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Compositional analysis of black soldier fly (*Hermetia illucens* L.) larvae and adults

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Appendix 1. Synthesis of cyclopropane fatty acid methyl esters

General

All manipulations were performed under dry N_2 using standard air-free techniques. Glassware was either dried overnight in a 120 °C oven or flame-dried prior to use and cooled under a stream of dry N_2. Thin layer chromatography (TLC) was performed using silica gel 60 coated plates and visualised with ceric ammonium molybdate (CAM) or 2,4-dinitrophenylhydrazine (DNP) stains. All compounds, solvents and reagents were purchased from commercial sources (Acros Organics, TCI, Alfa Aesar, MilliporeSigma) and used as received unless otherwise noted.^{1}H and ^{13}C NMR spectra were acquired with a Varian VR500 500 MHz spectrometer using $CDCl_3$ with 1% tetramethylsilane (TMS) as solvent. Chemical shifts are reported relative to TMS signal.

Synthesis of cyclopropane fatty acid methyl esters

An oven-dried 4-dram vial was charged with the unsaturated fatty acid methyl ester (0.25 mmol) and equipped with a magnetic stir bar and septum fitted cap. The flask was purged with dry N_2, charged with anhydrous dichloromethane (10 ml), diiodomethane (10 µl, 1.26 mmol) and cooled to 0 °C in an ice-water bath. Diethylzinc solution in toluene (~1.0 M, 15 wt. %; 1.3 ml, 1.3 mmol) was added dropwise to the stirring solution after which point the reaction was warmed slowly to room temperature and stirred for a total of 3 h. The colorless, translucent solution became turbid white after approximately 3 h. The reaction was monitored by GC-FID until greater than >70% conversions were achieved (5-18 h). Saturated NH_4Cl (5 ml) was added to the stirring solution and the contents transferred to a 150 ml Erlenmeyer flask. The mixture was further diluted with saturated brine (20 ml), hexanes (20 ml), 10% HCl (10 ml) and stirred for 15 min. The mixture was extracted twice with hexanes (10 ml) and the organic layer washed successively with saturated Na_2SO_3 (20 ml), 10 % $NaHCO_3$ (10 ml) and saturated brine (20 ml). The organic extract was dried over $MgSO_4$ and concentrated under vacuum to afford a colorless oil. The product was purified by preparative silver ion TLC (20×20 cm, 500 µm thickness, impregnated with 2.5 wt. % $AgNO_3$/MeOH) using 95:5 hexane:diethyl ether as eluent to obtain >99.95% pure product.

