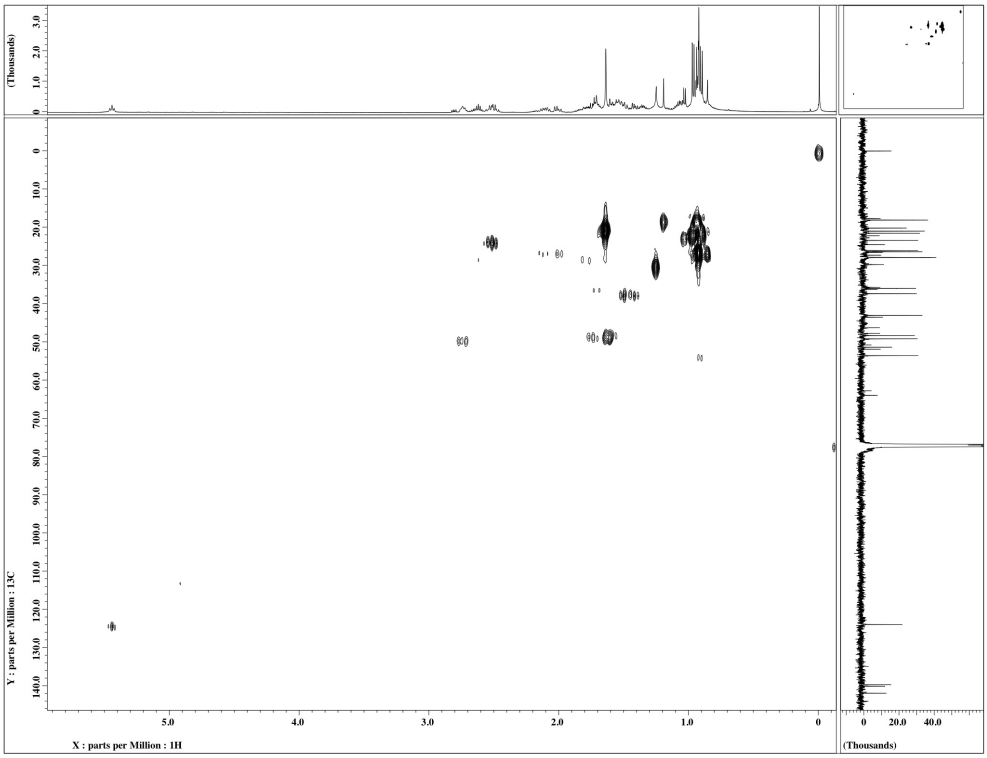


Figure S53. ^{1}H-^{13}C HMQC of **10**.

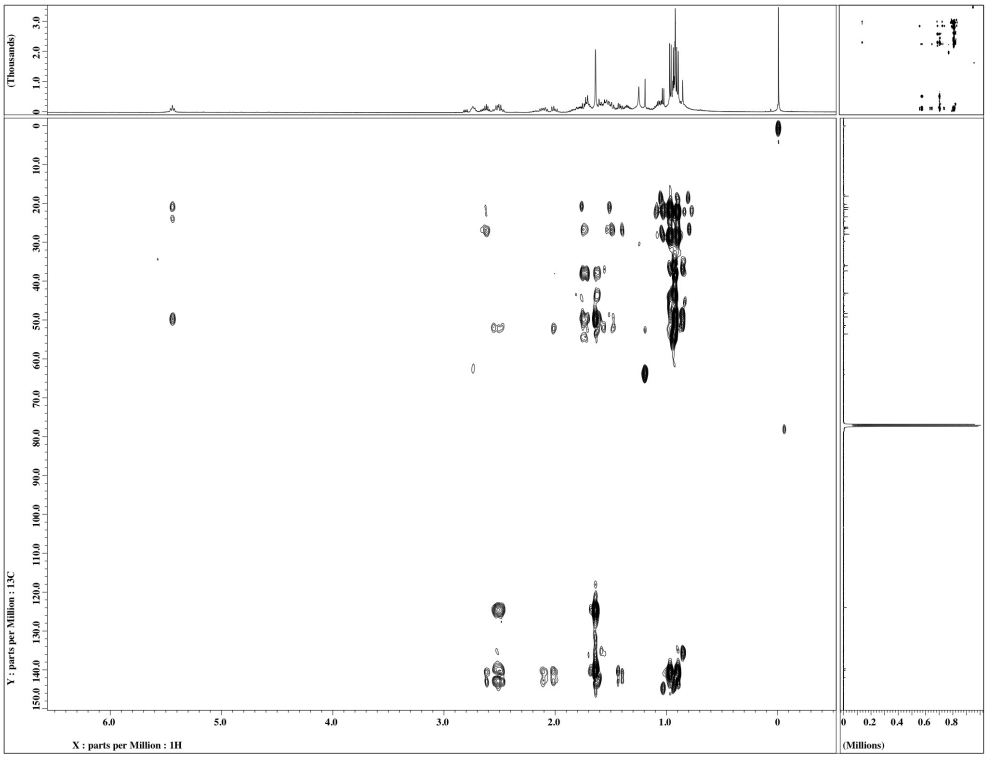


Figure S54. ^{1}H-^{13}C HMBC of **10**.

