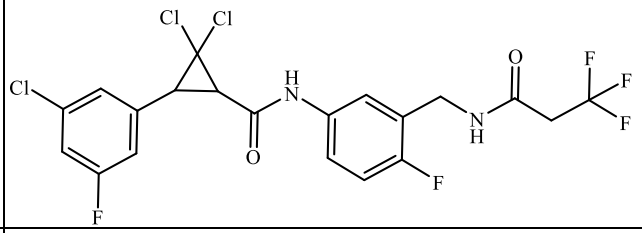
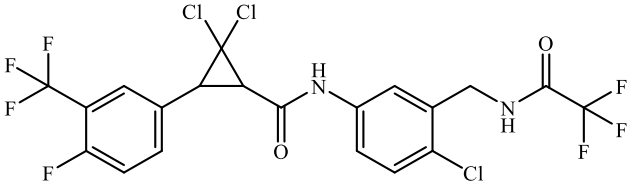
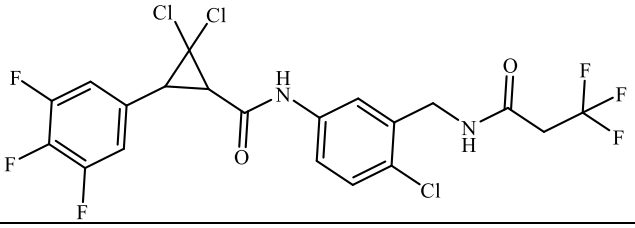
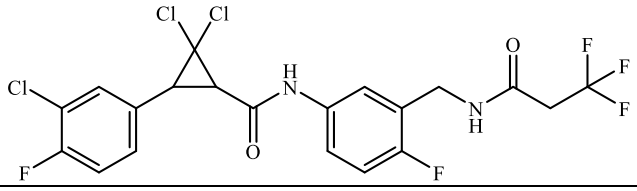
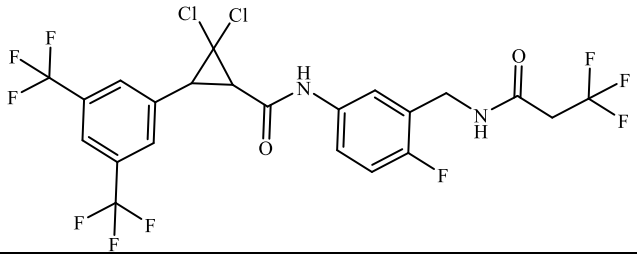
129		2,2-dichloro-3-(3-chloro-5-fluorophenyl)-N-[4-fluoro-3-[[(3,3,3-trifluoro-1-oxopropyl)amino]methyl] phenyl] cyclopropanecarboxamide
174		2,2-dichloro-N-[4-chloro-3-[[(2,2,2-trifluoroacetyl)amino]methyl]phenyl]-3-[4-fluoro-3-(trifluoromethyl)phenyl]cyclopropanecarboxamide
118		2,2-dichloro-N-[4-chloro-3-[[(3,3,3-trifluoro-1-oxopropyl)amino]methyl]phenyl]-3-(3,4,5-trifluorophenyl)cyclopropanecarboxamide
219		2,2-dichloro-3-(3-chloro-4-fluorophenyl)-N-[4-fluoro-3-[[(3,3,3-trifluoro-1-oxopropyl)amino]methyl]phenyl] Cyclopropanecarboxamide
220		3-[3,5-Bis(trifluoromethyl)phenyl]-2,2-dichloro-N-[4-fluoro-3-[[(3,3,3-trifluoro-1-oxopropyl)amino]methyl]phenyl] Cyclopropanecarboxamide

or enantiomers, or diastereomers, or combinations of the foregoing compounds.

Of note is that compounds of this disclosure are characterized by favorable metabolic and/or soil residual patterns and exhibit activity controlling a spectrum of agronomic and nonagronomic invertebrate pests.

Of particular note, for reasons of invertebrate pest control spectrum and economic importance, protection of agronomic crops from damage or injury caused by invertebrate pests by controlling invertebrate pests are embodiments of the disclosure. Compounds of this disclosure because of their favorable translocation properties or systemicity in plants also

compound as a yellow oil (12.87 g). ^{1}H NMR (CDCl3): δ 9.54 (d, 1H), 7.37 (m, 1H), 7.17 (m, 2H), 3.50 (d, 1H), 2.92 (dd, 1H).