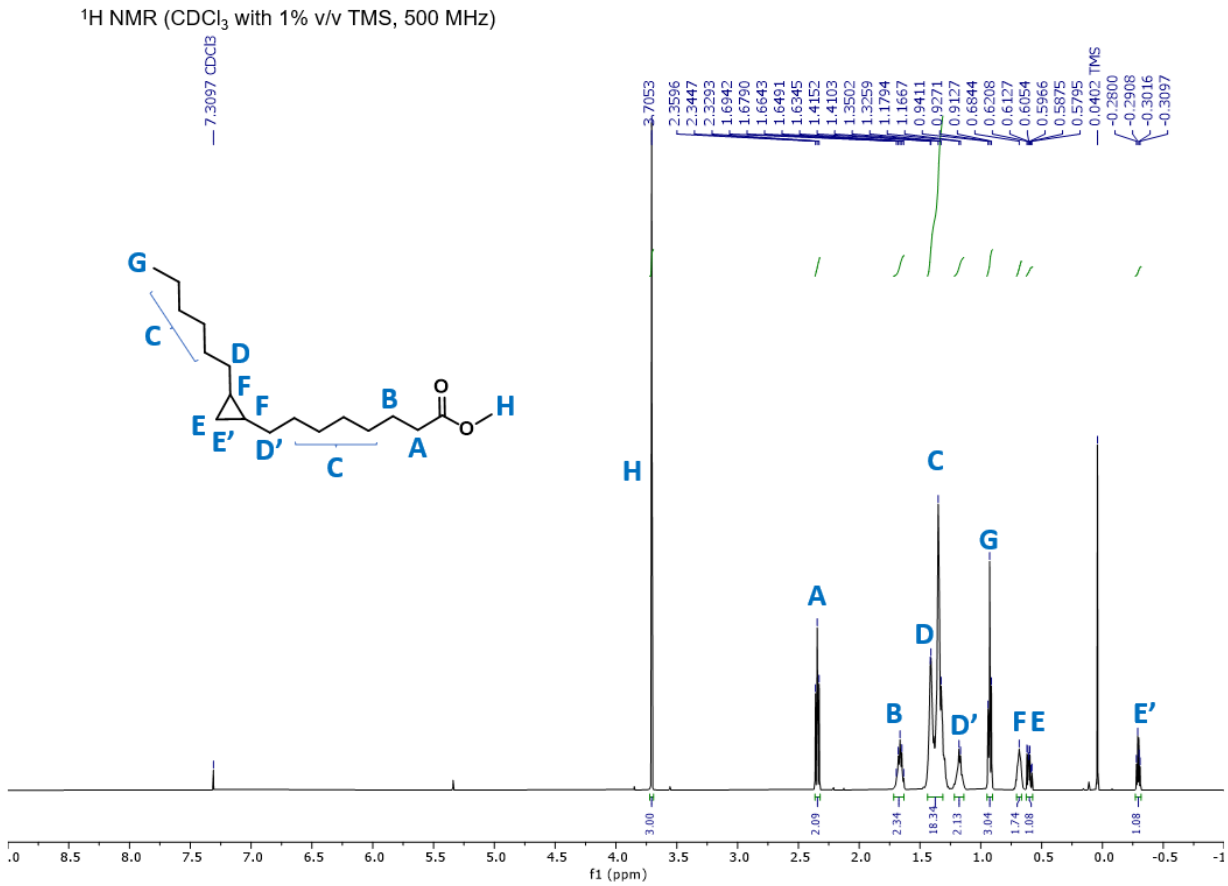

Figure S1. Methyl 8-(2-hexylcyclopropyl)octanoate. ^{1}H NMR (500 MHz, $CDCl_3$) δ 3.71 (s, 3H), 2.34 (t, J = 7.6 Hz, 2H), 1.66 (m, J = 7.5 Hz, 2H), 1.44 – 1.31 (m, 18H), 1.17 (d, J = 6.4 Hz, 2H), 0.93 (t, J = 7.1 Hz, 3H), 0.68 (s, 2H), 0.60 (m, 1H), -0.29 (m, 1H).

