



(51) International Patent Classification:

A01N 43/00 (2006.01) C07D 263/32 (2006.01)
A01N 43/40 (2006.01) C07D 285/12 (2006.01)
A01N 43/76 (2006.01) C07D 285/08 (2006.01)
A01N 43/78 (2006.01) C07D 213/40 (2006.01)
A01N 43/82 (2006.01) C07D 213/51 (2006.01)
A01P 13/00 (2006.01) C07D 277/40 (2006.01)
C07D 213/16 (2006.01) C07D 333/28 (2006.01)
C07D 213/44 (2006.01) A01N 37/44 (2006.01)
C07D 213/54 (2006.01) A01N 37/46 (2006.01)
C07D 213/61 (2006.01) A01P 13/02 (2006.01)
C07D 277/24 (2006.01) A01P 21/00 (2006.01)
C07D 277/30 (2006.01)

(21) International Application Number:

PCT/IL2023/050017

(22) International Filing Date:

05 January 2023 (05.01.2023)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

63/266,432 05 January 2022 (05.01.2022) US

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, CV, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE,

(54) Title: NOVEL DERIVATIVES OF NON-CODED AMINO ACIDS AND THEIR USE AS HERBICIDES

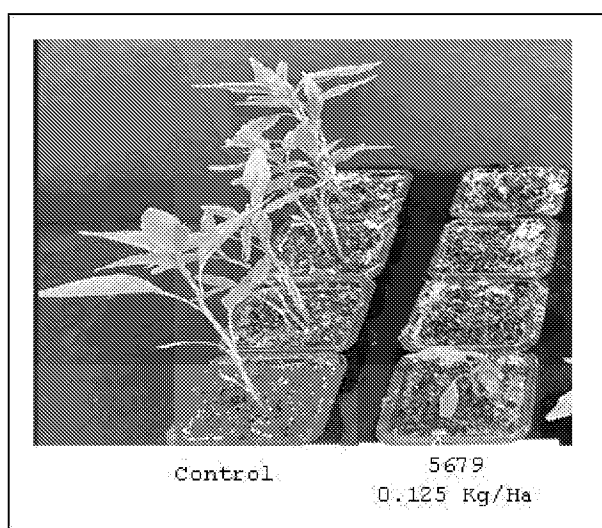


Figure 2

(57) Abstract: Novel non-coded amino acids derivatives having herbicidal activity, agricultural compositions, process for their manufacture and their use in crop protection are provided.



DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU,
LV, MC, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI,
SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN,
GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

NOVEL DERIVATIVES OF NON-CODED AMINO ACIDS AND THEIR USE AS HERBICIDES

FIELD OF THE INVENTION

The invention relates to novel chemical compounds having herbicidal activity, process for their manufacture and their use in crop protection.

5 BACKGROUND OF THE INVENTION

In addition to their role as protein constituents, amino acids and their derivatives are also involved in a plethora of cellular reactions and therefore they influence a number of physiological processes such as plant growth and development, intracellular pH control, generation of metabolic energy or redox power, and resistance to both abiotic and biotic stress.

10 Furthermore, a role for amino acids during signaling in plants has recently been discussed. In this context, regulation of amino acid content, fluxes, and transport through the plant are critical for plant adaptation to carbon and nitrogen status, development, and defense.

Pools of all amino acids is significantly affected during stress. Proline is known to significantly increase during the stress response in several plants and considered to represent a compatible
15 osmolyte. Moreover, branched-chain amino acids are also much induced during various stresses.

Mechanisms underlying regulation of amino acids pools require further elucidations. Local amino acid concentrations depend on the synthesis and degradation rates of proteins as well as amino acids and on transport processes. These processes rather modify the total pool size,
20 which is especially relevant when bulk degradation takes place such as during germination and senescence.

Crop protection with herbicides is a key elements of global food sustainability. Unfortunately, herbicide resistance may be developed shortly after the introduction of the herbicides. According to the herbicide resistance mechanisms, all processes can be grouped as follows:
25 target-site resistance, non-target-site resistance, cross-resistance and multiple-resistance. Target-site resistance is generally due to a single or several mutations in the gene encoding the herbicide-target enzyme, which, in turn, decreases the affinity for herbicide binding to that

enzyme. Non-target-site resistance is caused by mechanisms that reduce the amount of herbicidal active compound before it can attack the plant through the reduced absorption or altered translocation, increased herbicide sequestration or enhanced herbicide metabolism. Cross-resistance means that a single-resistance mechanism causes resistance to several herbicides with some mode of action. Multiple-resistance is a situation where two or more resistance mechanisms are present within the same plant, often due to sequential selection by herbicides with different modes of action. Currently, herbicide resistance has been reported in a multitude of weed biotypes around the globe. Many of those biotypes are resistant to acetolactate synthase (ALS) inhibitors PS I and PS II inhibitors, ACC-ase inhibitors and EPSPS inhibitors (herbicides of Groups 2, 1, 22, 5, and 9, respectively).

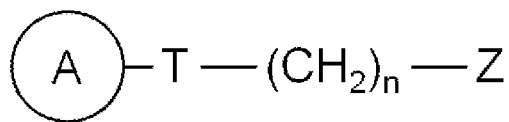
New compounds effective for controlling the growth of undesired vegetation are in constant demand. In the most common situation, such compounds are sought to selectively control the growth of weeds in useful crops such as cotton, rice, corn, wheat and soybeans, to name a few. Unchecked weed growth in such crops can cause significant losses, reducing profit to the farmer and increasing costs to the consumer. The importance of controlling weeds resistant to one or more classes of herbicides has gained particular importance in the last decade. In other situations, herbicides are desired which will control all plant growth.

Examples of areas in which complete control of all vegetation is desired are areas around railroad tracks, storage tanks and industrial storage areas. Identifying new compounds having herbicidal activity which are more effective, less costly and environmentally safe remains long and unmet need.

SUMMARY OF THE INVENTION

It is a principal object of the present invention to provide novel potent and safe agricultural compositions comprising chemical compounds, derivatives of non-coded amino acids having herbicidal activity, processes for their manufacture and their use in crop protection.

According to some embodiments, the invention provides an agricultural composition comprising a compound or a salt thereof having the structure



or a salt thereof, wherein:

A is cyclopentadiene, benzene or indene scaffold comprising from 1 to 4 heteroatoms; wherein each of the heteroatoms is independently selected from the group consisting of N, S, Se, and O; and wherein one or more of the carbon atoms of the ring are optionally chemically attached to at least one of the groups consisting of: $-\text{SO}_2\text{CF}_3$, $-\text{O}-\text{SO}_2\text{CF}_3$, $-\text{NR}_3^+$, $-\text{SO}_2\text{R}$, $-\text{CX}_3$, CX_2R , $-\text{COX}$, $-\text{CHO}$, $-\text{COR}$, $-\text{CO}_2\text{R}$, $-\text{CONH}_2$, $-\text{CONHR}$, $-\text{CONR}_2$, $-\text{N}=\text{O}$, $-\text{N}\equiv\text{N}^+$, $-\text{N}=\text{NR}$, $-\text{CR}=\text{NR}$, $-\text{N}=\text{CR}_2$, $-\text{F}$, $-\text{Cl}$, $-\text{Br}$, and $-\text{I}$, and wherein X is selected from F, Cl, Br and I;

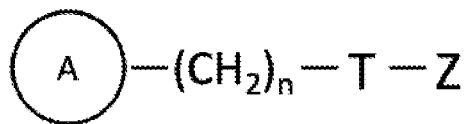
n is 0 to 5;

10 T is unsubstituted or substituted methylene group with one or two halides, $-\text{SO}_2\text{CF}_3$, $-\text{O}-\text{SO}_2\text{CF}_3$, $-\text{NR}_3^+$, $-\text{SO}_2\text{R}$, $-\text{CX}_3$, $-\text{CX}_2\text{R}-\text{COX}$, $-\text{CHO}$, $-\text{COR}$, $-\text{CO}_2\text{R}$, $-\text{CONH}_2$, $-\text{CONHR}$, $-\text{CONR}_2$, $-\text{F}$, $-\text{N}=\text{O}$, $-\text{N}\equiv\text{N}^+$, $-\text{N}=\text{NR}$, $-\text{CR}=\text{NR}$, $-\text{N}=\text{CR}_2$, and wherein X is selected from $-\text{F}$, $-\text{Cl}$, $-\text{Br}$ and $-\text{I}$; and,

15 Z is $-\text{COOH}$, $-\text{COO}^-$, $-\text{OH}$, $-\text{O}-\text{R}$, $-\text{COOR}$ with saturated or non-saturated alcohol residues with straight, branched, cyclic, aromatic or heteroaromatic chain; $-\text{O}-(\text{CH}_2\text{CH}_2\text{O})_n\text{R}$ ($n\geq 1$); $-\text{O}-(\text{CHMeCH}_2\text{O})_n\text{R}$ ($n\geq 1$); substituted or unsubstituted phosphate group, sulfonyl group, carbamoyl group, primary amine, secondary amine, tertiary amine, carboxamide, $-\text{NR}-\text{O}-\text{R}$, $-\text{O}-\text{NR}_2$, hydrazine, $-\text{NH}-\text{COR}$, and methanimidamide moiety or a salt thereof;

20 wherein R is selected from H, substituted or non-substituted alkyl, and substituted or non-substituted aryl group; and, wherein the composition comprises at least one agriculturally acceptable carrier.

According to some embodiments, the invention provides a method of controlling undesired plant growth, comprising applying to the locus of the undesired plant growth a herbicidally effective amount of a compound having the structure



or a salt thereof, wherein:

A is cyclopentadiene, benzene and indene scaffold comprising from 1 to 4 heteroatoms; wherein each of the heteroatoms is independently selected from the group consisting of N, S, Se, and O; and wherein one or more of the carbon atoms of the ring are optionally chemically attached to at least one of the groups consisting of: $-\text{SO}_2\text{CF}_3$, $-\text{O}-\text{SO}_2\text{CF}_3$, $-\text{NR}_3^+$, $-\text{SO}_2\text{R}$, $-\text{CX}_3$, $-\text{CX}_2\text{R}$, $-\text{COX}$, $-\text{CHO}$, $-\text{COR}$, $-\text{CO}_2\text{R}$, $-\text{CONH}_2$, $-\text{CONHR}$, $-\text{CONR}_2$, $-\text{N}=\text{O}$, $-\text{N}=\text{N}^+$, $-\text{N}=\text{NR}$, $-\text{CR}=\text{NR}$, $-\text{N}=\text{CR}_2$, $-\text{F}$, $-\text{Cl}$, $-\text{Br}$, and $-\text{I}$; and wherein X is selected from F, Cl, Br and I;

n is 0 to 5;

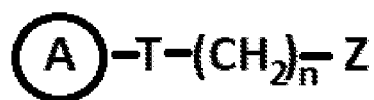
T is unsubstituted or substituted methylene group with one or two halides, $-\text{SO}_2\text{CF}_3$, $-\text{O}-\text{SO}_2\text{CF}_3$, $-\text{NR}_3^+$, $-\text{SO}_2\text{R}$, $-\text{CX}_3$, $-\text{CX}_2\text{R}$, $-\text{COX}$, $-\text{CHO}$, $-\text{COR}$, $-\text{CO}_2\text{R}$, $-\text{CONH}_2$, $-\text{CONHR}$, $-\text{CONR}_2$, $-\text{F}$, $-\text{N}=\text{O}$, $-\text{N}=\text{N}^+$, $-\text{N}=\text{NR}$, $-\text{CR}=\text{NR}$, $-\text{N}=\text{CR}_2$, and wherein X is selected from F, Cl, Br and I; and,

Z is $-\text{COOH}$, $-\text{COO}-$, $-\text{OH}$, $-\text{O}-\text{R}$, $-\text{COOR}$ with saturated or non-saturated alcohol residues with straight, branched, cyclic, aromatic or heteroaromatic chain; $-\text{O}-(\text{CH}_2\text{CH}_2\text{O})_n\text{R}$ ($n \geq 1$); $-\text{O}-(\text{CHMeCH}_2\text{O})_n\text{R}$ ($n \geq 1$); substituted or unsubstituted phosphate group, sulfonyl group, carbamoyl group, primary amine, secondary amine, tertiary amine, carboxamide, $-\text{NR}-\text{O}-\text{R}$, $-\text{O}-\text{NR}_2$, hydrazine, $-\text{NH}-\text{COR}$, and methanimidamide moiety or a salt thereof;

wherein R is selected from H, substituted or non-substituted alkyl, and substituted or non-substituted aryl group.

According to some embodiments, the invention provides a method of controlling undesired plant growth comprising applying to the locus of the undesired plant growth:

a. A first herbicide having the structure



or a salt thereof, wherein:

A is cyclopentadiene, benzene and indene scaffold comprising from 1 to 4 heteroatoms;

5 wherein each of the heteroatoms is independently selected from the group consisting of N, S, Se, and O; and wherein one or more of the carbon atoms of the ring are optionally chemically attached to at least one of the groups consisting of: -SO₂CF₃, -O-SO₂CF₃, -NR₃⁺, -SO₂R, -CX₃, -CX₂R-COX, -CHO, -COR, -CO₂R, -CONH₂, -CONHR, -CONR₂, -F, -N=O, -N≡N⁺, -N=NR, -CR=NR, -N=CR₂, -Cl, -Br, and -I; and
10 wherein X is selected from F, Cl, Br and I;

n is 0 to 5;

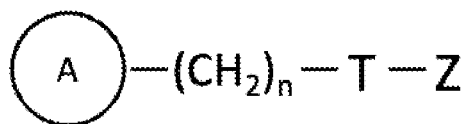
T is unsubstituted or substituted methylene group with one or two halides, -SO₂CF₃, -O-SO₂CF₃, -NR₃⁺, -SO₂R, -CX₃, -CX₂R, -COX, -CHO, -COR, -CO₂R, -CONH₂, -CONHR, -CONR₂, -F, -N=O, -N≡N⁺, -N=NR, -CR=NR, -N=CR₂, and wherein X is selected from F,
15 Cl, Br and I; and,

Z is -COOH, -COO-, -OH, -O-R, -COOR with saturated or non-saturated alcohol residues with straight, branched, cyclic, aromatic or heteroaromatic chain; -O-(CH₂CH₂O)_nR (n≥1); -O-(CHMeCH₂O)_nR (n≥1); substituted or unsubstituted phosphate group, sulfonyl group, carbamoyl group, primary amine, secondary amine, tertiary amine,
20 carboxamide, -NR-O-R, -O-NR₂, hydrazine, -NH-COR, and methanimidamide moiety or a salt thereof;

wherein R is selected from H, substituted or non-substituted alkyl, and substituted or non-substituted aryl group; and

b. A second herbicide, to effectively control the undesired plant growth.