Step E: Preparation of 2,2-Dichloro-3-(3,5-dichlorophenyl)cyclopropanecarboxylic acid

Sodium permanganate (40% aqueous solution, 18 g) was added dropwise to 2,2-dichloro-3-(3,5-dichlorophenyl)cyclopropanecarboxaldehyde (12.87 g, 42.90 mmol) in acetone (250 mL) at 15 °C. The reaction mixture was allowed to stir for 2 H warming up to room temperature over that time, then 5 mL of isopropyl alcohol was added and the reaction was allowed to stir for 30 minutes. Volatiles were then removed under reduced pressure to give a crude oil and 100 mL of 1 N hydrochloric acid and 500 mL of ethyl acetate was added. The liquid mixture was added to 100 g of Celite filtering aid and filtered. The organic layer was separated, dried over magnesium sulfate, filtered, and volatiles were removed under reduced pressure to give the desired crude acid product which was washed with hexanes to give a white powder (9.84 g). ^{1}H NMR (CDCl3): δ 7.36 (m, 1H), 7.17 (dd, 2H), 3.43 (d, 1H), 2.87 (d, 1H).

Step F: Preparation of N-[(2-chloro-5-nitrophenyl)methyl]-cyclopropanecarboxamide

The 2-chloro-5-nitrobenzon~~n~~itrile (4.97 g, 27.23 mmol) is dissolved in 100 mL of tetrahydrofuran, stirring under nitrogen. Boran dimethylsulfide complex (2.0 M in THF, 55 mL, 110.0 mmol) is added dropwise at room temperature over 15 minutes. The reaction mixture is then heated to 80°C for 18H. Extremely carefully, 25 mL of 2N hydrochloric acid is added dropwise to the reaction mixture after the heat is removed but the reaction has not cooled down to room temperature. The reaction mixture is then heated to reflux for 1H, then cooled to room temperature. Volatiles were removed under reduced pressure and heating to give the hydrochloric acid salt of 2-chloro-5-nitrobenzylamine which was used without further purification. The 2-chloro-5-nitrobenzylamine (427.0 mg, 2.289 mmol) was taken up in 10 mL of methylene chloride and 1 mL of triethylamine cooled to 0oC and after 15 minutes of stirring all solids dissolve. To this reaction mixture cyclpropylcarbonyl chloride (263.1 mg, 2.518 mmol) was added dropwise keeping the temperature below 5°C. The reaction mixture is allowed to slowly warm up to room temperature over 18 H. The reaction mixture is added to water (50 mL) and extracted with methylene chloride, dried over magnesium sulfate, filtered, and volatiles were removed under reduced pressure to give a crude oil which was chromatographed with eluent system hexanes to ethyl acetate to give 539 mg of the desired product. ^{1}H NMR (CDCl3): δ 8.25 (s, 1H), 8.10 (d, 1H), 7.58 (d, 1H), 6.25 (bs, 1H), 4.60 (d, 2H), 1.44 (m, 1H), 1.00 (m, 2H), 0.80 (m, 2H).

The 2-fluoro-5-nitrobenzon~~n~~itrile (5.000 g, 30.12 mmol) is dissolved in 100 mL of tetrahydrofuran, stirring under nitrogen. Boran dimethylsulfide complex (2.0 M in THF, 55 mL, 110.0 mmol) is added dropwise at room temperature over 15 minutes. The reaction mixture is then heated to 80oC for 18H. Extremely carefully, 25 mL of 2N hydrochloric acid is added dropwise to the reaction mixture after the heat is removed but the reaction has not cooled down to room temperature. The reaction mixture is then heated to reflux for 1H, then cooled to room temperature. Volatiles were removed under reduced pressure and heating to give the hydrochloric acid salt of 2-fluoro-5-nitrobenzylamine which was used without further purification. The 2-fluoro-5-nitrobenzylamine (1.000 g, 5.882 mmol) was taken up in 10 mL of methylene chloride and 1 mL of triethylamine cooled to 0^{o}C and after 15 minutes of stirring all solids dissolve. To this reaction mixture propionyl chloride (821 mg, 6.471 mmol) was added dropwise keeping the temperature below 5^{o}C. The reaction mixture is allowed to slowly warm up to room temperature over 18 H. The reaction mixture is added to water (50 mL) and extracted with methylene chloride, dried over magnesium sulfate, filtered, and volatiles were removed under reduced pressure to give a crude oil which was chromatographed with eluent system hexanes to ethyl acetate to give 799 mg of the desired product. ^{1}H NMR (CDCl3): δ 8.26 (s, 1H), 8.14 (d, 1H), 7.19 (t, 1H), 6.60 (bs, 1H), 4.56 (d, 2H), 2.33 (q, 2H), 1.19 (t, 3H).