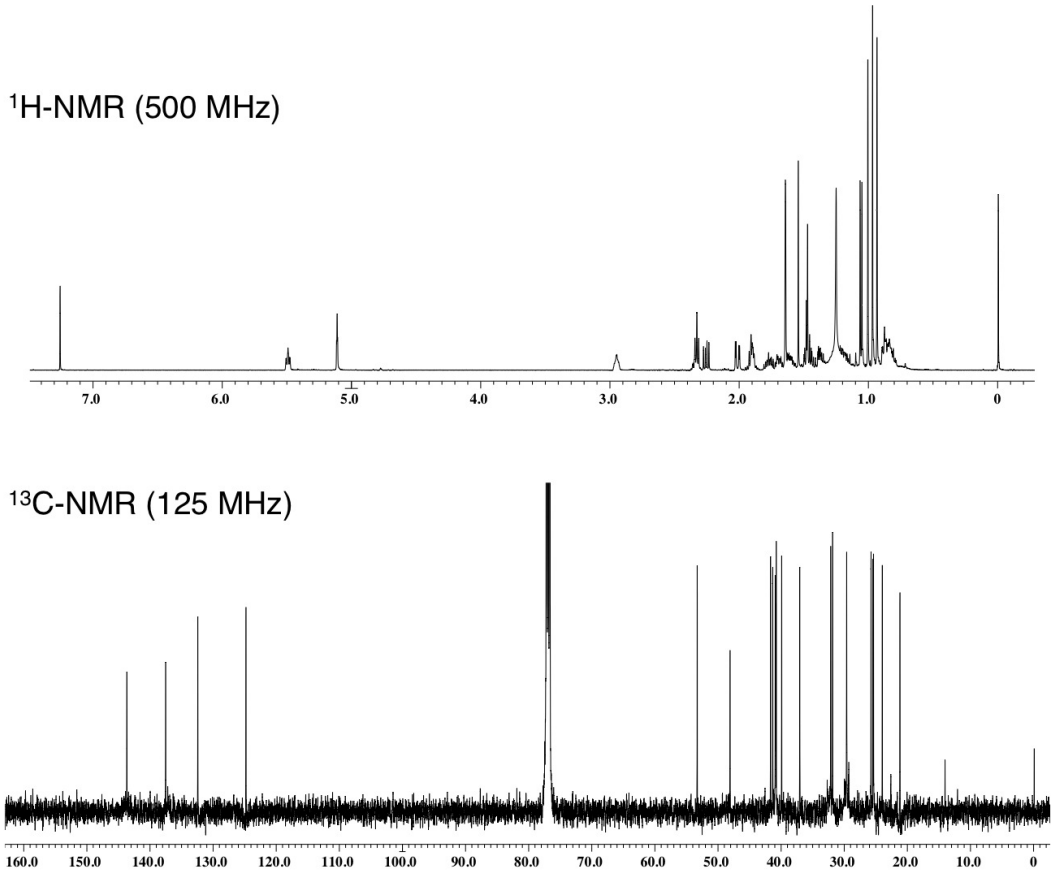


Figure S55. ^{1}H (upper) and ^{13}C (lower) NMR of tsukubadiene (**11**).