According to some embodiments, the invention provides a method of selectively controlling undesired vegetation, comprising applying to a locus of the undesired vegetation and agricultural composition comprising a compound or agriculturally acceptable salt, having the structure



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Wherein A is cyclopentadiene, benzene or indene scaffold comprising from 1 to 4 heteroatoms; wherein each of the heteroatoms is independently selected from the group consisting of N, S, Se, and O; and wherein one or more of the carbon atoms of the ring are optionally chemically attached to at least one of the groups consisting of: -SO₂CF₃, -O-SO₂CF₃, -NR₃⁺, -SO₂R, -CX₃, -CX₂R, -COX, -CHO, -COR, -CO₂R, -CONH₂, -CONHR, -CONR₂, -N=O, -N≡N⁺, -N=NR, -CR=NR, -N=CR₂, -F, -Cl, -Br, and -I, and wherein X is selected from F, Cl, Br and I;

10

n is 0 to 5;

T is unsubstituted or substituted methylene group with one or two halides, -SO₂CF₃, -O-SO₂CF₃, -NR₃⁺, -SO₂R, -CX₃, -CX₂R-COX, -CHO, -COR, -CO₂R, -CONH₂, -CONHR, -CONR₂, -F, -N=O, -N≡N⁺, -N=NR, -CR=NR, -N=CR₂, and wherein X is selected from -F, -Cl, -Br and -I; and,

15

Z is -COOH, -COO-, -OH, -O-R, -COOR with saturated or non-saturated alcohol residues with straight, branched, cyclic, aromatic or heteroaromatic chain; -O-(CH₂CH₂O)_nR (n≥1); -O-(CHMeCH₂O)_nR (n≥1); substituted or unsubstituted phosphate group, sulfonyl group, carbamoyl group, primary amine, secondary amine, tertiary amine, carboxamide, -NR-O-R, -O-NR₂, hydrazine, -NH-COR, and methanimidamide moiety or a salt thereof;

20

wherein R is selected from H, substituted or non-substituted alkyl, and substituted or non-substituted aryl group; and, wherein the locus of the undesired vegetation is a field of a crop.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 demonstrates pre-emergence herbicidal effect of compound 5666 on *Amaranthus palmeri*, 21 DPA. Damage Score 5;

Figure 2 demonstrates post-emergence herbicidal effect of compound 5679 on *Amaranth tuberculatus*, 14 DPA, foliar application. Damage Score 5;

5 Figure 3 demonstrates herbicidal effect of compounds 5679, 5666 and 6651 in drench application on *Malva nicaeensis*, 14 DPA. Damage Score 4;

Figure 4 demonstrates Selectivity of compound 5666 to cereals in soil application at dose 0.25 Kg/Ha, 21 DPA;

10 Figure 5 demonstrates selectivity of compounds 5746 and 5666 to corn in foliar application, 1 Kg/Ha, 21 DPA;

Figure 6 demonstrates selectivity of compounds 5657, 5602, 5609, 5629 to cereals (corn and barley) in drench application (0.05%), 14 DPA;

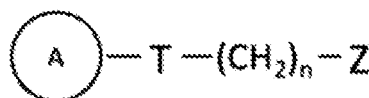
15 Figure 7 demonstrates herbicidal effect of compound 5679 in foliar application on Glyphosate resistance (Group 9) and Paraquat (Group 22) resistant *Conyza bonariensis*, 14 DPA; and,

Figure 8 demonstrates herbicidal effect of compound 5679 (0.5 kg a.i./ Ha, foliar application) on *Sonchus oleraceus* resistant to Sulfonylurea (Group 2 herbicide), 14 DPA

DETAILED DESCRIPTION OF THE INVENTION

20 The present invention is now described more fully hereinafter with reference to the accompanying examples and drawings, in which embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather these embodiments are provided so that this disclosure will be thorough and complete and will fully convey the scope of the invention to those skilled in the art.

According to some embodiments, the invention provides an agricultural composition comprising a compound or a salt thereof having the structure



or a salt thereof, wherein:

- 5 A is cyclopentadiene, benzene and indene scaffold comprising from 1 to 4 heteroatoms; wherein each of the heteroatoms is independently selected from the group consisting of N, S, Se, and O; and wherein one or more of the carbon atoms of the ring are optionally chemically attached to at least one of the groups consisting of: $-\text{SO}_2\text{CF}_3$, $-\text{O}-\text{SO}_2\text{CF}_3$, $-\text{NR}^+$, $-\text{SO}_2$, $-\text{CX}_3$, $-\text{CX}_2\text{R}$, $-\text{COX}$, $-\text{CHO}$, $-\text{COR}$, $-\text{CO}_2\text{R}$, $-\text{CONH}_2$, $-\text{CONHR}$, $-\text{CONR}_2$, $-\text{N}=\text{O}$, $-\text{N}=\text{N}^+$, $-\text{N}=\text{NR}$, $-\text{CR}=\text{NR}$, $-\text{N}=\text{CR}_2$, $-\text{F}$, $-\text{Cl}$, $-\text{Br}$, and $-\text{I}$, and wherein X is selected from $-\text{F}$, $-\text{Cl}$, $-\text{Br}$, and $-\text{I}$;

n is 0 to 5;

T is unsubstituted or substituted methylene group with one or two halides, $-\text{SO}_2\text{CF}_3$, $-\text{O}-\text{SO}_2\text{CF}_3$, $-\text{NR}_3^+$, $-\text{SO}_2\text{R}$, $-\text{CX}_3$, $-\text{CX}_2\text{R}-\text{COX}$, $-\text{CHO}$, $-\text{COR}$, $-\text{CO}_2\text{R}$, $-\text{CONH}_2$, $-\text{CONHR}$, $-\text{CONR}_2$, $-\text{F}$, $-\text{N}=\text{O}$, $-\text{N}=\text{N}^+$, $-\text{N}=\text{NR}$, $-\text{CR}=\text{NR}$, $-\text{N}=\text{CR}_2$, and wherein X is selected from $-\text{F}$, $-\text{Cl}$, $-\text{Br}$, and $-\text{I}$; and

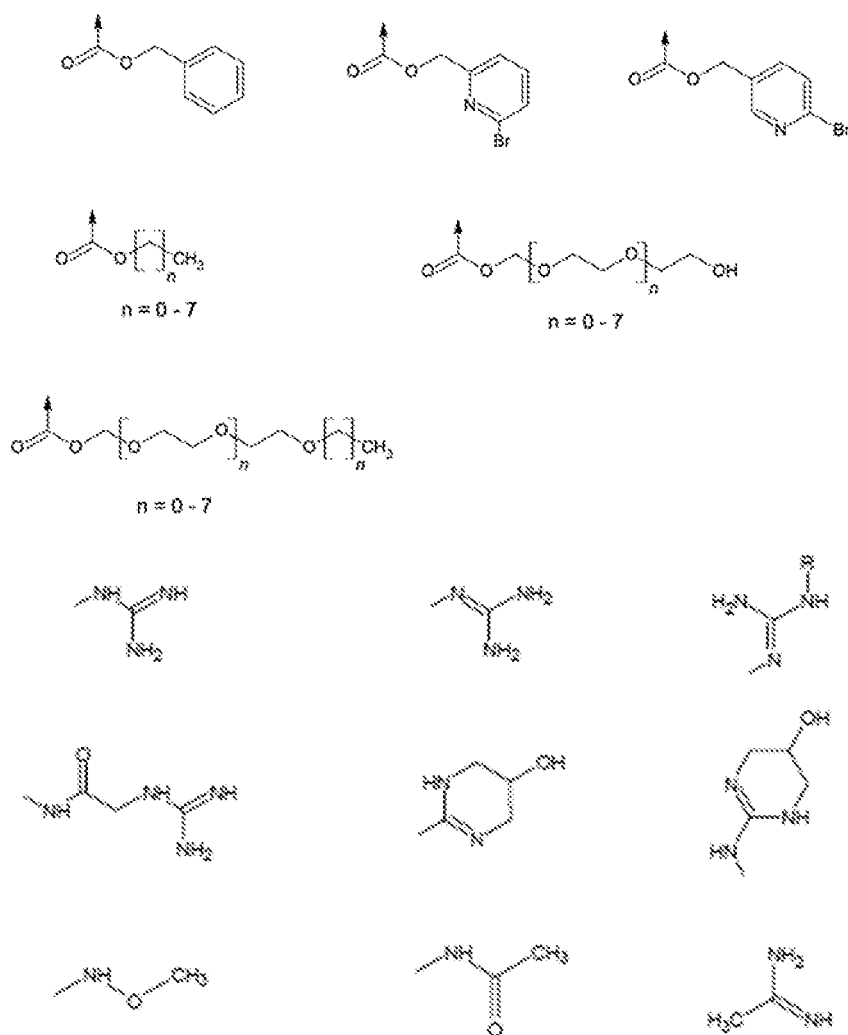
- 15 Z is $-\text{COOH}$, $-\text{COO}-$, $-\text{OH}$, $-\text{O}-\text{R}$, $-\text{COOR}$ with saturated or non-saturated alcohol residues with straight, branched, cyclic, aromatic or heteroaromatic chain; $-\text{O}-(\text{CH}_2\text{CH}_2\text{O})_n\text{R}$ ($n>1$); $-\text{O}-(\text{CHMeCH}_2\text{O})_n\text{R}$ ($n>1$); substituted or unsubstituted phosphate group, sulfonyl group, carbamoyl group, primary amine, secondary amine, tertiary amine, carboxamide, $-\text{NR}-\text{O}-\text{R}$, $-\text{O}-\text{NR}_2$, hydrazine, $-\text{NH}-\text{COR}$, and methanimidamide moiety or a salt thereof; wherein R is
20 selected from H, substituted or non-substituted alkyl, and substituted or non-substituted aryl group; and, wherein the composition comprises at least one agriculturally acceptable carrier.

According to some embodiments of the above composition, A is a heterocycle substituted with at least one Electron Withdrawing Group (EWG). As used herein, the term "Electron Withdrawing Group" refers, without limitation to an atom or a group that draws electron
25 density from neighboring atoms or aromatic ring, usually by resonance or inductive effects. The non-limiting list of the EWG of the invention includes: trifluoromethanesulfonyl and triflate

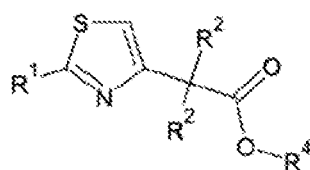
groups; substituted ammonium groups, such as, without limitation, $-NR_3^+$ (R is alkyl/s or H); nitro and nitroso groups $-NO_2$, $-N=O$; sulfonic acids and sulfonyl groups $(-O)-SO_3H$, $-SO_2R$; trihalomethyl groups $-CX_3$ (X is F, Cl, Br, I); haloformyl groups $-COX$ (X is F, Cl, Br, I); formyl and acyl groups $-CHO$, $-COR$; (substituted) aminocarbonyl groups $-CONH_2$, $-CONHR$, $-CONR_2$; halo
 5 groups $-F$, $-Cl$, $-Br$, $-I$; Azo groups $-N=N^+$ or $-N=NR$; Imino group $-CR=NR$ or $-N=CR_2$.

According to some embodiments of the above compositions, Z may be, without limitation, carboxyl or salts thereof $-COOH$ or COO^- , hydroxyl $-OH$, ether $-O-R$, ester $COOR$ with saturated or non-saturated alcohol groups with straight, branched, cyclic chain or aromatic/heteroaromatic chain, ethylene- and polyethylene glycol $-O-(CH_2CH_2O)_nR$ ($n>1$, R is H
 10 or alkyl), propylene and polypropylene glycol $-O-(CHMeCH_2O)_nR$ ($n>1$, R is H or alkyl), phosphates (substituted and non-substituted), sulfate/sulfonyl, carbamoyl group that consists of primary, secondary, and tertiary amide substituted with straight, branched, cyclic aliphatic chain, cyclic aromatic/heteroaromatic chain, ethylene glycol and polyethylene glycol (as above), propylene glycol, polypropylene glycol (as above), primary amine, secondary amine,
 15 tertiary amine, carboxamide, alkoxyamine groups of type $-NR-O-R$ and $-O-NR_2$, hydrazine, acetamide group $-NH-COR$, and methanimidamide moiety, or salts thereof.

According to some embodiments of the above compositions, Z is selected from



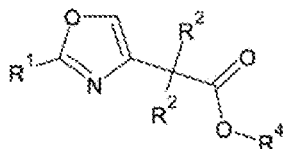
According to some embodiments, the above composition comprises a compound having the structure



- 5 Wherein R^1 is selected from Cl; Br; I; and $-CF_3$; R^2 is H or F; and R^4 is selected from H, saturated or non-saturated aliphatic straight, branched, cyclic or aromatic chain; ethylene glycol; polyethylene glycol; propylene glycol, polypropylene glycol, ethylpyridine, ethylbenzene, 1-(bromophenyl)ethan-1-one, 1-(1H-inden-3-yl)ethan-1-one, 1-(2,3-dihydro-1H-inden-1-

yl)ethan-1-one; 1-(2,3-dihydro-1H-inden-1-yl)propan-1-one; and 1-(1H-inden-3-yl)propan-1-one.

According to some embodiments, the above composition comprises a compound having the structure

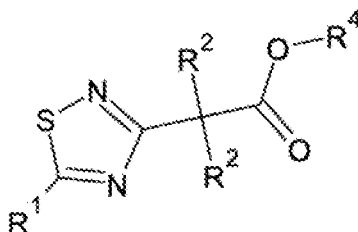


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Wherein R^1 is selected from Cl; Br; I; and CF_3 ; R^2 is H or F; and R^4 is selected from H, saturated or non-saturated aliphatic straight, branched, cyclic or aromatic chain; ethylene glycol; polyethylene glycol; propylene glycol, polypropylene glycol, ethylpyridine, ethylbenzene, 1-(bromophenyl)ethan-1-one, 1-(1H-inden-3-yl)ethan-1-one, 1-(2,3-dihydro-1H-inden-1-yl)ethan-1-one; 1-(2,3-dihydro-1H-inden-1-yl)propan-1-one; and 1-(1H-inden-3-yl)propan-1-one.

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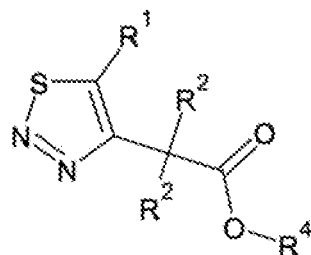
According to some embodiments, the above composition comprises a compound or an acceptable salt thereof having the structure



Wherein R^1 is selected from Cl; Br; I; and $-CF_3$; R^2 is H or F; and R^4 is selected from H, saturated or non-saturated aliphatic straight, branched, cyclic or aromatic chain; ethylene glycol; polyethylene glycol; propylene glycol, polypropylene glycol, ethylpyridine, ethylbenzene, 1-(bromophenyl)ethan-1-one, 1-(1H-inden-3-yl)ethan-1-one, 1-(2,3-dihydro-1H-inden-1-yl)ethan-1-one; 1-(2,3-dihydro-1H-inden-1-yl)propan-1-one; and 1-(1H-inden-3-yl)propan-1-one.

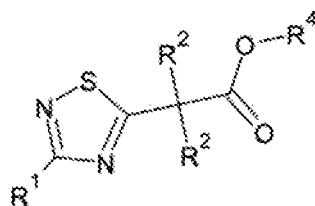
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According to some embodiments, the above composition comprises a compound or an acceptable salt thereof, having the structure



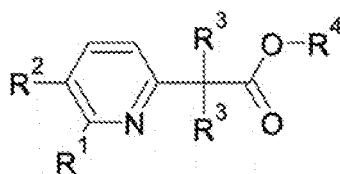
Wherein R^1 is selected from Cl; Br; I; and $-CF_3$; R^2 is H or F; and R^4 is selected from H, saturated or non-saturated aliphatic straight, branched, cyclic or aromatic chain; ethylene glycol; polyethylene glycol; propylene glycol, polypropylene glycol, ethylpyridine, ethylbenzene, 1-(bromophenyl)ethan-1-one, 1-(1H-inden-3-yl)ethan-1-one, 1-(2,3-dihydro-1H-inden-1-yl)ethan-1-one; 1-(2,3-dihydro-1H-inden-1-yl)propan-1-one; and 1-(1H-inden-3-yl)propan-1-one.

According to some embodiments, the above composition comprises a compound having the structure



Wherein R^1 is selected from Cl; Br; I; and $-CF_3$; R^2 is H or F; and R^4 is selected from H, saturated or non-saturated aliphatic straight, branched, cyclic or aromatic chain; ethylene glycol; polyethylene glycol; propylene glycol, polypropylene glycol, ethylpyridine, ethylbenzene, 1-(bromophenyl)ethan-1-one, 1-(1H-inden-3-yl)ethan-1-one, 1-(2,3-dihydro-1H-inden-1-yl)ethan-1-one; 1-(2,3-dihydro-1H-inden-1-yl)propan-1-one; and 1-(1H-inden-3-yl)propan-1-one.