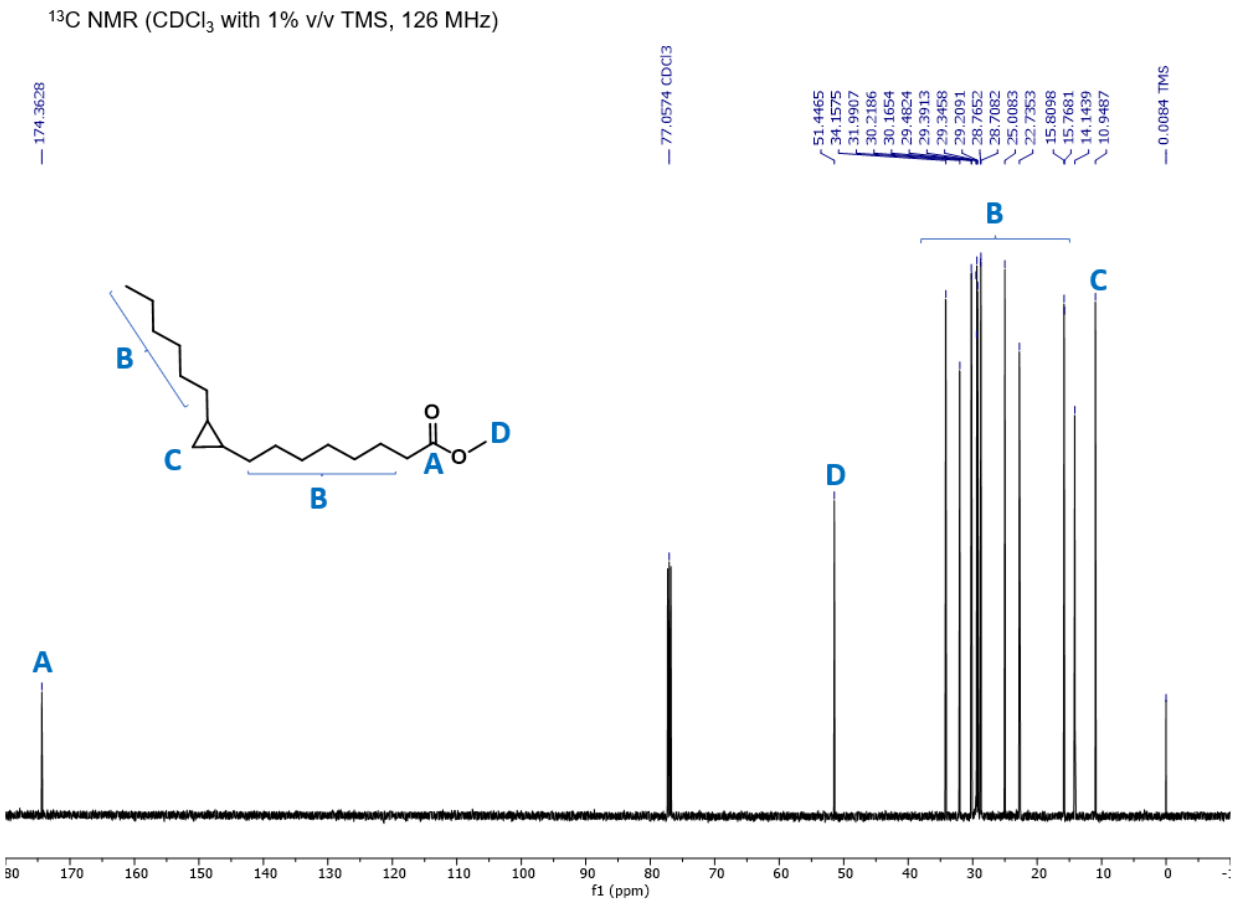

Figure S2. Methyl 8-(2-hexylcyclopropyl)octanoate. ^{13}C NMR (126 MHz, $CDCl_3$) δ 174.36, 77.06, 51.45, 34.16, 31.99, 30.22, 30.17, 29.48, 29.39, 29.35, 29.21, 28.77, 28.71, 25.01, 22.74, 15.81, 15.77, 14.14, 10.95.

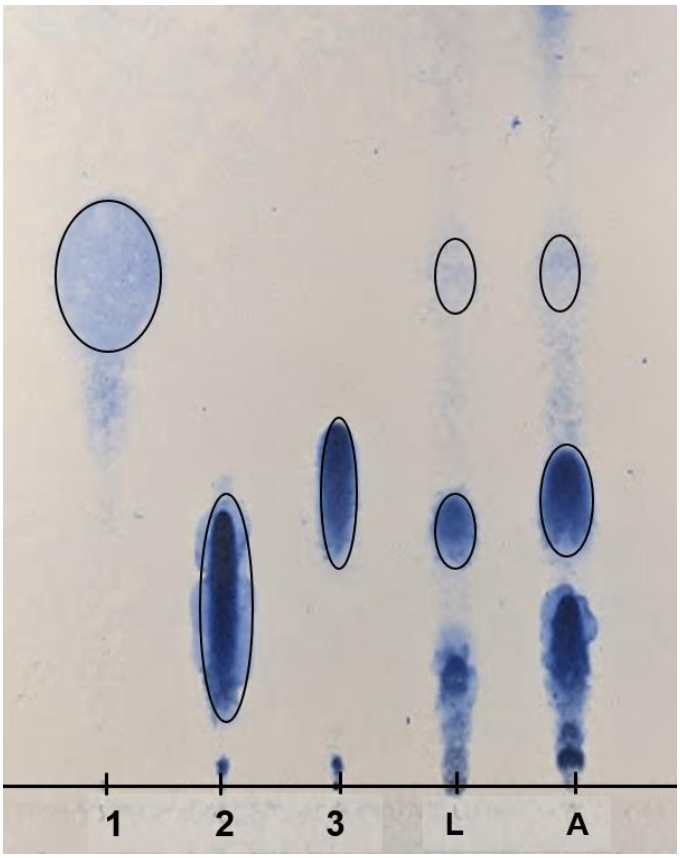

Figure S3. Silver nitrate TLC separation of black soldier fly larvae (L) and adult insect (A) fatty acid methyl ester extracts on silica gel using 95:5 hexane:diethyl ether visualised with ceric ammonium molybdate stain. 1 = methyl stearate; 2 = methyl linoleate; 3 = methyl linolelaidate.