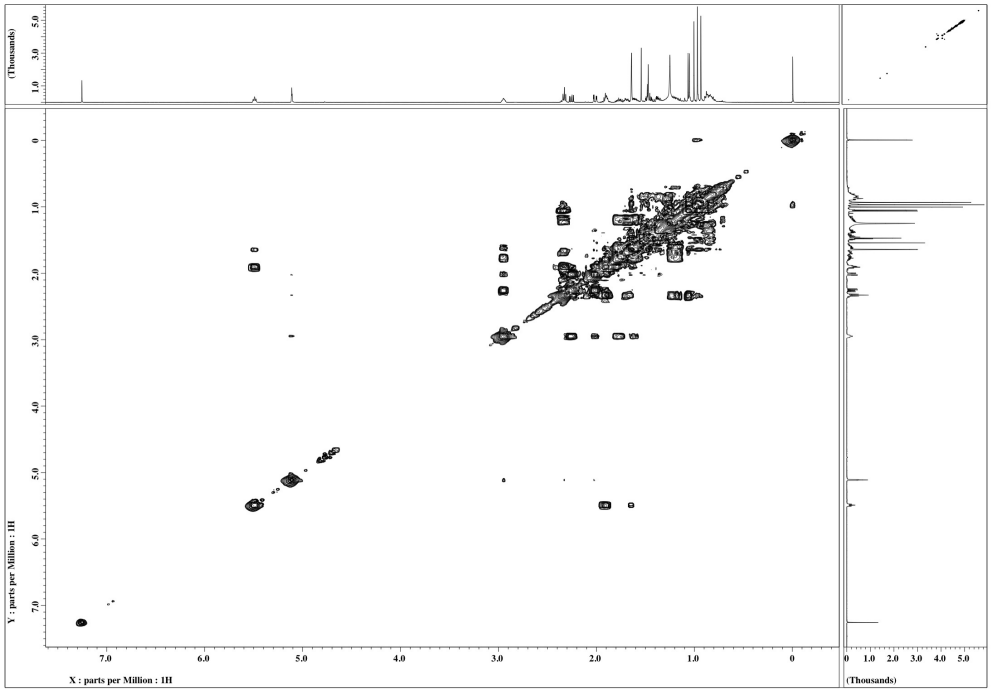


Figure S56. ^{1}H-^{1}H COSY of **11**.

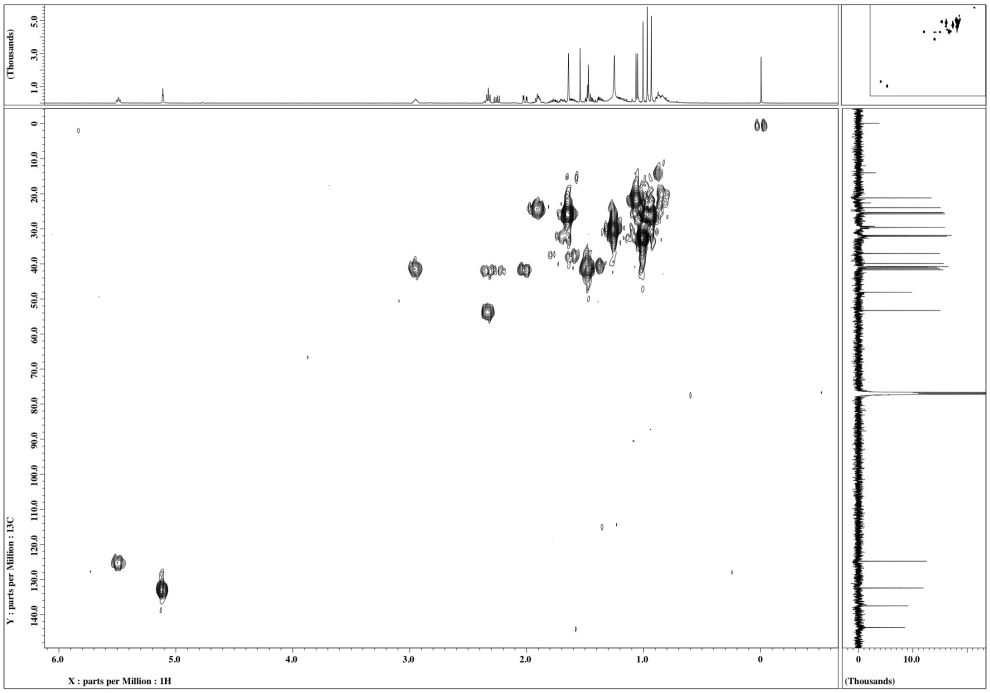


Figure S57. ^{1}H-^{13}C HMQC of **11**.