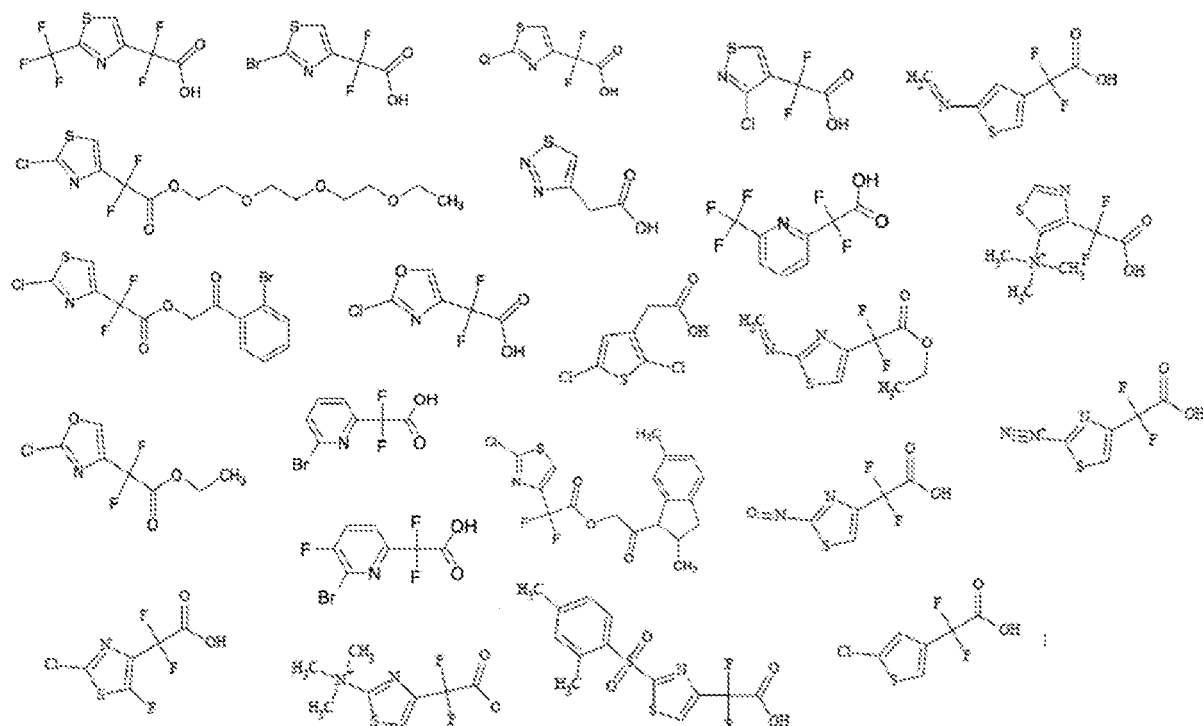
According to some embodiments, the above composition comprises a compound or an acceptable salt thereof, having the structure

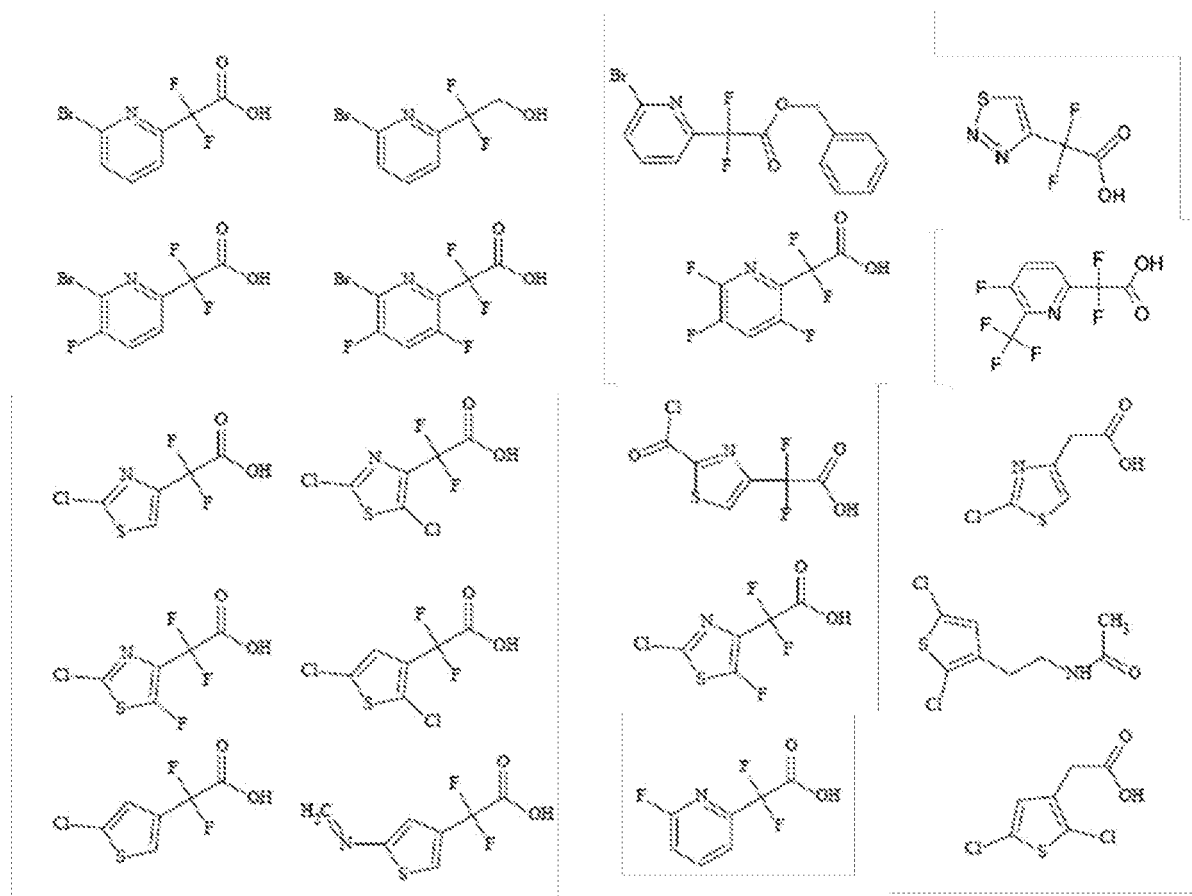


Wherein R^1 is selected from Cl; Br; I; and $-CF_3$; R^2 and R^3 is each independently selected from H or F; and R^4 is selected from H, saturated or non-saturated aliphatic straight, branched, cyclic or aromatic chain; ethylene glycol; polyethylene glycol; propylene glycol, polypropylene glycol, ethylpyridine, ethylbenzene, 1-(bromophenyl)ethan-1-one, 1-(1H-inden-3-yl)ethan-1-one, 1-(2,3-dihydro-1H-inden-1-yl)ethan-1-one; 1-(2,3-dihydro-1H-inden-1-yl)propan-1-one; and 1-(1H-inden-3-yl)propan-1-one.

According to some embodiments, the above composition comprises a non-limiting list of compounds including (2-bromo-1,3-thiazol-4-yl)(difluoro)acetic acid; difluoro[2-(trifluoromethyl)-1,3-thiazol-4-yl]acetic acid; 2-[2-(2-ethoxyethoxy)ethoxy]ethyl, (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; 2-(2-bromophenyl)-2-oxoethyl, (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; 2-(2,7-methyl-2,3-dihydro-1H-inden-1-yl)-2-oxoethyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; (2-chloro-1,3-oxazol-4-yl)(difluoro)acetic acid; ethyl (2-chloro-1,3-oxazol-4-yl)(difluoro)acetate; difluoro(1,2,3-thiadiazol-4-yl)acetic acid; (1,2,3-thiadiazol-4-yl)acetic acid; (3-chloro-1,2-thiazol-4-yl)(difluoro)acetic acid.

According to some embodiments of the above compositions, the non-limiting list of compounds, or agriculturally acceptable salts includes:



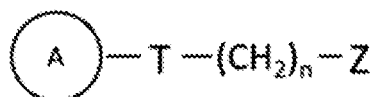


According to some embodiments, the above agricultural compositions further comprise at least one crop protection agent. The non-limiting list of the crop protection agents includes atrazine, terbuthylazine, (S)-metolachlor, metolachlor, terbutryn, simazine, dimethenamid, (S)-
 5 dimethenamid, flufenacet, acetochlor, alachlor, isoxaflutole, isoxachlortole, mesotrione, sulcotrione, metosulam, flumetsulam, pendimethalin, bromoxynil, bentazone, carfentrazone-ethyl, clomazone, nicosulfuron, rimsulfuron, halosulfuron-methyl, metribuzin, flumiclorac-pentyl, prosulfuron, primisulfuron-methyl, dicamba, fluthiacet-methyl, pyridate, 2,4-D, clopyralide, diflufenzopyr, fluroxypyr, MCPA, MCPB, mecoprop (MCP), metobenzuron,
 10 thifensulfuron-methyl, aclonifen, EPTC, glyphosate, glufosinate, sulfosate, cyanazine, propaquizafop, metamitron, pyramin, phenmedipham, desmedipham, ethofumesate, triasulfuron, chloridazon, lenacil, triallate, fluazifop, sethoxydim, quizalofop, clopyralide, clethodim, oxasulfuron, acifluorfen, benazolin-ethyl, sulfentrazone, chlorimuron-ethyl, cloransulam-methyl, fomesafen, imazamox, imazaquin, imazethapyr, imazapyr, lactofen,
 15 fenoxaprop(P-ethyl), thidiazuron, tribufos, trifluralin, dimethachlor, napropamide, quinmerac, metazachlor, carbetamide, dimefuron, propyzamide, ethametsulfuron-methyl, tebutam,

fluometuron, prometryn, norflurazon, pyriithiobac-sodium, MSMA, DSMA, diuron, flurochloridone, dithiopyr, thiazopyr, oxyfluorfen, ethalfluralin, clodinafop, amidosulfuron, diclofop-methyl, diflufenican, ethoxysulfuron, fentrazamide, flazasulfuron, florasulam, fluazolate, flucarbazone, flupyrsulfuron-methyl sodium, flurtamone, iodosulfuron, isoproturon, 5 chlortoluron, chlorsulfuron, metsulfuron-methyl, sulfosulfuron, tribenuron-methyl, 2,4-DB, 2,4-DP, bifenox, flamprop-M, imazamethabenz-methyl, ioxynil, tralkoxydim, fluoroglycofen-ethyl, methabenzthiazuron, isoxaben, prosulfocarb, difenzoquat-metilsulfate, pretilachlor, cinosulfuron, fenclorim, bensulfuron-methyl, imazosulfuron, pyrazosulfuron-ethyl, azimsulfuron, esprocarb, mefenacet, molinate, propanil, pyrazolate, cyhalofop-butyl, 10 bispyribac- sodium, pyriminobac-methyl, cafenstrole, oxadiargyl, oxadiazon, bromobutide, MY-100, dymron, NB 061, MK243, HW-52, AC 014, ametryn, hexazinone, asulam, azafenidin, tebuthiuron, ethametsulfuron-methyl, or a combination thereof.

According to some embodiments, the invention provides a method of controlling undesired plant growth comprising applying to the locus of said undesired plant growth the agricultural 15 composition according to the embodiments of the above composition.

According to some embodiments, the invention provides a method of controlling undesired plant growth comprising applying to the locus of the undesired plant growth a herbicidally effective amount of a compound having the structure



20 or a salt thereof, wherein:

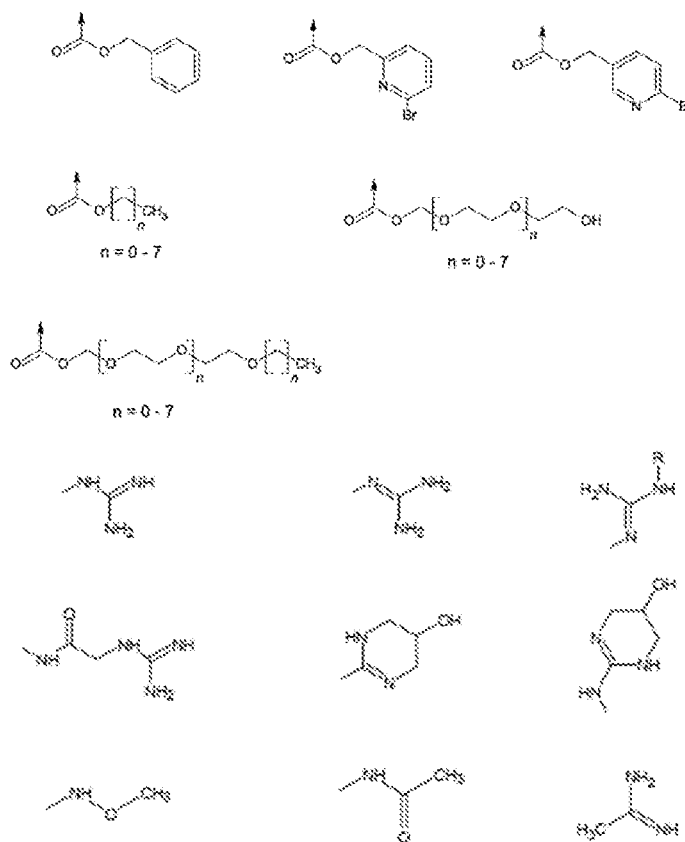
A is cyclopentadiene, benzene and indene scaffold comprising from 1 to 4 heteroatoms; wherein each of the heteroatoms is independently selected from the group consisting of N, S, Se, and O; and wherein one or more of the carbon atoms of the ring are optionally chemically attached to at least one of the groups consisting of: -SO₂CF₃, -O-SO₂CF₃, -NR⁺, -SO₂, -CX₃, -CX₂R, 25 -COX, -CHO, -COR, -CO₂R, -CONH₂, -CONHR, -CONR₂, -N=O, -N=N⁺, -N=NR, -CR=NR, -N=CR₂, -F, -Cl, -Br, and -I, and wherein X is selected from -F, -Cl, -Br, and -I;

n is 0 to 5;