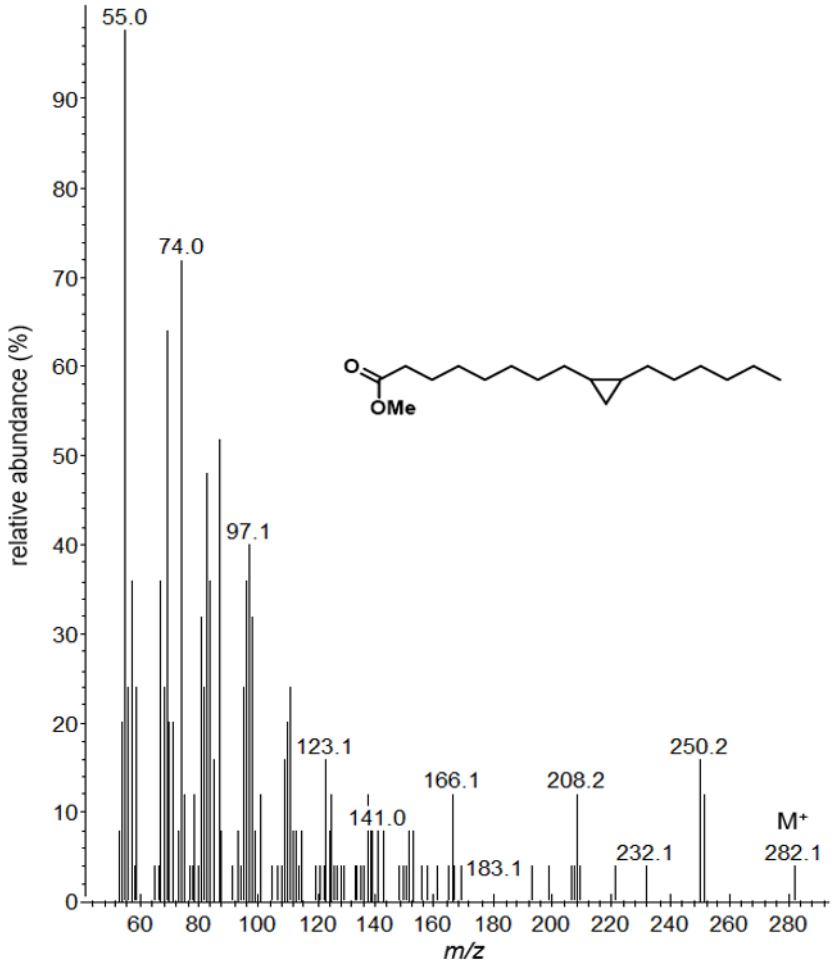

Figure S4. Methyl 8-(2-hexylcyclopropyl)octanoate: EI-MS (70 eV; RI 2013.0): *m/z* 282.1 (5), 250.2 (16), 232.1 (6), 208.2 (12), 166.1 (12), 74.0 (72), 55.0 (100).