Step B: Preparation of N-[(2-fluoro-5-aminophenyl)methyl]-propanamide

The N-[(2-fluoro-5-nitrophenyl)methyl]-propanamide (779 mg, 3.466 mmol) was dissolved in 50 mL of ethyl acetate and 10 mL of ethanol and placed under nitrogen in a parr bottle. Platinum oxide (100 mg) was added in one portion and the reaction mixture was purged three times with nitrogen and then purged three times with hydrogen, obtaining a pressure of about 50 psi of hydrogen gas the reaction mixture was shaken for 3H. The hydrogen gas was removed and the reaction mixture was filtered through Celite. The filtrate was placed on a rotovap and the volatiles were removed to obtain 458 mg of the title compound as a light yellow solid. ^{1}H NMR (CDCl3): δ 6.83 (t, 1H), 6.64 (dd, 1H), 6.52 (ddd, 1H), 5.81 (bs, 1H) 4.39 (d, 2H), 3.56 (bs, 2H), 2.23 (q, 2H), 1.16 (t, 3H).

Step C: Preparation of 2,2-dichloro-3-(3,5-dichlorophenyl)-N-[4-fluoro-3-[(propanoylamino)methyl]phenyl]cyclopropane-1-carboxamide

The 2,2-dichloro-3-(3,5-dichlorophenyl)cyclopropanecarboxylic acid (500 mg, 1.666 mmol) was dissolved in 10 mL of methylene chloride and oxalyl chloride (228 mg, 1.800 mmol) was added and cooled to 0oC. Ten drops of dimethylformamide was then added and the reaction mixture was allowed to stir for 15 minutes, at which time bubbling occurred. The reaction mixture was allowed to warm up to room temperature over the course of 1H, at which

time the N-[(2-fluoro-5-aminophenyl)methyl]-propanamide (294.0 mg, 1.500 mmol) was added followed by 1 mL of triethylamine. The reaction mixture was allowed to stir at room temperature for 18 H. The reaction mixture was added to an aqueous sodium bicarbonate solution and extracted three times with 25 mL of methylene chloride, then dried over magnesium sulfate, filtered, and volatiles removed under reduced pressure to give a crude solid which was chromatographed on the MPLC with an eluent of hexanes to 50% ethyl acetate. This purification provided 157.9 mg of the title compound. ^{1}H NMR (CDCl3): δ 9.49 (bs, 1H), 7.68 (d,1H), 7.33 (s, 1H), 7.27 (m, 1H), 7.16 (s, 2H), 6.97 (t, 1H), 6.24 (bs, 1H), 4.44 (d, 2H), 3.51 (d, 1H), 3.03 (d, 1H), 2.31 (q, 2H), 1.19 (t, 3H).

SYNTHESIS EXAMPLE 3

Preparation of ~~2,2, dichloro-N-[4-chlor-3-[(cyclopropanecarbonylamino)methyl]phenyl]-3-[3,4,5-trifluorophenyl)phenyl]cyclopropane-1-carboxamide~~2,2-dichloro-N-[4-chloro-3-[[(cyclopropylcarbonyl) amino] methyl]phenyl]-3-[4-fluoro-3-(trifluoromethyl)phenyl]cyclopropanecarboxamide (compound 39)

Step A: Preparation of (E)-3-(4-Fluoro-3-trifluoromethylphenyl)acrylaldehyde

Acetaldehyde (50 g, 1.136 moles) was added to a stirred solution of 4-fluoro-3-(trifluoromethyl)benzaldehyde (24.00 g, 125.0 mmol) in 50 mL of methanol at 0^{o}C, stirring, under nitrogen. A solution of potassium hydroxide (1.0 g, 17.86 mmol) in 10 mL of methanol was added dropwise. Allowed the reaction mixture to stir for 40 minutes slowly warming up to room temperature. Acetic anhydride (75 mL) was added at 10^{o}C to the reaction which was then heated to 80^{o}C for 1H. The reaction then was cooled to room temperature and 20 mL of concentrated hydrochloric acid was added. The reaction was then heated to reflux for 30 minutes. The reaction mixture was diluted with 500 mL of water and extracted with 250 mL of ethyl acetate, the organic layer was dried with magnesium sulfate, filtered, and the volatiles were removed under reduced pressure to afford 22.78 g of the title compound which was used in the next step without further purification. ^{1}H NMR (CDCl3): δ 9.73 (d, 1H), 7.74-7.81 (m, 2H), 7.45 (d, 1H), 7.29 (d, 1H), 6.69 (dd, 1H).