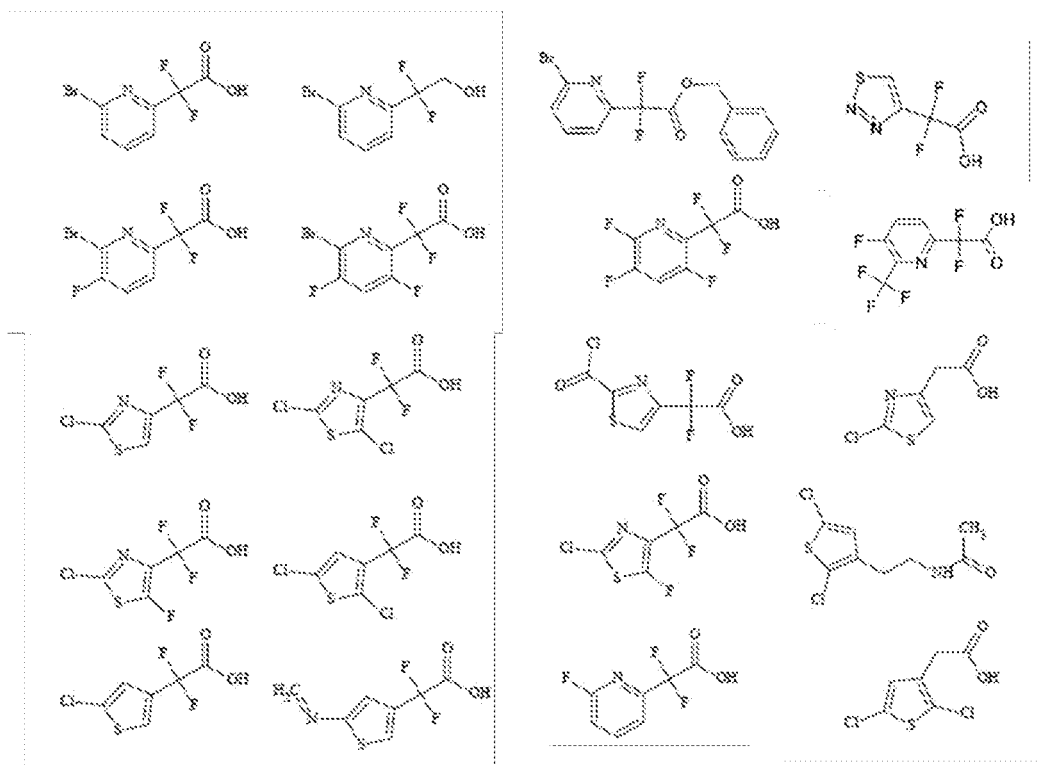
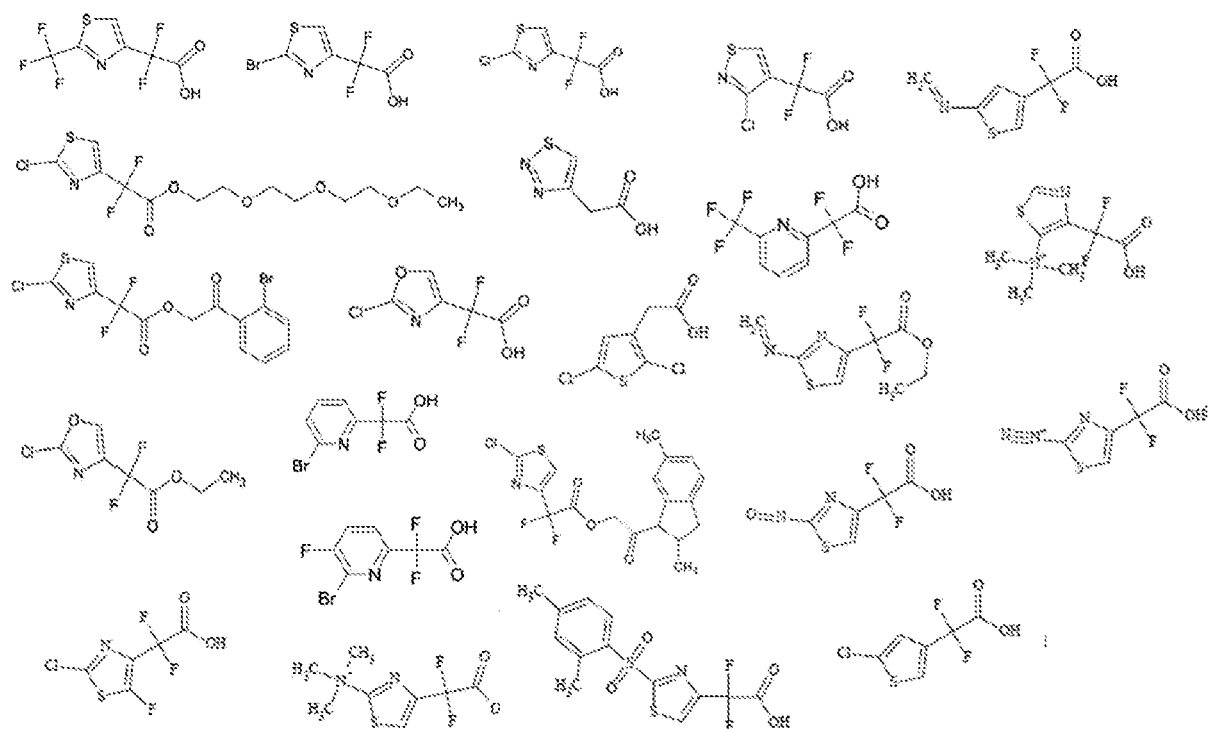
T is unsubstituted or substituted methylene group with one or two halides, $-\text{SO}_2\text{CF}_3$, $-\text{O}-\text{SO}_2\text{CF}_3$, $-\text{NR}_3^+$, $-\text{SO}_2\text{R}$, $-\text{CX}_3$, $-\text{CX}_2\text{R}-\text{COX}$, $-\text{CHO}$, $-\text{COR}$, $-\text{CO}_2\text{R}$, $-\text{CONH}_2$, $-\text{CONHR}$, $-\text{CONR}_2$, $-\text{F}$, $-\text{N}=\text{O}$, $-\text{N}=\text{N}^+$, $-\text{N}=\text{NR}$, $-\text{CR}=\text{NR}$, $-\text{N}=\text{CR}_2$, and wherein X is selected from $-\text{F}$, $-\text{Cl}$, $-\text{Br}$, and $-\text{I}$; and

- 5 Z is $-\text{COOH}$, $-\text{COO}-$, $-\text{OH}$, $-\text{O}-\text{R}$, $-\text{COOR}$ with saturated or non-saturated alcohol residues with straight, branched, cyclic, aromatic or heteroaromatic chain; $-\text{O}-(\text{CH}_2\text{CH}_2\text{O})_n\text{R}$ ($n>1$); $-\text{O}-(\text{CHMeCH}_2\text{O})_n\text{R}$ ($n>1$); substituted or unsubstituted phosphate group, sulfonyl group, carbamoyl group, primary amine, secondary amine, tertiary amine, carboxamide, $-\text{NR}-\text{O}-\text{R}$, $-\text{O}-\text{NR}_2$, hydrazine, $-\text{NH}-\text{COR}$, and methanimidamide moiety or a salt thereof; wherein R is
- 10 selected from H, substituted or non-substituted alkyl, and substituted or non-substituted aryl group.

According to some embodiments of the above method, Z might be selected, without limitation, from the group including:



According to some embodiments of the above method, the non-limiting list of compounds, or agriculturally acceptable salts includes



According to some embodiments, the above method further comprises applying to the locus of the undesired plant growth at least one crop protection agent. According to some embodiments, the crop protection agent is selected from the group consisting of herbicide, fungicide, insecticide and a plant growth regulator.

- 5 According to some embodiments of the above method, the crop protection agent is herbicide.

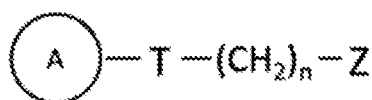
According to some embodiments of the above method, the crop protection agent is amino acid synthesis inhibitor herbicide. The non-limiting list of amino acid synthesis inhibitor herbicides of the invention includes: sulfonylurea herbicide, imidazolinone herbicide, sulfonamide herbicide, amino acid derivatives, imazamox, imazapic, imazethapyr, imazaquin, imazapyr and
 10 imazamethabenz, Chlorimuron, Primisulfuron, Thifensulfuron, Triasulfuron, Nicosulfuron, Metsulfuron, Tribenuron, Rimsulfuron, Triflusaluron, glyphosate or any combination thereof.

According to some embodiments of the above method, the crop protection agent is a plant growth regulator.

- 15 According to some embodiments of the above method, the non-limiting list of plant growth regulators of the invention includes dicamba, 2,4-D, clopyralid and fluroxypyr.

According to some embodiments, the invention provides a method of controlling undesired plant growth comprising applying to the locus of the undesired plant growth

- a. a first herbicide having the structure



- 20 or a salt thereof, wherein

A is cyclopentadiene, benzene and indene scaffold comprising from 1 to 4 heteroatoms; wherein each of the heteroatoms is independently selected from the group consisting of N, S, Se, and O; and wherein one or more of the carbon atoms of the ring are optionally chemically attached to at least one of the groups consisting of: -SO₂CF₃, -O-SO₂CF₃, -NR⁺,
 25 -SO₂, -CX₃, -CX₂R, -COX, -CHO, -COR, -CO₂R, -CONH₂, -CONHR, -CONR₂, -N=O, -N=N⁺, -

$N=NR$, $-CR=NR$, $-N=CR_2$, $-F$, $-Cl$, $-Br$, and $-I$, and wherein X is selected from $-F$, $-Cl$, $-Br$, and $-I$;

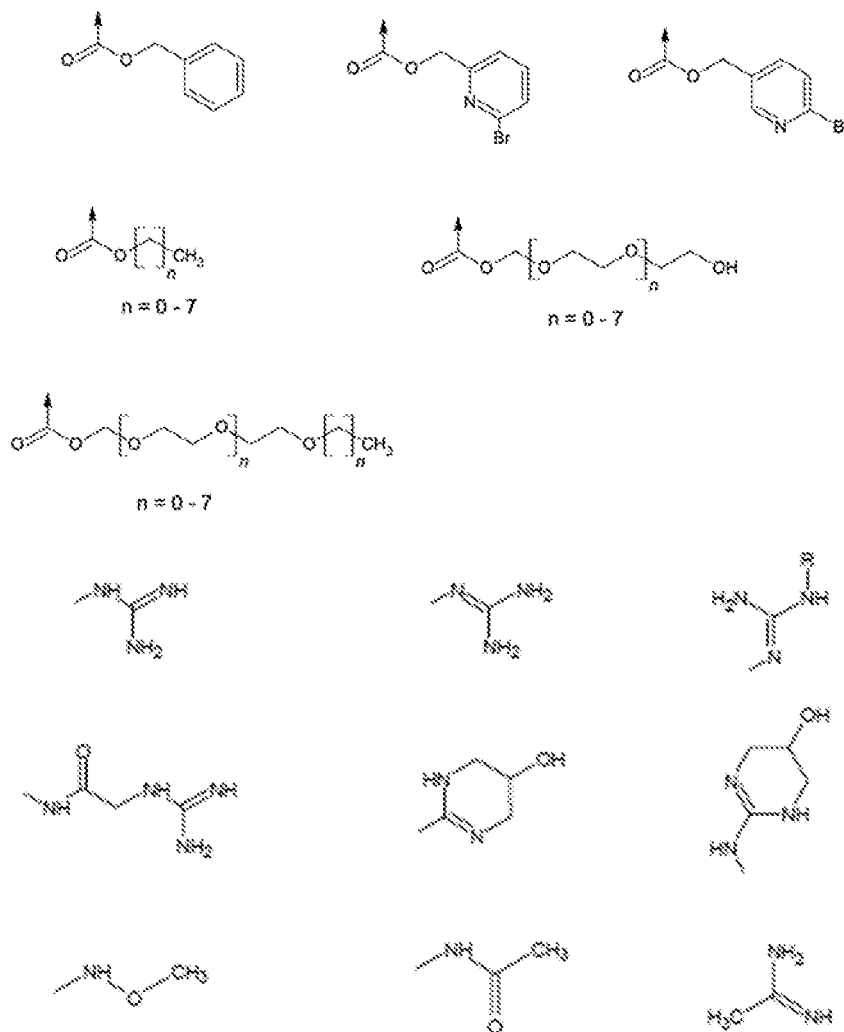
n is 0 to 5;

5 T is unsubstituted or substituted methylene group with one or two halides, $-SO_2CF_3$, $-O-SO_2CF_3$, $-NR_3^+$, $-SO_2R$, $-CX_3$, $-CX_2R-COX$, $-CHO$, $-COR$, $-CO_2R$, $-CONH_2$, $-CONHR$, $-CONR_2$, $-F$, $-N=O$, $-N=N^+$, $-N=NR$, $-CR=NR$, $-N=CR_2$, and wherein X is selected from $-F$, $-Cl$, $-Br$, and $-I$; and

10 Z is $-COOH$, $-COO^-$, $-OH$, $-O-R$, $-COOR$ with saturated or non-saturated alcohol residues with straight, branched, cyclic, aromatic or heteroaromatic chain; $-O-(CH_2CH_2O)_nR$ ($n>1$); $-O-(CHMeCH_2O)_nR$ ($n>1$); substituted or unsubstituted phosphate group, sulfonyl group, carbamoyl group, primary amine, secondary amine, tertiary amine, carboxamide, $-NR-O-R$, $-O-NR_2$, hydrazine, $-NH-COR$, and methanimidamide moiety or a salt thereof; wherein R is selected from H , substituted or non-substituted alkyl, and substituted or non-substituted aryl group; and

15 b. a second herbicide, to effectively control the undesired plant growth.

According to some embodiments of the above method, Z might be selected, without limitation, from the group including:



According to some embodiments of the above method, the second herbicide can be, without limitation, amino acid synthesis inhibitor herbicide, such as sulfonylurea herbicide, imidazolinone herbicide, sulfonamide herbicide, and amino acid derivative.

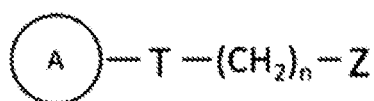
- 5 According to some embodiments of the above method, the second herbicide may be selected from a non-limiting list including imazamox, imazapic, imazethapyr, imazaquin, imazapyr, imazamethabenz, Chlorimuron, Primisulfuron, Thifensulfuron, Triasulfuron, Nicosulfuron, Metsulfuron, Tribenuron, Rimsulfuron, Triflusulfuron, Glyphosate, atrazine, terbuthylazine, (S)-metolachlor, metolachlor, terbutryn, simazine, dimethenamid, (S)-dimethenamid, flufenacet,
- 10 acetochlor, alachlor, isoxaflutole, isoxachlortole, mesotrione, sulcotrione, metosulam, flumetsulam, pendimethalin, bromoxynil, bentazone, carfentrazone-ethyl, clomazone, nicosulfuron, rimsulfuron, halosulfuron-methyl, metribuzin, flumiclorac-pentyl, prosulfuron,

primisulfuron-methyl, dicamba, fluthiacet-methyl, pyridate, 2,4-D, clopyralide, diflufenzopyr,
 fluroxypyr, MCPA, MCPB, mecoprop (MCP), metobenzuron, thifensulfuron-methyl, aclonifen,
 EPTC, glyphosate, glufosinate, sulfosate, cyanazine, propaquizafop, metamilon, pyramin,
 phenmedipham, desmedipham, ethofumesate, triasulfuron, chloridazon, lenacil, triallate,
 5 fluazifop, sethoxydim, quizalofop, clopyralide, clethodim, oxasulfuron, acifluorfen, benazolin-
 ethyl, sulfentrazone, chlorimuron-ethyl, cloransulam-methyl, fomesafen, imazamox,
 imazaquin, imazethapyr, imazapyr, lactofen, fenoxaprop(P-ethyl), thidiazuron, tribufos,
 trifluralin, dimethachlor, napropamide, quinmerac, metazachlor, carbetamide, dimefuron,
 propyzamide, ethametsulfuron-methyl, tebutam, fluometuron, prometryn, norflurazon,
 10 pyriithiobac- sodium, MSMA, DSMA, diuron, flurochloridone, dithiopyr, thiazopyr, oxyfluorfen,
 ethalfluralin, clodinafop, amidosulfuron, diclofop-methyl, diflufenican, ethoxysulfuron,
 fentrazamide, flazasulfuron, florasulam, fluazolate, flucarbazone, flupyrsulfuron-methyl
 sodium, flurtamone, iodosulfuron, isoproturon, chlortoluron, chlorsulfuron, metsulfuron-
 methyl, sulfosulfuron, tribenuron-methyl, 2,4-DB, 2,4-DP, bifenox, flamprop-M,
 15 imazamethabenz-methyl, ioxynil, tralkoxydim, fluoroglyphofen-ethyl, methabenzthiazuron,
 isoxaben, prosulfocarb, difenzoquat-metilsulfate, pretilachlor, cinosulfuron, fenclorim,
 bensulfuron-methyl, imazosulfuron, pyrazosulfuron-ethyl, azimsulfuron, esprocarb,
 mefenacet, molinate, propanil, pyrazolate, cyhalofop-butyl, bispyribac- sodium, pyriminobac-
 methyl, cafenstrole, oxadiargyl, oxadiazon, bromobutide, MY-100, dymron, NB 061, MK243,
 20 HW-52, AC 014, ametryn, hexazinone, asulam, azafenidin, tebuthiuron, and ethametsulfuron-
 methyl.

According to some embodiments, the above methods further comprise applying to the locus of undesired growth a third herbicide or a plant growth regulator.