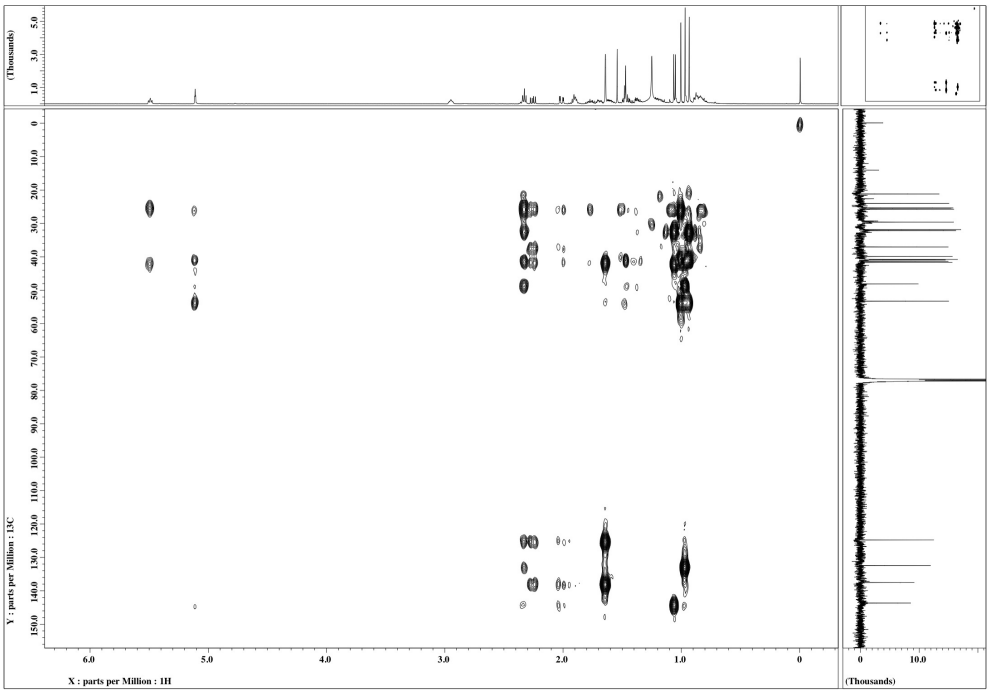


Figure S58. ^{1}H-^{13}C HMBC of **11**.