Step B: Preparation of (E)-2-Fluoro-1-trifluoromethyl-5-(3,3-diethoxyprop-1-en-1-yl)benzene

Triethylorthoformate (19.32 g, 130.6 mmoles) was added to (E)-3-(4-Fluoro-3-trifluoromethylphenyl)acrylaldehyde (22.78 g, 104.5 mmoles) in ethanol (200 mL). A catalytic amount of N-bromosuccinimide (500 mg) was added to the reaction mixture and was allowed to stir for 24 hours at room temperature. Ethanol was removed under reduced pressure. The resulting reaction mixture residue was added to an aqueous solution of 5% sodium hydroxide (100 mL) and extracted 3 x 300 mL of diethyl ether, dried over anhydrous

magnesium sulfate, filtered, and volatiles were removed under reduced pressure to yield the desired product (29.33 g). 1H NMR (CDCl3): δ 7.61 (d, 1H), 7.56 (dt, 1H), 7.16 (t, 1H), 6.68 (d, 1H), 6.19 (dd, 1H), 5.08 (d, 1H), 3.56-3.72 (m, 4H), 1.22-1.26 (m, 6H).

Step C: Preparation of 2-Fluoro-1-trifluoromethyl-5-[2,2-dichloro-3-(diethoxymethyl) cyclopropyl]benzene

The (E)-2-Fluoro-1-trifluoromethyl-5-(3,3-diethoxyprop-1-en-1-yl)benzene (29.33 g, 100.4 mmol) was taken up in chloroform (400 mL) and tetrabutylammonium hexafluorophosphonate (1.000 g) was added and with vigorous stirring the reaction mixture was heated to 40°C. Aqueous sodium hydroxide (50% by weight, 60 mL) was added dropwise over the course of 30 minutes. The reaction continued heating overnight. The reaction was then cooled to room temperature and diluted with 400 mL of hexanes and the organic layer was filtered through celite, dried over anhydrous magnesium sulfate, filtered, and volatiles were removed under reduced pressure to give 18.36 g of a dark oil which was used without further purification. ^{1}H NMR (CDCl3): δ 7.49 (d, 1H), 7.44 (dt, 1H) 7.19 (t, 1H) 4.59 (d, 1H), 3.58-3.77 (m, 4H), 2.83 (d, 1H), 2.27 (dd, 1H), 1.32 (t, 3H), 1.21 (t, 3H).

Step D: Preparation of 2,2-Dichloro-3-(4-fluoro-3-trifluoromethylphenyl) cyclopropanecarboxaldehyde

The 2-fluoro-1-trifluoromethyl-5-[2,2-dicloro-3-(diethoxymethyl)cyclopropyl]benzene (18.36 g, 48.96 mmol) was taken up in acetonitrile (400 mL) and 42 mL of concentrated aqueous hydrochloric acid was added and the reaction was allowed to stir at room temperature for 16H. Water (200 mL) was added and volatiles were removed under reduced pressure, followed by extraction 2x400 mL hexanes. The organic layers were combined and dried over magnesium sulfate, filtered, and volatiles were removed under reduced pressure. This crude mixture was purified by MPLC (silica gel eluted with 0-25% ethyl acetate in hexanes) to give the title compound as a yellow oil (9.681 g). ^{1}H NMR (CDCl3): δ 9.55 (d, 1H), 7.51 (d, 1H), 7.47 (dt, 1H), 7.25 (t, 1H), 3.56 (d, 1H), 2.94 (dd, 1H)

Step E: Preparation of 2,2-Dichloro-3-(4-fluoro-3-trifluoromethylphenyl) cyclopropanecarboxylic acid

Sodium permanganate (40% aqueous solution, 13.50 g) was added dropwise to 2,2-dichloro-3-(4-fluoro-3-trifluoromethylphenyl)cyclopropanecarboxaldehyde (9.681 g, 30.54 mmol) in acetone (200 mL) at 15°C. The reaction mixture was allowed to stir for 2 H warming up to room temperature over that time, then 5 mL of isopropyl alcohol was added and the reaction was allowed to stir for 30 minutes. Volatiles were then removed under reduced pressure to give a crude oil and 100 mL of 1 N hydrochloric acid and 500 mL of ethyl acetate