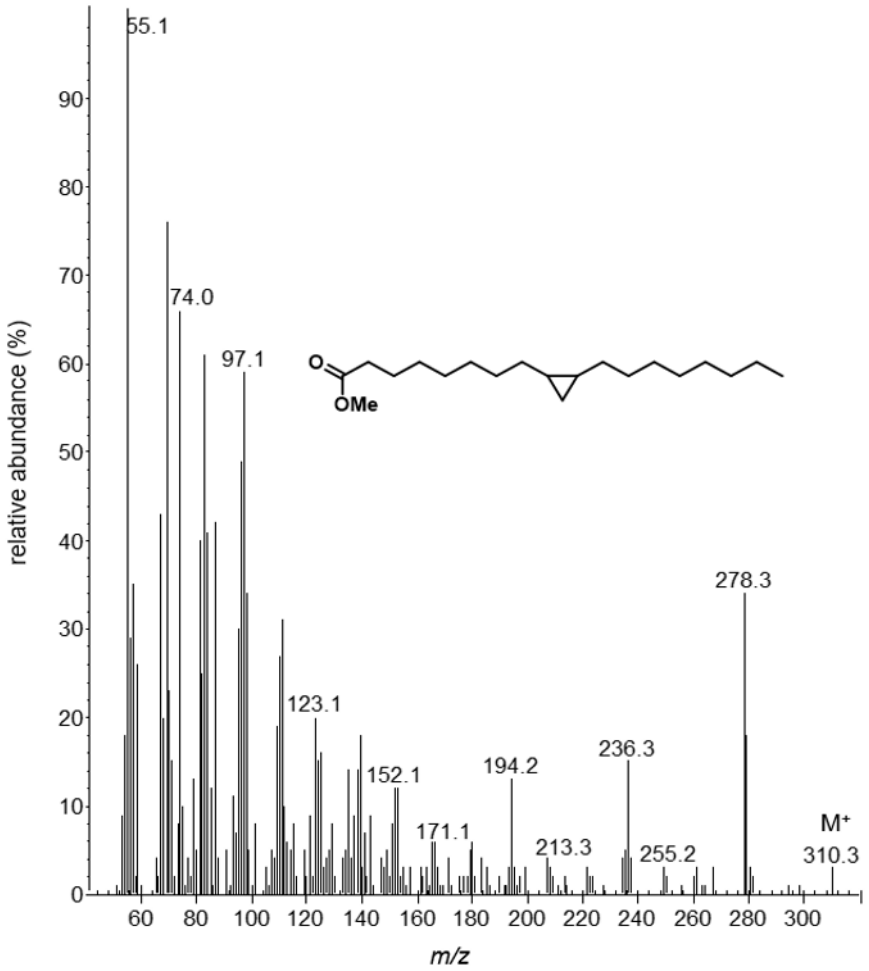

Figure S5. Methyl 8-(2-octylcyclopropyl)octanoate: EI-MS (70 eV; RI: 2213.3): *m/z* 310.3 (5), 278.3 (38), 255.2 (6), 236.3 (16), 19421 (14), 74.0 (76), 55.1 (100).