According to some embodiments, the invention provides a composition for controlling
 25 undesired plant growth comprising a mixture of:

a. a first herbicide having the structure



or a salt thereof, wherein

A is cyclopentadiene, benzene and indene scaffold comprising from 1 to 4 heteroatoms; wherein each of the heteroatoms is independently selected from the group consisting of N, S, Se, and O; and wherein one or more of the carbon atoms of the ring are optionally
 5 chemically attached to at least one of the groups consisting of: $-\text{SO}_2\text{CF}_3$, $-\text{O}-\text{SO}_2\text{CF}_3$, $-\text{NR}^+$, $-\text{SO}_2$, $-\text{CX}_3$, $-\text{CX}_2\text{R}$, $-\text{COX}$, $-\text{CHO}$, $-\text{COR}$, $-\text{CO}_2\text{R}$, $-\text{CONH}_2$, $-\text{CONHR}$, $-\text{CONR}_2$, $-\text{N}=\text{O}$, $-\text{N}=\text{N}^+$, $-\text{N}=\text{NR}$, $-\text{CR}=\text{NR}$, $-\text{N}=\text{CR}_2$, $-\text{F}$, $-\text{Cl}$, $-\text{Br}$, and $-\text{I}$, and wherein X is selected from $-\text{F}$, $-\text{Cl}$, $-\text{Br}$, and $-\text{I}$;

n is 0 to 5;

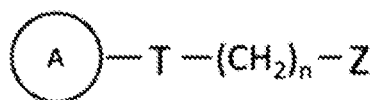
10 T is unsubstituted or substituted methylene group with one or two halides, $-\text{SO}_2\text{CF}_3$, $-\text{O}-\text{SO}_2\text{CF}_3$, $-\text{NR}_3^+$, $-\text{SO}_2\text{R}$, $-\text{CX}_3$, $-\text{CX}_2\text{R}-\text{COX}$, $-\text{CHO}$, $-\text{COR}$, $-\text{CO}_2\text{R}$, $-\text{CONH}_2$, $-\text{CONHR}$, $-\text{CONR}_2$, $-\text{F}$, $-\text{N}=\text{O}$, $-\text{N}=\text{N}^+$, $-\text{N}=\text{NR}$, $-\text{CR}=\text{NR}$, $-\text{N}=\text{CR}_2$, and wherein X is selected from $-\text{F}$, $-\text{Cl}$, $-\text{Br}$, and $-\text{I}$; and

15 Z is $-\text{COOH}$, $-\text{COO}-$, $-\text{OH}$, $-\text{O}-\text{R}$, $-\text{COOR}$ with saturated or non-saturated alcohol residues with straight, branched, cyclic, aromatic or heteroaromatic chain; $-\text{O}-(\text{CH}_2\text{CH}_2\text{O})_n\text{R}$ ($n>1$); $-\text{O}-(\text{CHMeCH}_2\text{O})_n\text{R}$ ($n>1$); substituted or unsubstituted phosphate group, sulfonyl group, carbamoyl group, primary amine, secondary amine, tertiary amine, carboxamide, $-\text{NR}-\text{O}-\text{R}$, $-\text{O}-\text{NR}_2$, hydrazine, $-\text{NH}-\text{COR}$, and methanimidamide moiety or a salt thereof; wherein R is selected from H, substituted or non-substituted alkyl, and substituted or
 20 non-substituted aryl group;

b. at least one herbicide or a plant growth regulator; and,

c. at least one acceptable carrier.

According to some embodiments, the invention provides a method of selectively inhibiting growth of undesired vegetation comprising applying to the locus of the undesired plant growth
 25 a herbicidally effective amount of a compound having the structure



or a salt thereof, wherein:

A is cyclopentadiene, benzene and indene scaffold comprising from 1 to 4 heteroatoms; wherein each of the heteroatoms is independently selected from the group consisting of N, S, Se, and O; and wherein one or more of the carbon atoms of the ring are optionally chemically attached to at least one of the groups consisting of: $-\text{SO}_2\text{CF}_3$, $-\text{O}-\text{SO}_2\text{CF}_3$, $-\text{NR}^+$, $-\text{SO}_2$, $-\text{CX}_3$, $-\text{CX}_2\text{R}$, $-\text{COX}$, $-\text{CHO}$, $-\text{COR}$, $-\text{CO}_2\text{R}$, $-\text{CONH}_2$, $-\text{CONHR}$, $-\text{CONR}_2$, $-\text{N}=\text{O}$, $-\text{N}=\text{N}^+$, $-\text{N}=\text{NR}$, $-\text{CR}=\text{NR}$, $-\text{N}=\text{CR}_2$, $-\text{F}$, $-\text{Cl}$, $-\text{Br}$, and $-\text{I}$, and wherein X is selected from $-\text{F}$, $-\text{Cl}$, $-\text{Br}$, and $-\text{I}$;

n is 0 to 5;

T is unsubstituted or substituted methylene group with one or two halides, $-\text{SO}_2\text{CF}_3$, $-\text{O}-\text{SO}_2\text{CF}_3$, $-\text{NR}_3^+$, $-\text{SO}_2\text{R}$, $-\text{CX}_3$, $-\text{CX}_2\text{R}-\text{COX}$, $-\text{CHO}$, $-\text{COR}$, $-\text{CO}_2\text{R}$, $-\text{CONH}_2$, $-\text{CONHR}$, $-\text{CONR}_2$, $-\text{F}$, $-\text{N}=\text{O}$, $-\text{N}=\text{N}^+$, $-\text{N}=\text{NR}$, $-\text{CR}=\text{NR}$, $-\text{N}=\text{CR}_2$, and wherein X is selected from $-\text{F}$, $-\text{Cl}$, $-\text{Br}$, and $-\text{I}$; and

Z is $-\text{COOH}$, $-\text{COO}-$, $-\text{OH}$, $-\text{O}-\text{R}$, $-\text{COOR}$ with saturated or non-saturated alcohol residues with straight, branched, cyclic, aromatic or heteroaromatic chain; $-\text{O}-(\text{CH}_2\text{CH}_2\text{O})_n\text{R}$ ($n>1$); $-\text{O}-(\text{CHMeCH}_2\text{O})_n\text{R}$ ($n>1$); substituted or unsubstituted phosphate group, sulfonyl group, carbamoyl group, primary amine, secondary amine, tertiary amine, carboxamide, $-\text{NR}-\text{O}-\text{R}$, $-\text{O}-\text{NR}_2$, hydrazine, $-\text{NH}-\text{COR}$, and methanimidamide moiety or a salt thereof; wherein R is selected from H, substituted or non-substituted alkyl, and substituted or non-substituted aryl group.

As used herein the term “undesired plant growth” is interchangeable with terms such as “unwanted vegetation”, “weed growth”, “undesired vegetation” and such, and refers to growth of weeds at the expense of crops. The inhibition of growth can be a full inhibition of growth, partial inhibition of growth, exerting negative effect on the growth rate of the weed in comparison to the growth rate of the crop. The effect on the weed performance can be achieved prior to its emergence resulting in lack and/or less weeds at the treated area, or after the emergence, resulting in growth arrest, irreversible damage to the weed and death of the

plant. In the context of the invention the term “plant” refers, without limitation, to whole plant or its parts, including roots, leaves, fruits, flowers, tissues, seeds or any other plant part.

As used herein the term “selectively inhibiting” refers to inhibiting the growth of the weed, without exerting negative effect on the crop.

- 5 According to some embodiments of the above methods and compositions, the non-limiting list of crops of the invention includes soybean, maize, cereals, rice, barley, sorghum, oilseed and oats.

According to some embodiments of the above methods, the “undesired plant growth” refers to weeds resistant to herbicides, such as, without limitation, HPAC 9 group (Inhibitors of EPSP
10 synthesis), 2 (Acetolactate Synthase (ALS) inhibitors), 22 (Photosystem I, Paraquat), and 4 (Plant growth regulators or synthetic auxins).

According to some embodiments of the above methods and compositions, the application can be, without limitation, a foliar application, a drench application or a soil application.

According to some embodiments, the invention provides a method of inhibiting the growth of
15 weeds, in a selective manor.

According to some embodiments, the composition is applied to the soil pre-emergence and to the weeds post-emergence.

According to some embodiments, the invention provides an agricultural composition comprising a compound or a salt thereof selected from 2-(2,5-dichlorothiophen-3-yl)ethan-1-
20 amine; 3-(2,5-dichlorothiophen-3-yl)-2-hydroxypropanoic acid; 2-(2,5-dichlorothiophen-3-yl)acetic acid; 1-(2,5-dichlorothiophen-3-yl)methanamine; 2-(thiophen-3-yl)ethan-1-amine; 2-(thiophen-3-yl)ethan-1-ol; 2-amino-1-(thiophen-3-yl)ethan-1-ol; 2-(thiophen-3-yl)acetamide; 2-(1H-1,2,4-triazol-5-yl)ethan-1-amine; 2-(1H-1,2,4-triazol-5-yl)ethan-1-amine; 3-(thiophen-3-yl)propan-1-amine; 2,5-dichloro-1,3-thiazole-4-carboxylic acid; 4-(2,5-dichlorothiophen-3-yl)butanoic
25 acid; ethyl 3-[5-(chloromethyl)-1,3,4-thiadiazol-2-yl]-2-acetamido-3,3-difluoropropanoate; 2-amino-3-(1H-indazol-3-yl)propanoic acid hydrochloride[HCl]; (2-bromopyridin-4-yl)acetic acid; 3-(2-bromopyridin-4-yl)-2-hydroxypropanoic acid; 2-(2-

bromopyridin-4-yl)ethan-1-amine; 4-(2-aminoethyl)phenol; bis[(2-bromopyridin-4-yl)methyl]amine; 2-(pyridin-3-yl)acetamide; 2-(2,6-dibromopyridin-4-yl)acetic acid; 2-bromo-4-(2-bromoethyl)pyridine; naphthalene-2-carboxylic acid; 2-bromopyridine-4-carboxylic acid; (2E)-3-(2,6-dichloropyridin-3-yl)prop-2-enoic acid; 2-amino-N-(2-bromopyridin-4-yl)ethane-1-sulfonamide; 4-(2,5-dichlorothiophen-3-yl)butanamide; 2-(thiophen-3-yl)ethane-1-thiol; (2-aminoethyl)[(2,5-dichlorothiophen-3-yl)methyl]amine; 2-{[2-(thiophen-3-yl)ethyl]sulfanyl}ethan-1-amine; 3-(thiophen-3-yl)propane-1,2-diol; 3-[(2,5-dichlorothiophen-3-yl)formamido]-2,2-difluoropropanoic acid; 3-(2,5-dichlorothiophen-3-yl)propanoic acid; (2E)-3-(5-chlorothiophen-2-yl)prop-2-enoic acid; (2E)-3-(1,3-thiazol-5-yl)prop-2-enoic acid; 2-(2,5-dichlorothiophen-3-yl)acetamide; [(2,5-dichlorothiophen-3-yl)methyl]hydrazine; 3-{[(2,5-dichlorothiophen-3-yl)methyl]amino}-2,2-difluoropropanoic acid; 3-(2,5-dichlorothiophen-3-yl)-2-oxopropanoic acid; 2,5-dichloro-1,3-thiazole-4-carbonyl chloride; 2-bromo-N-[(2,5-dichlorothiophen-3-yl)methyl]pyridine-4-carboxamide; 2-{[(2,5-dichlorothiophen-3-yl)methyl]amino}acetic acid; dichloro-1,3-thiazole-4-carboxamide; N-(2,5-dichloro-1,3-thiazol-4-yl)acetamide; (3E)-4-(2,5-dichlorothiophen-3-yl)-2-oxobut-3-enoic acid; (2E)-3-(3-chloro-1H-1,2,4-triazol-5-yl)prop-2-enoic acid; (2E)-3-(2,4-dichloro-1,3-thiazol-5-yl)prop-2-enoic acid; 2-(2-chlorothiophen-3-yl)-2,2-difluoroacetic acid; 3-{[(2,5-dichlorothiophen-3-yl)methyl]amino}-2,2-difluoropropanoic acid; 2-(5-chlorothiophen-3-yl)-2,2-difluoroacetic acid; 3-[4-[(2,5-dichlorothiophen-3-yl)methyl]piperazin-1-yl]propanoic acid; trichloro-1,3-thiazole; 3-(1H-1,2,4-triazol-1-yl)propanoic acid; N-[2-(2,5-dichlorothiophen-3-yl)ethyl]acetamide; 4-(2,5-dichlorothiophen-3-yl)-2,2-dimethylbutanoic acid; 2-(2,5-dichlorothiophen-3-yl)-2-oxoacetic acid; 4-(2,5-dichlorothiophen-3-yl)-4,4-difluorobutanoic acid; 2-amino-3-(1H-1,2,4-triazol-1-yl)propanoic acid dihydrochloride [HCl]; N-propyl-3-(4H-1,2,4-triazol-3-yl)propanamide; propyl 3-(4H-1,2,4-triazol-3-yl)propanoate; 2-(2,5-dichlorothiophen-3-yl)-2,2-difluoroacetamide; 2-(2,5-dichloro-1,3-thiazol-4-yl)acetic acid; 3-(2,5-dichloro-1,3-thiazol-4-yl)-N-propylpropanamide; ethyl 3-(2,5-dichloro-1,3-thiazol-4-yl)propanoate; (2,5-dichlorothiophen-3-yl)(difluoro)acetic acid; 2-(3-bromo-1H-1,2,4-triazol-5-yl)ethan-1-amine; ethyl (2,5-dichlorothiophen-3-yl)(difluoro)acetate; [2-(2,5-dichlorothiophen-3-yl)(difluoro)acetamido]acetic acid; 2-oxo-2-(2,4,5-trichlorothiophen-3-yl)acetic acid; 3-(2,5-dichlorothiophen-3-yl)-N-ethylpropanamide; 3-[(2,5-dibromothiophene-3-sulfonyl)amino]propanoic acid; N-(2-aminoethyl)-2,5-dibromothiophene-3-sulfonamide; ethyl

3-(2,5-dichlorothiophen-3-yl)propanoate; N-[2-(2,5-dichloro-1,3-thiazol-4-yl)ethyl]acetamide; 2,2-difluoro-2-(2,4,5-trichlorothiophen-3-yl)acetic acid; methyl oxo(2,4,5-trichlorothiophen-3-yl)acetate; 1-(2,5-dichloro-1,3-thiazol-4-yl)methanamine; 2,2-difluoro-2-(2-oxo-2,3-dihydro-1H-1,3-benzodiazol-5-yl)acetic acid; ethyl (2,5-dichloro-1,3-thiazol-4-yl)(difluoro)acetate; 5 methyl 2-chloro-2-(2,5-dichlorothiophen-3-yl)acetate; 4-(2,5-dichlorothiophen-3-yl)butan-1-amine; 2-amino-2-(2,5-dichlorothiophen-3-yl)acetic acid; propyl[2-(1H-1,2,4-triazol-3-yl)ethyl]amine; ethyl 2-(2-bromo-5-methyl-1,3-thiazol-4-yl)acetate; ethyl 2-bromo-2-(2-bromo-5-methyl-1,3-thiazol-4-yl)acetate; ethyl 2-(2-bromo-1,3-thiazol-4-yl)acetate; sodium (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; 2-(2,5-dichloro-1,3-thiazol-4-yl)-2,2-difluoroacetic 10 acid;; ethyl (2,5-dichlorothiophen-3-yl)acetate; benzyl 2-(2,5-dichlorothiophen-3-yl)acetate; 2-(2,5-dichlorothiophen-3-yl)-N-methoxyethan-1-amine; 2-(2,5-dichlorothiophen-3-yl)-N,N,N-trimethylethan-1-aminium; ethyl 2-(5-bromo-2-methyl-1,3-thiazol-4-yl)acetate; 2-amino-4,5,6,7-tetrahydro-1,3-benzothiazole-4-carboxylic acid hydrochloride; 5-(2,5-dichlorothiophen-3-yl)imidazolidine-2,4-dione; 2-chloro-4-phenyl-1,3-thiazole; 2-(2-amino-1,3-thiazol-4-yl)-2,2-difluoroacetic acid; 2,2-difluoro-2-[2-(trifluoromethyl)-1,3-thiazol-4-yl]acetic acid; 2-(2,5-dichloro-1,3-thiazol-4-yl)-N,N,N-trimethylethan-1-aminium; 2-chloro-4-(phenoxyethyl)-1,3-thiazole; 2-chloro[1,3]thiazolo[5,4-b]pyridine-6-carboxylic acid; 4-benzyl-2-chloro-1,3-thiazole; 3-([2-(2,5-dichloro-1,3-thiazol-4-yl)ethyl]amino)methylphenol; 2,2-difluoro-2-(1H-1,2,3,4-tetrazol-5-yl)acetic acid; dibenzyl[(2-chloro-1,3-thiazol-4-yl)methyl]amine; 20 dichloro-1,3-thiazole-4-sulfinic acid; 2-(2,5-dichloro-1,3-thiazol-4-yl)ethan-1-amine; 2,5-dichlorothiophene-3-carboxylic acid; (thiophen-3-yl)acetic acid; benzyl[2-(2,5-dichlorothiophen-3-yl)ethyl]amine; (thiophen-3-yl)propanedioic acid; N-[2-(2,5-dichloro-1,3-thiazol-4-yl)ethyl]-2-(3-hydroxyphenyl)acetamide; 4-[difluoro(phenyl)methyl]-1,3-thiazol-2-amine; 4-[difluoro(phenyl)methyl]-1H-imidazole; 2-chloro-4-[difluoro(phenyl)methyl]-1,3-thiazole; 2,2-difluoro[2-(trifluoromethyl)-1,3-thiazol-5-yl]acetic acid; ethyl 2,2-difluoro-2-[5-(trifluoromethyl)thiophen-2-yl]acetate; 2-chloro-4-(2-hydrazinylethyl)-1,3-thiazole; ethyl difluoro(thiophen-3-yl)acetate; 2-(2-chloro-1,3-thiazol-4-yl)acetohydrazide; [2-(2,5-dichlorothiophen-3-yl)ethyl]hydrazine; ethyl difluoro[5-(trifluoromethyl)thiophen-3-yl]acetate; N-[2-(2,5-dichlorothiophen-3-yl)ethyl]-2-phenylacetamide; benzyl (2,5-dichlorothiophen-3-yl)(difluoro)acetate; 2,2-difluoro-2-[5-(trifluoromethyl)-1,3-thiazol-2-yl]acetic acid; [2-(5-chlorothiophen-3-yl)ethyl]hydrazine; [(2-chloro-1,3-thiazol-4-