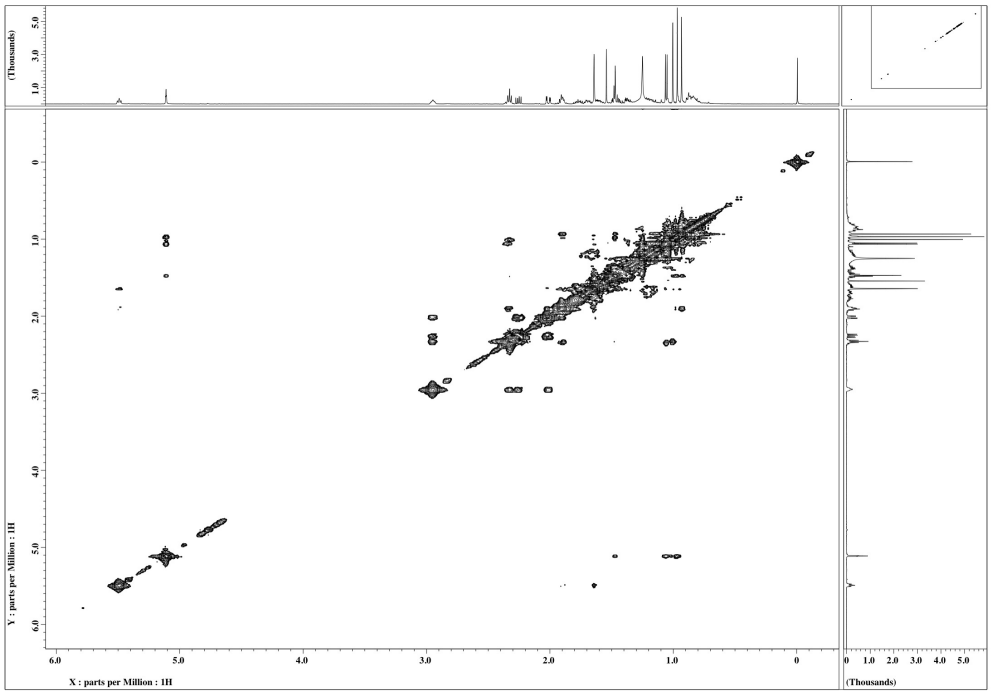


Figure S59. ^{1}H-^{1}H NOESY of **11.**

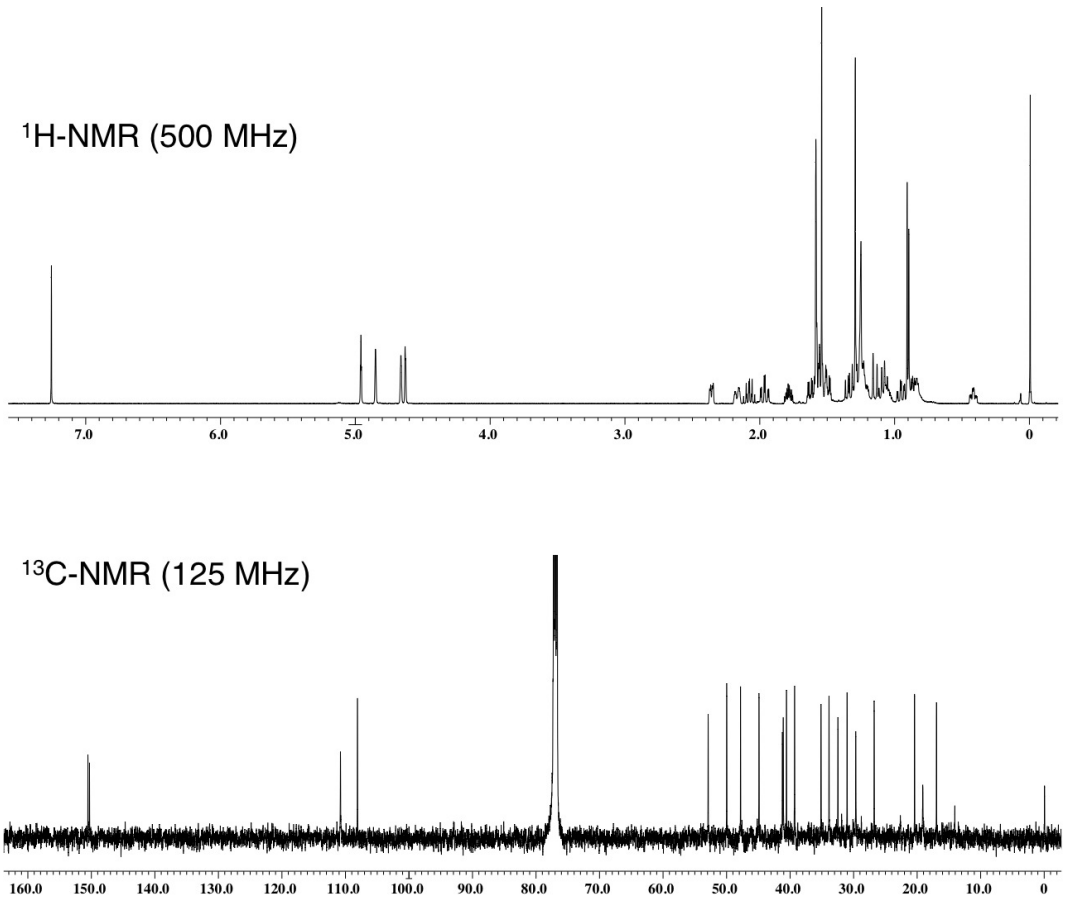


Figure S60. ^{1}H (upper) and ^{13}C (lower) NMR of odyverdiene A (**12**).