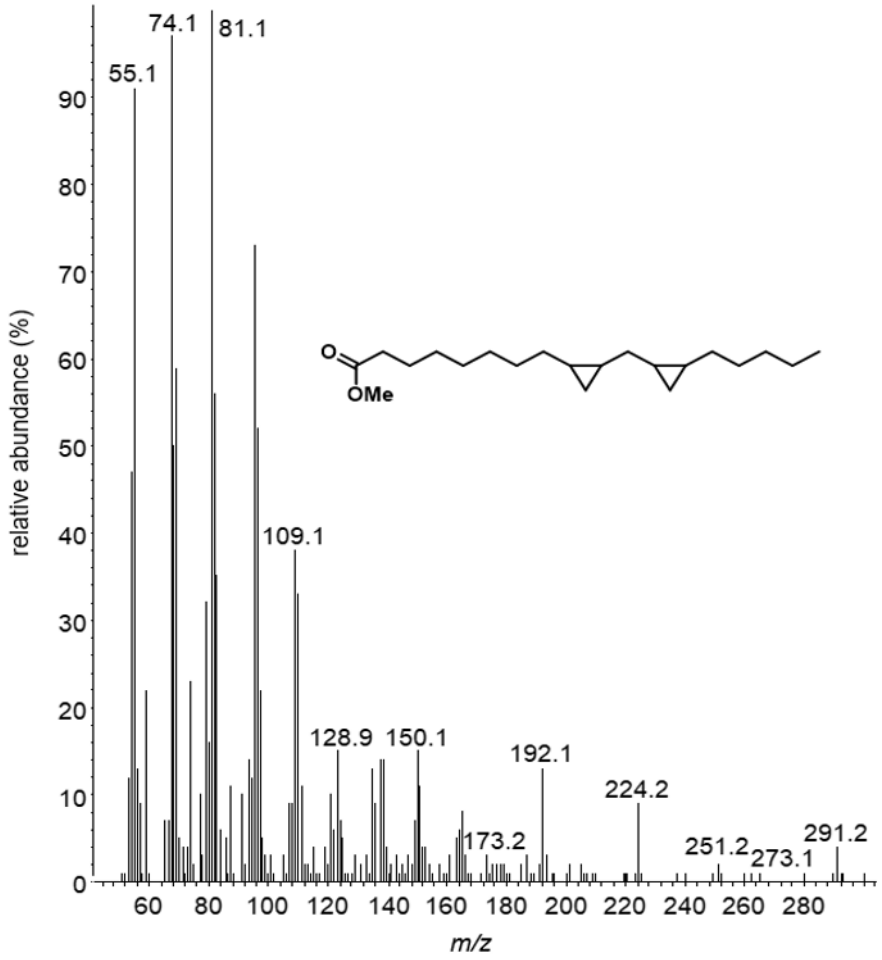

Figure S6. Methyl 8-(2-((2-pentylcyclopropyl)methyl)cyclopropyl)octanoate: EI-MS (70 eV; RI: 2297.3): *m/z* 310.3 (5), 278.3 (38), 255.2 (6), 236.3 (16), 19421 (14), 74.0 (76), 55.1 (100).

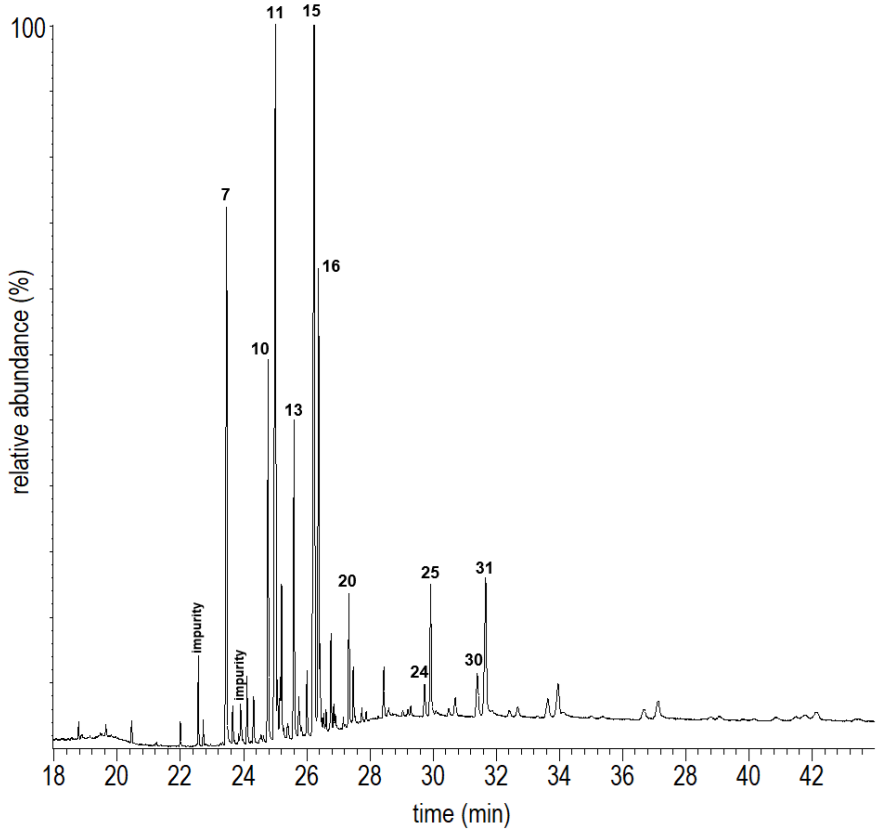

Figure S7. Representative total ion chromatogram (TIC) of black soldier fly adult alkanes. Only select components shown. Refer to Table 4 for quantities; for numbering scheme, start with *n*-nondecane as 1 (numbering scheme not shown on Table 4). 7 = *n*-heptacosane; 10 = *n*-nonacosane; 11 = 11-methylnonacosane; 13 = 3,11-dimethylnonacosane; 15 = 11-methylhentriacontane; 16 = 11,15-dimethylhentriacontane; 20 = 11-methyltritriacontane; 24 = 11-methylheptatriacontane; 25 = 11,15-dimethylheptatriacontane; 30 = 11-methylnonatriacontane; 31 = 11,15-dimethylnonatriacontane.