yl)methyl]phosphonic acid; 1-(2-chloro-1,3-thiazol-4-yl)-3-phenylpropan-2-one; 2-(2-chloro-1,3-thiazol-4-yl)-N'-methylacetohydrazide; 2-[2-(5-chloro-3-fluoropyridin-2-yl)-1,3-thiazol-4-yl]acetic acid; 2,2-difluoro-2-[5-methyl-2-(trifluoromethyl)-1,3-thiazol-4-yl]acetic acid; 2-(2-chloro-1,3-thiazol-4-yl)-2,2-difluoroethan-1-ol; N'-[2-(2,5-dichlorothiophen-3-yl)ethyl]-N-(3-hydroxypropyl)guanidine; 2-carbamimidamido-N-[2-(2,5-dichlorothiophen-3-yl)ethyl]acetamide; N-[2-(2,5-dichlorothiophen-3-yl)ethyl]-N'-(2-hydroxypropyl)guanidine; difluoro[2-(trifluoromethyl)thiophen-3-yl]acetic acid; ethyl 2-(2-amino-5-chloro-1,3-thiazol-4-yl)-2,2-difluoroacetate; 2-(2-bromo-1,3-thiazol-4-yl)-2,2-difluoroacetic acid; 2-[2-(2,5-dichlorothiophen-3-yl)ethyl]-1,4,5,6-tetrahydropyrimidin-5-ol; 2-(2-{[2-(2,5-dichlorothiophen-3-yl)ethyl]amino}-4,5-dihydro-1H-imidazol-1-yl)ethan-1-ol; 2-{[2-(2,5-dichlorothiophen-3-yl)ethyl](4,5-dihydro-1H-imidazol-2-yl)amino}ethan-1-ol; 2-[2-(4-chloro-2-fluorophenyl)-1,3-thiazol-4-yl]-2,2-difluoroacetic acid; (4-bromophenyl)methyl (2,5-dichlorothiophen-3-yl)acetate; 2,2-difluoro-2-{2-[3-fluoro-5-(trifluoromethyl)pyridin-2-yl]-1,3-thiazol-4-yl}acetic acid; [(2-bromo-1,3-thiazol-4-yl)(difluoro)methyl]phosphonic acid; 2-(4-methylphenyl)-2-oxoethyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; 4-amino-5-(2-chlorothiophen-3-yl)pentanoic acid; 2-oxo-2-(pyridin-2-yl)ethyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; 2-oxo-2-phenylethyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; 2-(2-{[2-(2,5-dichlorothiophen-3-yl)ethyl]amino}-4,5-dihydro-1H-imidazol-1-yl)ethan-1-ol; 3-acetyl-1-[2-(2,5-dichlorothiophen-3-yl)ethyl]piperidin-4-one; [2,5-bis(trifluoromethyl)-1,3-thiazol-4-yl](difluoro)acetic acid; 2-[2-(benzyloxy)ethoxy]ethyl 2-(2-chloro-1,3-thiazol-4-yl)-2,2-difluoroacetate; 2-(2-methoxyethoxy)ethyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; (2-bromophenyl)methyl (2,5-dichlorothiophen-3-yl)(difluoro)acetate; 2-(1,2,3-thiadiazol-4-yl)acetic acid; [2-(2,4-dimethylbenzene-1-sulfonyl)-1,3-thiazol-4-yl](difluoro)acetic acid; 5H,6H-thieno[3,2-d][1,2,3]thiadiazole-5-carboxylic acid; (2-chloro-5-fluoro-1,3-thiazol-4-yl)(difluoro)acetic acid; {2-[(6-amino-9H-purin-9-yl)methoxy]ethoxy}methyl (2-chloro-1,3-thiazol-4-yl)acetate; (2-chloro-1,3-thiazol-4-yl)(cyano)acetic acid; (2-chloro-5-fluoro-1,3-thiazol-4-yl)(difluoro)acetic acid; (6-cyanopyridin-2-yl)(difluoro)acetic acid; (6-bromopyridin-2-yl)methyl 2-(2,5-dichlorothiophen-3-yl)-2,2-difluoroacetate; (6-bromopyridin-2-yl)methyl (2,5-dichlorothiophen-3-yl)acetate; difluoro[4-(trifluoromethyl)thiophen-3-yl]acetic acid; (4-bromophenyl)methyl (2,5-dichlorothiophen-3-yl)(difluoro)acetate; 2-(2-methoxyethoxy)ethyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; (2-bromophenyl)methyl (2,5-dichlorothiophen-3-

yl)(difluoro)acetate; 2-(3-chloro-1,2-thiazol-4-yl)-2,2-difluoroacetic acid; 2,5,8,11,14-pentaoxahexadecan-16-yl 2-(2-chloro-1,3-thiazol-4-yl)-2,2-difluoroacetate; ethyl 2-(2-chloro-1,3-thiazol-4-yl)-2,2-difluoroacetate; 2-(2-chloro-1,3-benzothiazol-4-yl)-2,2-difluoroacetic acid; 2-[5-chloro-2-(trifluoromethyl)-1,3-thiazol-4-yl]-2,2-difluoroacetic acid; 2-[2-chloro-5-(2-phenylethynyl)-1,3-thiazol-4-yl]-2,2-difluoroacetic acid; 2-(4-methylphenyl)-2-oxoethyl (2-chloro-1,3-thiazol-4-yl)acetate; 2-(2-cyanothiophen-3-yl)acetic acid; octyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; 3-(2-chloro-1,3-thiazol-4-yl)-3-oxopropanoic acid; 2-(6-bromopyridin-2-yl)-2-oxoethyl (2-chlorothiophen-3-yl)acetate; 4-(2,5-dichloro-1,3-thiazol-4-yl)but-3-ynoic acid; 2-bromopyridine-4-carboxamide; (2E)-3-(6-chloropyridin-2-yl)prop-2-enoic acid; (2E)-3-(2-chloropyridin-3-yl)prop-2-enoic acid; (2E)-3-(2-bromopyridin-3-yl)prop-2-enoic acid; (2E)-3-(2-bromopyridin-4-yl)prop-2-enoic acid; 2-bromo-N-(2-bromopyridin-4-yl)pyridine-4-carboxamide; (2E)-3-(2-bromopyridin-4-yl)-N-(4-hydroxyphenyl)prop-2-enamide; 3-(2-bromopyridin-4-yl)-2-oxopropanoic acid; 2-(2,6-dibromopyridin-4-yl)ethan-1-amine; 4-(2-aminoethyl)-6-bromopyridine-2-carbonitrile; 2,2-difluoro-2-(pyridin-4-yl)acetic acid; 2-[4-(pyridin-4-yloxy)phenyl]acetic acid; 3-amino-3-(2-bromopyridin-4-yl)propanamide; 2-(6-bromopyridin-2-yl)-2,2-difluoroacetic acid; 3-[(2-bromopyridin-4-yl)formamido]-2,2-difluoropropanoic acid; 2,2-difluoro-2-(pyrimidin-2-yl)acetic acid; 2-(6-bromopyridin-3-yl)-2,2-difluoroacetic acid; 2-(6-bromopyrimidin-4-yl)ethan-1-amine; 2-[2-amino-3-(4-hydroxyphenyl)propanamido]-3-phenylpropanoic acid hydrochloride; 2-(2-phenoxy-4-yl)ethan-1-amine; (2-bromopyridin-4-yl)(oxo)acetic acid; 1-chloroisoquinoline-7-carboxylic acid; 2-(2,6-dichloropyridin-4-yl)-2,2-difluoroacetic acid; methyl 2-(2-bromopyridin-4-yl)-2,2-difluoroacetate; (2,6-dibromopyridin-4-yl)-2,2-difluoroacetic acid; 2-(2,6-dibromopyridin-4-yl)-2,2-difluoroacetamide; 6-bromopyridine-2-carboximidamide hydrochloride; ethyl 2-(6-bromopyridin-2-yl)acetate; N-[(6-bromopyridin-2-yl)methyl]guanidine; N-(6-bromopyridin-2-yl)guanidine hydrochloride; (2E)-3-(6-bromopyridin-3-yl)-2,3-difluoroprop-2-enoic acid; ethyl 2-(6-bromopyridin-2-yl)-2,2-difluoroacetate; 2-(6-bromopyridin-2-yl)-2,2-difluoroethan-1-ol ; [2-(6-bromopyridin-2-yl)ethyl]trimethylazanium; 2-bromo-6-phenoxy-4-pyridine; benzyl (6-bromopyridin-2-yl)(difluoro)acetate; 2-amino-3-(6-bromopyridin-2-yl)propan-1-ol; 2-(6-bromopyridin-2-yl)ethanimidamide hydrochloride; 3-(2-bromopyridin-4-yl)propan-1-amine; 2-bromo-6-[difluoro(phenyl)methyl]pyridine; 2,2-difluoro-2-[6-(trifluoromethyl)pyridin-2-yl]acetic acid; 2,2-difluoro-2-[4-(trifluoromethyl)pyrimidin-2-yl]acetic acid; 2-(6-chloropyrazin-

2-yl)-2,2-difluoroacetic acid; 2,2-difluoro-2-[6-(trifluoromethyl)pyrazin-2-yl]acetic acid; 2-[6-(4-chloro-2-fluorophenyl)pyridin-2-yl]-2,2-difluoroacetic acid; 2-(6-bromopyridin-2-yl)ethan-1-amine; 2-[6-(2,5-dichlorothiophen-3-yl)pyridin-2-yl]-2,2-difluoroacetic acid; 2,2-difluoro-2-{6-[2-(trifluoromethyl)-1,3-thiazol-4-yl]pyridin-2-yl}acetic acid; 2,2-difluoro-2-{6-[2-fluoro-4-(trifluoromethyl)phenyl]pyridin-2-yl}acetic acid; difluoro(3,5,6-trifluoropyridin-2-yl)acetic acid; 2-fluoro-2-(3,5,6-trifluoropyridin-2-yl)acetic acid; 2-[6-(2-chloro-1,3-thiazol-4-yl)pyridin-2-yl]-2,2-difluoroacetic acid; (6-bromo-5-fluoropyridin-2-yl)(difluoro)acetic acid; difluoro(6-fluoropyridin-2-yl)acetic acid; difluoro[6-(methylideneamino)pyridin-2-yl]acetic acid; (6-chloropyridin-2-yl)(difluoro)acetic acid; (6-bromo-5-fluoropyridin-2-yl)(difluoro)acetic acid; octyl (2-bromo-6-cyanopyridin-3-yl)acetate; octyl (6-bromo-2-cyanopyridin-3-yl)acetate; and at least one acceptable carrier.

According to some embodiments, the invention provides a method of controlling undesired plant growth comprising applying to the locus of the undesired growth a compound or a salt thereof selected from: 2-(2,5-dichlorothiophen-3-yl)ethan-1-amine; 3-(2,5-dichlorothiophen-3-yl)-2-hydroxypropanoic acid; 2-(2,5-dichlorothiophen-3-yl)acetic acid; 1-(2,5-dichlorothiophen-3-yl)methanamine; 2-(thiophen-3-yl)ethan-1-amine; 2-(thiophen-3-yl)ethan-1-ol; 2-amino-1-(thiophen-3-yl)ethan-1-ol; 2-(thiophen-3-yl)acetamide; 2-(1H-1,2,4-triazol-5-yl)ethan-1-amine; 2-(1H-1,2,4-triazol-5-yl)ethan-1-amine; 3-(thiophen-3-yl)propan-1-amine; 2,5-dichloro-1,3-thiazole-4-carboxylic acid; 4-(2,5-dichlorothiophen-3-yl)butanoic acid; ethyl 3-[5-(chloromethyl)-1,3,4-thiadiazol-2-yl]-2-acetamido-3,3-difluoropropanoate; 2-amino-3-(1H-indazol-3-yl)propanoic acid hydrochloride[HCl]; (2-bromopyridin-4-yl)acetic acid; 3-(2-bromopyridin-4-yl)-2-hydroxypropanoic acid; 2-(2-bromopyridin-4-yl)ethan-1-amine; 4-(2-aminoethyl)phenol; bis[(2-bromopyridin-4-yl)methyl]amine; 2-(pyridin-3-yl)acetamide; 2-(2,6-dibromopyridin-4-yl)acetic acid; 2-bromo-4-(2-bromoethyl)pyridine; naphthalene-2-carboxylic acid; 2-bromopyridine-4-carboxylic acid; (2E)-3-(2,6-dichloropyridin-3-yl)prop-2-enoic acid; 2-amino-N-(2-bromopyridin-4-yl)ethane-1-sulfonamide; 4-(2,5-dichlorothiophen-3-yl)butanamide; 2-(thiophen-3-yl)ethane-1-thiol; (2-aminoethyl)[(2,5-dichlorothiophen-3-yl)methyl]amine; 2-[[2-(thiophen-3-yl)ethyl]sulfanyl]ethan-1-amine; 3-(thiophen-3-yl)propane-1,2-diol; 3-[(2,5-dichlorothiophen-3-yl)formamido]-2,2-difluoropropanoic acid; 3-(2,5-dichlorothiophen-3-yl)propanoic acid; (2E)-3-(5-chlorothiophen-2-yl)prop-2-enoic acid;

(2E)-3-(1,3-thiazol-5-yl)prop-2-enoic acid; 2-(2,5-dichlorothiophen-3-yl)acetamide; [(2,5-dichlorothiophen-3-yl)methyl]hydrazine; 3-[[[(2,5-dichlorothiophen-3-yl)methyl]amino]-2,2-difluoropropanoic acid; 3-(2,5-dichlorothiophen-3-yl)-2-oxopropanoic acid; 2,5-dichloro-1,3-thiazole-4-carbonyl chloride; 2-bromo-N-[(2,5-dichlorothiophen-3-yl)methyl]pyridine-4-

5 carboxamide; 2-[[[(2,5-dichlorothiophen-3-yl)methyl]amino]acetic acid; dichloro-1,3-thiazole-4-carboxamide; N-(2,5-dichloro-1,3-thiazol-4-yl)acetamide; (3E)-4-(2,5-dichlorothiophen-3-yl)-2-oxobut-3-enoic acid; (2E)-3-(3-chloro-1H-1,2,4-triazol-5-yl)prop-2-enoic acid; (2E)-3-(2,4-dichloro-1,3-thiazol-5-yl)prop-2-enoic acid; 2-(2-chlorothiophen-3-yl)-2,2-difluoroacetic acid; 3-[[[(2,5-dichlorothiophen-3-yl)methyl]amino]-2,2-difluoropropanoic acid; 2-(5-

10 chlorothiophen-3-yl)-2,2-difluoroacetic acid; 3-{4-[(2,5-dichlorothiophen-3-yl)methyl]piperazin-1-yl}propanoic acid; trichloro-1,3-thiazole; 3-(1H-1,2,4-triazol-1-yl)propanoic acid; N-[2-(2,5-dichlorothiophen-3-yl)ethyl]acetamide; 4-(2,5-dichlorothiophen-3-yl)-2,2-dimethylbutanoic acid; 2-(2,5-dichlorothiophen-3-yl)-2-oxoacetic acid; 4-(2,5-dichlorothiophen-3-yl)-4,4-difluorobutanoic acid; 2-amino-3-(1H-1,2,4-triazol-1-yl)propanoic