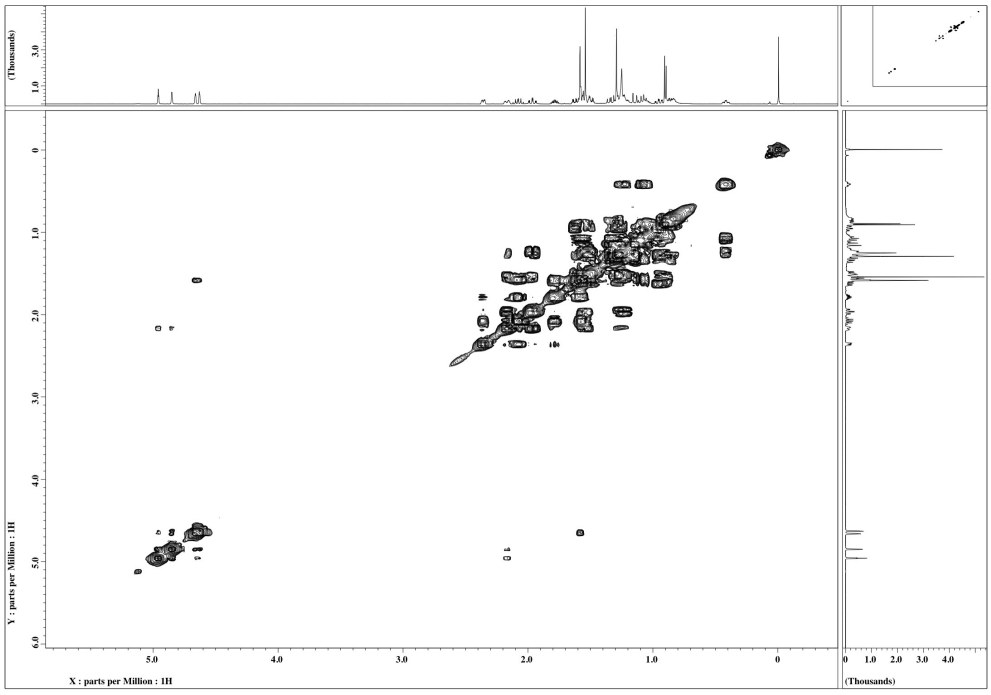


Figure S61. ^{1}H-^{1}H COSY of **12.**

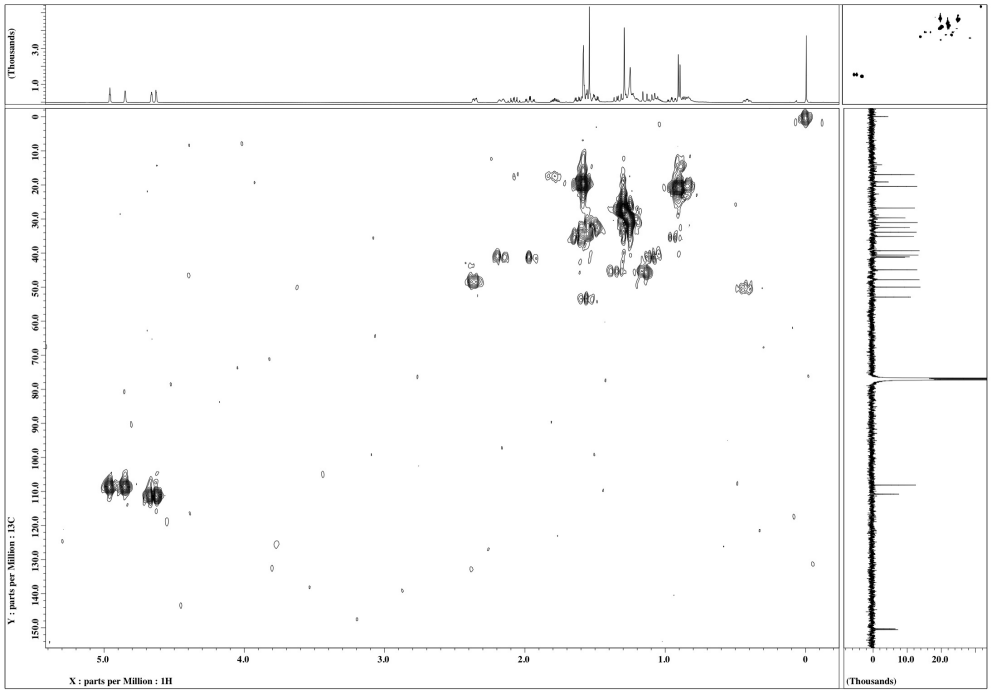


Figure S62. ^{1}H-^{13}C HMQC of **12**.

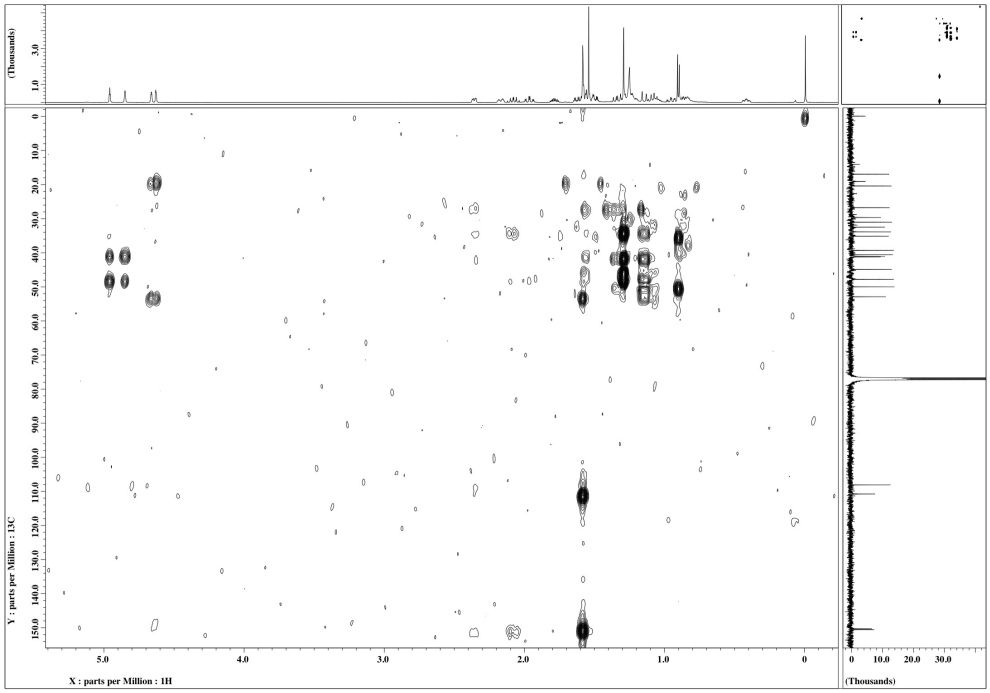


Figure S63. ^{1}H-^{13}C HMBC of **12**.

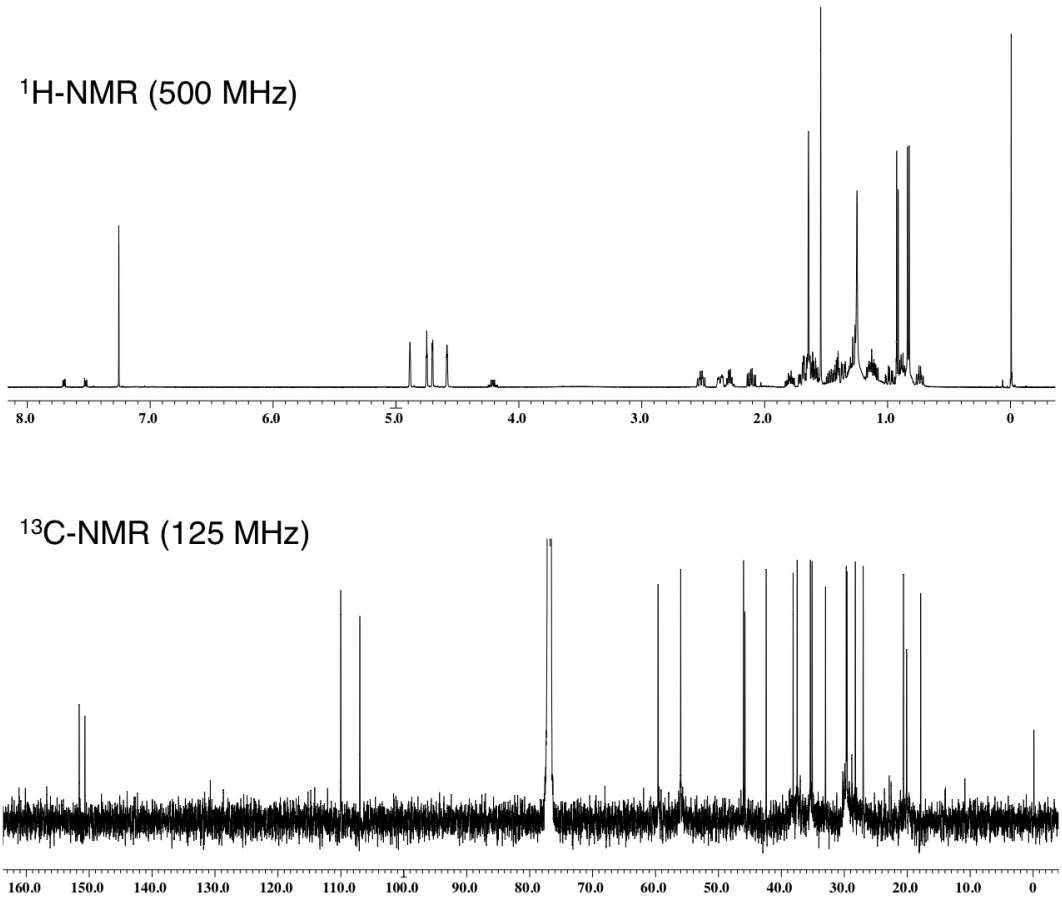


Figure S64. ^{1}H (upper) and ^{13}C (lower) NMR of odyverdiene B (**13**).