15 acid dihydrochloride [HCl]; N-propyl-3-(4H-1,2,4-triazol-3-yl)propanamide; propyl 3-(4H-1,2,4-triazol-3-yl)propanoate; 2-(2,5-dichlorothiophen-3-yl)-2,2-difluoroacetamide; 2-(2,5-dichloro-1,3-thiazol-4-yl)acetic acid; 3-(2,5-dichloro-1,3-thiazol-4-yl)-N-propylpropanamide; ethyl 3-(2,5-dichloro-1,3-thiazol-4-yl)propanoate; (2,5-dichlorothiophen-3-yl)(difluoro)acetic acid; 2-(3-bromo-1H-1,2,4-triazol-5-yl)ethan-1-amine; ethyl (2,5-dichlorothiophen-3-

20 yl)(difluoro)acetate; [2-(2,5-dichlorothiophen-3-yl)(difluoro)acetamido]acetic acid; 2-oxo-2-(2,4,5-trichlorothiophen-3-yl)acetic acid; 3-(2,5-dichlorothiophen-3-yl)-N-ethylpropanamide; 3-[(2,5-dibromothiophene-3-sulfonyl)amino]propanoic acid; N-(2-aminoethyl)-2,5-dibromothiophene-3-sulfonamide; ethyl 3-(2,5-dichlorothiophen-3-yl)propanoate; N-[2-(2,5-dichloro-1,3-thiazol-4-yl)ethyl]acetamide; 2,2-difluoro-2-(2,4,5-trichlorothiophen-3-yl)acetic

25 acid; methyl oxo(2,4,5-trichlorothiophen-3-yl)acetate; 1-(2,5-dichloro-1,3-thiazol-4-yl)methanamine; 2,2-difluoro-2-(2-oxo-2,3-dihydro-1H-1,3-benzodiazol-5-yl)acetic acid; ethyl (2,5-dichloro-1,3-thiazol-4-yl)(difluoro)acetate; methyl 2-chloro-2-(2,5-dichlorothiophen-3-yl)acetate; 4-(2,5-dichlorothiophen-3-yl)butan-1-amine; 2-amino-2-(2,5-dichlorothiophen-3-yl)acetic acid; propyl[2-(1H-1,2,4-triazol-3-yl)ethyl]amine; ethyl 2-(2-bromo-5-methyl-1,3-

30 thiazol-4-yl)acetate; ethyl 2-bromo-2-(2-bromo-5-methyl-1,3-thiazol-4-yl)acetate; ethyl 2-(2-bromo-1,3-thiazol-4-yl)acetate; sodium (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; 2-(2,5-

dichloro-1,3-thiazol-4-yl)-2,2-difluoroacetic acid; ethyl (2,5-dichlorothiophen-3-yl)acetate; benzyl 2-(2,5-dichlorothiophen-3-yl)acetate; 2-(2,5-dichlorothiophen-3-yl)-N-methoxyethan-1-amine; 2-(2,5-dichlorothiophen-3-yl)-N,N,N-trimethylethan-1-aminium; ethyl 2-(5-bromo-2-methyl-1,3-thiazol-4-yl)acetate; 2-amino-4,5,6,7-tetrahydro-1,3-benzothiazole-4-carboxylic acid hydrochloride; 5-(2,5-dichlorothiophen-3-yl)imidazolidine-2,4-dione; 2-chloro-4-phenyl-1,3-thiazole; 2-(2-amino-1,3-thiazol-4-yl)-2,2-difluoroacetic acid; 2,2-difluoro-2-[2-(trifluoromethyl)-1,3-thiazol-4-yl]acetic acid; 2-(2,5-dichloro-1,3-thiazol-4-yl)-N,N,N-trimethylethan-1-aminium; 2-chloro-4-(phenoxyethyl)-1,3-thiazole; 2-chloro[1,3]thiazolo[5,4-b]pyridine-6-carboxylic acid; 4-benzyl-2-chloro-1,3-thiazole; 3-([2-(2,5-dichloro-1,3-thiazol-4-yl)ethyl]amino)methylphenol; 2,2-difluoro-2-(1H-1,2,3,4-tetrazol-5-yl)acetic acid; dibenzyl[(2-chloro-1,3-thiazol-4-yl)methyl]amine; dichloro-1,3-thiazole-4-sulfinic acid; 2-(2,5-dichloro-1,3-thiazol-4-yl)ethan-1-amine; 2,5-dichlorothiophene-3-carboxylic acid; (thiophen-3-yl)acetic acid; benzyl[2-(2,5-dichlorothiophen-3-yl)ethyl]amine; (thiophen-3-yl)propanedioic acid; N-[2-(2,5-dichloro-1,3-thiazol-4-yl)ethyl]-2-(3-hydroxyphenyl)acetamide; 4-[difluoro(phenyl)methyl]-1,3-thiazol-2-amine; 4-[difluoro(phenyl)methyl]-1H-imidazole; 2-chloro-4-[difluoro(phenyl)methyl]-1,3-thiazole; 2,2-difluoro-2-(trifluoromethyl)-1,3-thiazol-5-yl]acetic acid; ethyl 2,2-difluoro-2-[5-(trifluoromethyl)thiophen-2-yl]acetate; 2-chloro-4-(2-hydrazinylethyl)-1,3-thiazole; ethyl difluoro(thiophen-3-yl)acetate; 2-(2-chloro-1,3-thiazol-4-yl)acetohydrazide; [2-(2,5-dichlorothiophen-3-yl)ethyl]hydrazine; ethyl difluoro[5-(trifluoromethyl)thiophen-3-yl]acetate; N-[2-(2,5-dichlorothiophen-3-yl)ethyl]-2-phenylacetamide; benzyl (2,5-dichlorothiophen-3-yl)(difluoro)acetate; 2,2-difluoro-2-[5-(trifluoromethyl)-1,3-thiazol-2-yl]acetic acid; [2-(5-chlorothiophen-3-yl)ethyl]hydrazine; [(2-chloro-1,3-thiazol-4-yl)methyl]phosphonic acid; 1-(2-chloro-1,3-thiazol-4-yl)-3-phenylpropan-2-one; 2-(2-chloro-1,3-thiazol-4-yl)-N'-methylacetohydrazide; 2-[2-(5-chloro-3-fluoropyridin-2-yl)-1,3-thiazol-4-yl]acetic acid; 2,2-difluoro-2-[5-methyl-2-(trifluoromethyl)-1,3-thiazol-4-yl]acetic acid; 2-(2-chloro-1,3-thiazol-4-yl)-2,2-difluoroethan-1-ol; N'-[2-(2,5-dichlorothiophen-3-yl)ethyl]-N-(3-hydroxypropyl)guanidine; 2-carbamimidamido-N-[2-(2,5-dichlorothiophen-3-yl)ethyl]acetamide; N-[2-(2,5-dichlorothiophen-3-yl)ethyl]-N'-(2-hydroxypropyl)guanidine; difluoro[2-(trifluoromethyl)thiophen-3-yl]acetic acid; ethyl 2-(2-amino-5-chloro-1,3-thiazol-4-yl)-2,2-difluoroacetate; 2-(2-bromo-1,3-thiazol-4-yl)-2,2-difluoroacetic acid; 2-[2-(2,5-

dichlorothiophen-3-yl)ethyl]-1,4,5,6- tetrahydropyrimidin-5-ol; 2-(2-{[2-(2,5-dichlorothiophen-3-yl)ethyl]amino}-4,5-dihydro-1H-imidazol-1-yl)ethan-1-ol; 2-{[2-(2,5-dichlorothiophen-3-yl)ethyl](4,5-dihydro-1H-imidazol-2-yl)amino}ethan-1-ol; 2-[2-(4-chloro-2-fluorophenyl)-1,3-thiazol-4-yl]-2,2-difluoroacetic acid; (4-bromophenyl)methyl (2,5-dichlorothiophen-3-yl)acetate; 2,2-difluoro-2-{2-[3-fluoro-5-(trifluoromethyl)pyridin-2-yl]-1,3-thiazol-4-yl}acetic acid; [(2-bromo-1,3-thiazol-4-yl)(difluoro)methyl]phosphonic acid; 2-(4-methylphenyl)-2-oxoethyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; 4-amino-5-(2-chlorothiophen-3-yl)pentanoic acid; 2-oxo-2-(pyridin-2-yl)ethyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; 2-oxo-2-phenylethyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; 2-(2-{[2-(2,5-dichlorothiophen-3-yl)ethyl]amino}-4,5-dihydro-1H-imidazol-1-yl)ethan-1-ol; 3-acetyl-1-[2-(2,5-dichlorothiophen-3-yl)ethyl]piperidin-4-one; [2,5-bis(trifluoromethyl)-1,3-thiazol-4-yl](difluoro)acetic acid; 2-[2-(benzyloxy)ethoxy]ethyl 2-(2-chloro-1,3-thiazol-4-yl)-2,2-difluoroacetate; 2-(2-methoxyethoxy)ethyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; (2-bromophenyl)methyl (2,5-dichlorothiophen-3-yl)(difluoro)acetate; 2-(1,2,3-thiadiazol-4-yl)acetic acid; [2-(2,4-dimethylbenzene-1-sulfonyl)-1,3-thiazol-4-yl](difluoro)acetic acid; 5H,6H-thieno[3,2-d][1,2,3]thiadiazole-5-carboxylic acid; (2-chloro-5-fluoro-1,3-thiazol-4-yl)(difluoro)acetic acid; {2-[(6-amino-9H-purin-9-yl)methoxy]ethoxy}methyl (2-chloro-1,3-thiazol-4-yl)acetate; (2-chloro-1,3-thiazol-4-yl)(cyano)acetic acid; (2-chloro-5-fluoro-1,3-thiazol-4-yl)(difluoro)acetic acid; (6-cyanopyridin-2-yl)(difluoro)acetic acid; (6-bromopyridin-2-yl)methyl 2-(2,5-dichlorothiophen-3-yl)-2,2-difluoroacetate; (6-bromopyridin-2-yl)methyl (2,5-dichlorothiophen-3-yl)acetate; difluoro[4-(trifluoromethyl)thiophen-3-yl]acetic acid ; (4-bromophenyl)methyl (2,5-dichlorothiophen-3-yl)(difluoro)acetate; 2-(2-methoxyethoxy)ethyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; (2-bromophenyl)methyl (2,5-dichlorothiophen-3-yl)(difluoro)acetate; 2-(3-chloro-1,2-thiazol-4-yl)-2,2-difluoroacetic acid; 2,5,8,11,14-pentaoxahexadecan-16-yl 2-(2-chloro-1,3-thiazol-4-yl)-2,2-difluoroacetate; ethyl 2-(2-chloro-1,3-thiazol-4-yl)-2,2-difluoroacetate; 2-(2-chloro-1,3-benzothiazol-4-yl)-2,2-difluoroacetic acid; 2-[5-chloro-2-(trifluoromethyl)-1,3-thiazol-4-yl]-2,2-difluoroacetic acid; 2-[2-chloro-5-(2-phenylethynyl)-1,3-thiazol-4-yl]-2,2-difluoroacetic acid; 2-(4-methylphenyl)-2-oxoethyl (2-chloro-1,3-thiazol-4-yl)acetate; 2-(2-cyanothiophen-3-yl)acetic acid; octyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; 3-(2-chloro-1,3-thiazol-4-yl)-3-oxopropanoic acid; 2-(6-bromopyridin-2-yl)-2-oxoethyl (2-chlorothiophen-3-yl)acetate; 4-(2,5-dichloro-1,3-thiazol-4-

yl)but-3-ynoic acid; 2-bromopyridine-4-carboxamide; (2E)-3-(6-chloropyridin-2-yl)prop-2-enoic acid; (2E)-3-(2-chloropyridin-3-yl)prop-2-enoic acid; (2E)-3-(2-bromopyridin-3-yl)prop-2-enoic acid; (2E)-3-(2-bromopyridin-4-yl)prop-2-enoic acid; 2-bromo-N-(2-bromopyridin-4-yl)pyridine-4-carboxamide; (2E)-3-(2-bromopyridin-4-yl)-N-(4-hydroxyphenyl)prop-2-enamide;

5 3-(2-bromopyridin-4-yl)-2-oxopropanoic acid; 2-(2,6-dibromopyridin-4-yl)ethan-1-amine; 4-(2-aminoethyl)-6-bromopyridine-2-carbonitrile; 2,2-difluoro-2-(pyridin-4-yl)acetic acid; 2-[4-(pyridin-4-yloxy)phenyl]acetic acid; 3-amino-3-(2-bromopyridin-4-yl)propanamide; 2-(6-bromopyridin-2-yl)-2,2-difluoroacetic acid; 3-[(2-bromopyridin-4-yl)formamido]-2,2-difluoropropanoic acid; 2,2-difluoro-2-(pyrimidin-2-yl)acetic acid; 2-(6-bromopyridin-3-yl)-2,2-

10 difluoroacetic acid; 2-(6-bromopyrimidin-4-yl)ethan-1-amine; 2-[2-amino-3-(4-hydroxyphenyl)propanamido]-3-phenylpropanoic acid hydrochloride; 2-(2-phenoxy-pyridin-4-yl)ethan-1-amine; (2-bromopyridin-4-yl)(oxo)acetic acid; 1-chloroisoquinoline-7-carboxylic acid; 2-(2,6-dichloropyridin-4-yl)-2,2-difluoroacetic acid; methyl 2-(2-bromopyridin-4-yl)-2,2-difluoroacetate; (2,6-dibromopyridin-4-yl)-2,2-difluoroacetic acid; 2-(2,6-dibromopyridin-4-yl)-

15 2,2-difluoroacetamide; 6-bromopyridine-2-carboximidamide hydrochloride; ethyl 2-(6-bromopyridin-2-yl)acetate; N-[(6-bromopyridin-2-yl)methyl]guanidine; N-(6-bromopyridin-2-yl)guanidine hydrochloride; (2E)-3-(6-bromopyridin-3-yl)-2,3-difluoroprop-2-enoic acid; ethyl 2-(6-bromopyridin-2-yl)-2,2-difluoroacetate; 2-(6-bromopyridin-2-yl)-2,2-difluoroethan-1-ol ; [2-(6-bromopyridin-2-yl)ethyl]trimethylazanium; 2-bromo-6-phenoxy-pyridine; benzyl (6-

20 bromopyridin-2-yl)(difluoro)acetate; 2-amino-3-(6-bromopyridin-2-yl)propan-1-ol; 2-(6-bromopyridin-2-yl)ethanimidamide hydrochloride; 3-(2-bromopyridin-4-yl)propan-1-amine; 2-bromo-6-[difluoro(phenyl)methyl]pyridine; 2,2-difluoro-2-[6-(trifluoromethyl)pyridin-2-yl]acetic acid; 2,2-difluoro-2-[4-(trifluoromethyl)pyrimidin-2-yl]acetic acid; 2-(6-chloropyrazin-2-yl)-2,2-difluoroacetic acid; 2,2-difluoro-2-[6-(trifluoromethyl)pyrazin-2-yl]acetic acid; 2-[6-(4-

25 chloro-2-fluorophenyl)pyridin-2-yl]-2,2-difluoroacetic acid; 2-(6-bromopyridin-2-yl)ethan-1-amine; 2-[6-(2,5-dichlorothiophen-3-yl)pyridin-2-yl]-2,2-difluoroacetic acid; 2,2-difluoro-2-{6-[2-(trifluoromethyl)-1,3-thiazol-4-yl]pyridin-2-yl}acetic acid; 2,2-difluoro-2-{6-[2-fluoro-4-(trifluoromethyl)phenyl]pyridin-2-yl}acetic acid; difluoro(3,5,6-trifluoropyridin-2-yl)acetic acid; 2-fluoro-2-(3,5,6-trifluoropyridin-2-yl)acetic acid; 2-[6-(2-chloro-1,3-thiazol-4-yl)pyridin-2-yl]-

30 2,2-difluoroacetic acid; (6-bromo-5-fluoropyridin-2-yl)(difluoro)acetic acid; difluoro(6-fluoropyridin-2-yl)acetic acid; difluoro[6-(methylideneamino)pyridin-2-yl]acetic acid; (6-

chloropyridin-2-yl)(difluoro)acetic acid; (6-bromo-5-fluoropyridin-2-yl)(difluoro)acetic acid; octyl (2-bromo-6-cyanopyridin-3-yl)acetate; octyl (6-bromo-2-cyanopyridin-3-yl)acetate; and at least one acceptable carrier.