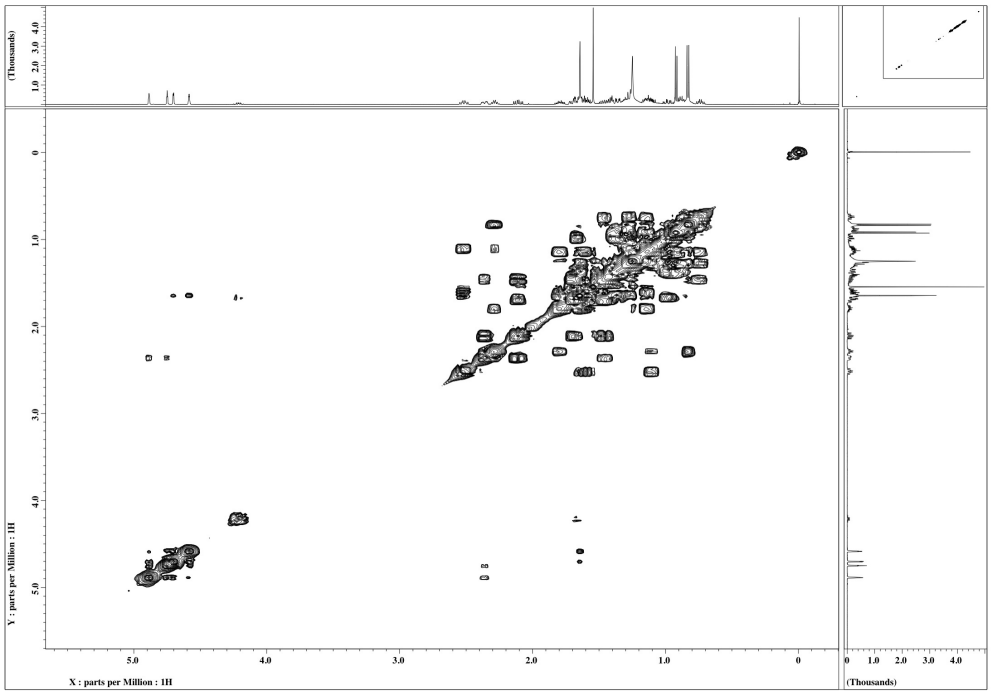


Figure S65. ^{1}H-^{1}H COSY of **13.**

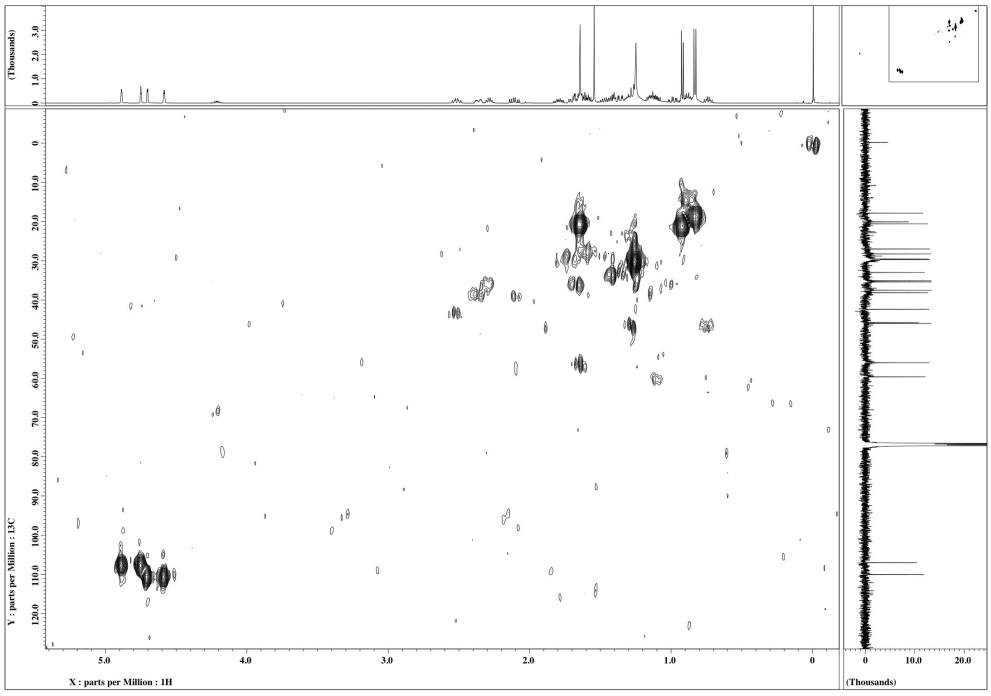


Figure S66. ^{1}H-^{13}C HMQC of **13**.

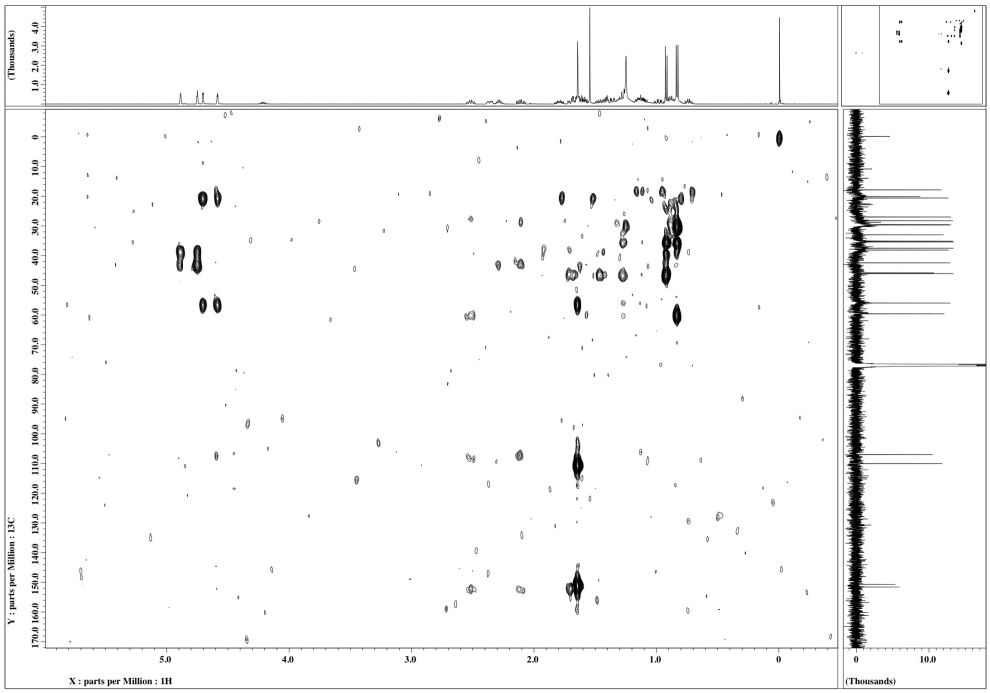


Figure S67. ^{1}H-^{13}C HMBC of **13**.