According to some embodiments, the invention provides a method of controlling undesired plant growth comprising applying to the locus of the undesired growth an agricultural composition compound or a salt thereof selected from: 2-(2,5-dichlorothiophen-3-yl)ethan-1-amine; 3-(2,5-dichlorothiophen-3-yl)-2-hydroxypropanoic acid; 2-(2,5-dichlorothiophen-3-yl)acetic acid; 1-(2,5-dichlorothiophen-3-yl)methanamine; 2-(thiophen-3-yl)ethan-1-amine; 2-(thiophen-3-yl)ethan-1-ol; 2-amino-1-(thiophen-3-yl)ethan-1-ol; 2-(thiophen-3-yl)acetamide; 2-(1H-1,2,4-triazol-5-yl)ethan-1-amine; 2-(1H-1,2,4-triazol-5-yl)ethan-1-amine; 3-(thiophen-3-yl)propan-1-amine; 2,5-dichloro-1,3-thiazole-4-carboxylic acid; 4-(2,5-dichlorothiophen-3-yl)butanoic acid; ethyl 3-[5-(chloromethyl)-1,3,4-thiadiazol-2-yl]-2-acetamido-3,3-difluoropropanoate; 2-amino-3-(1H-indazol-3-yl)propanoic acid hydrochloride[HCl]; (2-bromopyridin-4-yl)acetic acid; 3-(2-bromopyridin-4-yl)-2-hydroxypropanoic acid; 2-(2-bromopyridin-4-yl)ethan-1-amine; 4-(2-aminoethyl)phenol; bis[(2-bromopyridin-4-yl)methyl]amine; 2-(pyridin-3-yl)acetamide; 2-(2,6-dibromopyridin-4-yl)acetic acid; 2-bromo-4-(2-bromoethyl)pyridine; naphthalene-2-carboxylic acid; 2-bromopyridine-4-carboxylic acid; (2E)-3-(2,6-dichloropyridin-3-yl)prop-2-enoic acid; 2-amino-N-(2-bromopyridin-4-yl)ethane-1-sulfonamide; 4-(2,5-dichlorothiophen-3-yl)butanamide; 2-(thiophen-3-yl)ethane-1-thiol; (2-aminoethyl)[(2,5-dichlorothiophen-3-yl)methyl]amine; 2-{[2-(thiophen-3-yl)ethyl]sulfanyl}ethan-1-amine; 3-(thiophen-3-yl)propane-1,2-diol; 3-[(2,5-dichlorothiophen-3-yl)formamido]-2,2-difluoropropanoic acid; 3-(2,5-dichlorothiophen-3-yl)propanoic acid; (2E)-3-(5-chlorothiophen-2-yl)prop-2-enoic acid; (2E)-3-(1,3-thiazol-5-yl)prop-2-enoic acid; 2-(2,5-dichlorothiophen-3-yl)acetamide; [(2,5-dichlorothiophen-3-yl)methyl]hydrazine; 3-[(2,5-dichlorothiophen-3-yl)methyl]amino}-2,2-difluoropropanoic acid; 3-(2,5-dichlorothiophen-3-yl)-2-oxopropanoic acid; 2,5-dichloro-1,3-thiazole-4-carbonyl chloride; 2-bromo-N-[(2,5-dichlorothiophen-3-yl)methyl]pyridine-4-carboxamide; 2-[(2,5-dichlorothiophen-3-yl)methyl]amino}acetic acid; dichloro-1,3-thiazole-4-carboxamide; N-(2,5-dichloro-1,3-thiazol-4-yl)acetamide; (3E)-4-(2,5-dichlorothiophen-3-yl)-2-oxobut-3-enoic acid; (2E)-3-(3-chloro-1H-1,2,4-triazol-5-yl)prop-2-enoic acid; (2E)-3-(2,4-dichloro-1,3-thiazol-5-yl)prop-2-enoic acid; 2-

(2-chlorothiophen-3-yl)-2,2-difluoroacetic acid; 3-[(2,5-dichlorothiophen-3-yl)methyl]amino}-2,2-difluoropropanoic acid; 2-(5-chlorothiophen-3-yl)-2,2-difluoroacetic acid; 3-{4-[(2,5-dichlorothiophen-3-yl)methyl]piperazin-1-yl}propanoic acid; trichloro-1,3-thiazole; 3-(1H-1,2,4-triazol-1-yl)propanoic acid; N-[2-(2,5-dichlorothiophen-3-yl)ethyl]acetamide; 4-(2,5-dichlorothiophen-3-yl)-2,2-dimethylbutanoic acid; 2-(2,5-dichlorothiophen-3-yl)-2-oxoacetic acid; 4-(2,5-dichlorothiophen-3-yl)-4,4-difluorobutanoic acid; 2-amino-3-(1H-1,2,4-triazol-1-yl)propanoic acid dihydrochloride [HCl]; N-propyl-3-(4H-1,2,4-triazol-3-yl)propanamide; propyl 3-(4H-1,2,4-triazol-3-yl)propanoate; 2-(2,5-dichlorothiophen-3-yl)-2,2-difluoroacetamide; 2-(2,5-dichloro-1,3-thiazol-4-yl)acetic acid; 3-(2,5-dichloro-1,3-thiazol-4-yl)-N-propylpropanamide; ethyl 3-(2,5-dichloro-1,3-thiazol-4-yl)propanoate; (2,5-dichlorothiophen-3-yl)(difluoro)acetic acid; 2-(3-bromo-1H-1,2,4-triazol-5-yl)ethan-1-amine; ethyl (2,5-dichlorothiophen-3-yl)(difluoro)acetate; [2-(2,5-dichlorothiophen-3-yl)(difluoro)acetamido]acetic acid; 2-oxo-2-(2,4,5-trichlorothiophen-3-yl)acetic acid; 3-(2,5-dichlorothiophen-3-yl)-N-ethylpropanamide; 3-[(2,5-dibromothiophene-3-sulfonyl)amino]propanoic acid; N-(2-aminoethyl)-2,5-dibromothiophene-3-sulfonamide; ethyl 3-(2,5-dichlorothiophen-3-yl)propanoate; N-[2-(2,5-dichloro-1,3-thiazol-4-yl)ethyl]acetamide; 2,2-difluoro-2-(2,4,5-trichlorothiophen-3-yl)acetic acid; methyl oxo(2,4,5-trichlorothiophen-3-yl)acetate; 1-(2,5-dichloro-1,3-thiazol-4-yl)methanamine; 2,2-difluoro-2-(2-oxo-2,3-dihydro-1H-1,3-benzodiazol-5-yl)acetic acid; ethyl (2,5-dichloro-1,3-thiazol-4-yl)(difluoro)acetate; methyl 2-chloro-2-(2,5-dichlorothiophen-3-yl)acetate; 4-(2,5-dichlorothiophen-3-yl)butan-1-amine; 2-amino-2-(2,5-dichlorothiophen-3-yl)acetic acid; propyl[2-(1H-1,2,4-triazol-3-yl)ethyl]amine; ethyl 2-(2-bromo-5-methyl-1,3-thiazol-4-yl)acetate; ethyl 2-bromo-2-(2-bromo-5-methyl-1,3-thiazol-4-yl)acetate; ethyl 2-(2-bromo-1,3-thiazol-4-yl)acetate; sodium (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; 2-(2,5-dichloro-1,3-thiazol-4-yl)-2,2-difluoroacetic acid; ethyl (2,5-dichlorothiophen-3-yl)acetate; benzyl 2-(2,5-dichlorothiophen-3-yl)acetate; 2-(2,5-dichlorothiophen-3-yl)-N-methoxyethan-1-amine; 2-(2,5-dichlorothiophen-3-yl)-N,N,N-trimethylethan-1-aminium; ethyl 2-(5-bromo-2-methyl-1,3-thiazol-4-yl)acetate; 2-amino-4,5,6,7-tetrahydro-1,3-benzothiazole-4-carboxylic acid hydrochloride; 5-(2,5-dichlorothiophen-3-yl)imidazolidine-2,4-dione; 2-chloro-4-phenyl-1,3-thiazole; 2-(2-amino-1,3-thiazol-4-yl)-2,2-difluoroacetic acid; 2,2-difluoro-2-[2-(trifluoromethyl)-1,3-thiazol-4-yl]acetic acid; 2-(2,5-dichloro-1,3-thiazol-4-yl)-N,N,N-trimethylethan-1-aminium; 2-chloro-4-

(phenoxyethyl)-1,3-thiazole; 2-chloro[1,3]thiazolo[5,4-b]pyridine-6-carboxylic acid; 4-benzyl-2-chloro-1,3-thiazole; 3-([2-(2,5-dichloro-1,3-thiazol-4-yl)ethyl]amino)methylphenol; 2,2-difluoro-2-(1H-1,2,3,4-tetrazol-5-yl)acetic acid; dibenzyl[(2-chloro-1,3-thiazol-4-yl)methyl]amine; dichloro-1,3-thiazole-4-sulfinic acid; 2-(2,5-dichloro-1,3-thiazol-4-yl)ethan-1-amine; 2,5-dichlorothiophene-3-carboxylic acid; (thiophen-3-yl)acetic acid; benzyl[2-(2,5-dichlorothiophen-3-yl)ethyl]amine; (thiophen-3-yl)propanedioic acid; N-[2-(2,5-dichloro-1,3-thiazol-4-yl)ethyl]-2-(3-hydroxyphenyl)acetamide; 4-[difluoro(phenyl)methyl]-1,3-thiazol-2-amine; 4-[difluoro(phenyl)methyl]-1H-imidazole; 2-chloro-4-[difluoro(phenyl)methyl]-1,3-thiazole; 2,2-difluoro[2-(trifluoromethyl)-1,3-thiazol-5-yl]acetic acid; ethyl 2,2-difluoro-2-[5-(trifluoromethyl)thiophen-2-yl]acetate; 2-chloro-4-(2-hydrazinylethyl)-1,3-thiazole; ethyl difluoro(thiophen-3-yl)acetate; 2-(2-chloro-1,3-thiazol-4-yl)acetohydrazide; [2-(2,5-dichlorothiophen-3-yl)ethyl]hydrazine; ethyl difluoro[5-(trifluoromethyl)thiophen-3-yl]acetate; N-[2-(2,5-dichlorothiophen-3-yl)ethyl]-2-phenylacetamide; benzyl (2,5-dichlorothiophen-3-yl)(difluoro)acetate; 2,2-difluoro-2-[5-(trifluoromethyl)-1,3-thiazol-2-yl]acetic acid; [2-(5-chlorothiophen-3-yl)ethyl]hydrazine; [(2-chloro-1,3-thiazol-4-yl)methyl]phosphonic acid; 1-(2-chloro-1,3-thiazol-4-yl)-3-phenylpropan-2-one; 2-(2-chloro-1,3-thiazol-4-yl)-N'-methylacetohydrazide; 2-[2-(5-chloro-3-fluoropyridin-2-yl)-1,3-thiazol-4-yl]acetic acid; 2,2-difluoro-2-[5-methyl-2-(trifluoromethyl)-1,3-thiazol-4-yl]acetic acid; 2-(2-chloro-1,3-thiazol-4-yl)-2,2-difluoroethan-1-ol; N'-[2-(2,5-dichlorothiophen-3-yl)ethyl]-N-(3-hydroxypropyl)guanidine; 2-carbamimidamido-N-[2-(2,5-dichlorothiophen-3-yl)ethyl]acetamide; N-[2-(2,5-dichlorothiophen-3-yl)ethyl]-N'-(2-hydroxypropyl)guanidine; difluoro[2-(trifluoromethyl)thiophen-3-yl]acetic acid; ethyl 2-(2-amino-5-chloro-1,3-thiazol-4-yl)-2,2-difluoroacetate; 2-(2-bromo-1,3-thiazol-4-yl)-2,2-difluoroacetic acid; 2-[2-(2,5-dichlorothiophen-3-yl)ethyl]-1,4,5,6-tetrahydropyrimidin-5-ol; 2-[2-(2,5-dichlorothiophen-3-yl)ethyl]amino-4,5-dihydro-1H-imidazol-1-yl)ethan-1-ol; 2-[2-(2,5-dichlorothiophen-3-yl)ethyl](4,5-dihydro-1H-imidazol-2-yl)amino)ethan-1-ol; 2-[2-(4-chloro-2-fluorophenyl)-1,3-thiazol-4-yl]-2,2-difluoroacetic acid; (4-bromophenyl)methyl (2,5-dichlorothiophen-3-yl)acetate; 2,2-difluoro-2-{2-[3-fluoro-5-(trifluoromethyl)pyridin-2-yl]-1,3-thiazol-4-yl}acetic acid; [(2-bromo-1,3-thiazol-4-yl)(difluoro)methyl]phosphonic acid; 2-(4-methylphenyl)-2-oxoethyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; 4-amino-5-(2-chlorothiophen-3-yl)pentanoic acid; 2-oxo-2-(pyridin-2-yl)ethyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; 2-

oxo-2-phenylethyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; 2-(2-{[2-(2,5-dichlorothiophen-3-yl)ethyl]amino}-4,5-dihydro-1H-imidazol-1-yl)ethan-1-ol; 3-acetyl-1-[2-(2,5-dichlorothiophen-3-yl)ethyl]piperidin-4-one; [2,5-bis(trifluoromethyl)-1,3-thiazol-4-yl](difluoro)acetic acid; 2-[2-(benzyloxy)ethoxy]ethyl 2-(2-chloro-1,3-thiazol-4-yl)-2,2-difluoroacetate; 2-(2-methoxyethoxy)ethyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; (2-bromophenyl)methyl (2,5-dichlorothiophen-3-yl)(difluoro)acetate; 2-(1,2,3-thiadiazol-4-yl)acetic acid; [2-(2,4-dimethylbenzene-1-sulfonyl)-1,3-thiazol-4-yl](difluoro)acetic acid; 5H,6H-thieno[3,2-d][1,2,3]thiadiazole-5-carboxylic acid; (2-chloro-5-fluoro-1,3-thiazol-4-yl)(difluoro)acetic acid; {2-[(6-amino-9H-purin-9-yl)methoxy]ethoxy}methyl (2-chloro-1,3-thiazol-4-yl)acetate; (2-chloro-1,3-thiazol-4-yl)(cyano)acetic acid; (2-chloro-5-fluoro-1,3-thiazol-4-yl)(difluoro)acetic acid; (6-cyanopyridin-2-yl)(difluoro)acetic acid; (6-bromopyridin-2-yl)methyl 2-(2,5-dichlorothiophen-3-yl)-2,2-difluoroacetate; (6-bromopyridin-2-yl)methyl (2,5-dichlorothiophen-3-yl)acetate; difluoro[4-(trifluoromethyl)thiophen-3-yl]acetic acid; (4-bromophenyl)methyl (2,5-dichlorothiophen-3-yl)(difluoro)acetate; 2-(2-methoxyethoxy)ethyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; (2-bromophenyl)methyl (2,5-dichlorothiophen-3-yl)(difluoro)acetate; 2-(3-chloro-1,2-thiazol-4-yl)-2,2-difluoroacetic acid; 2,5,8,11,14-pentaoxahexadecan-16-yl 2-(2-chloro-1,3-thiazol-4-yl)-2,2-difluoroacetate; ethyl 2-(2-chloro-1,3-thiazol-4-yl)-2,2-difluoroacetate; 2-(2-chloro-1,3-benzothiazol-4-yl)-2,2-difluoroacetic acid; 2-[5-chloro-2-(trifluoromethyl)-1,3-thiazol-4-yl]-2,2-difluoroacetic acid; 2-[2-chloro-5-(2-phenylethynyl)-1,3-thiazol-4-yl]-2,2-difluoroacetic acid; 2-(4-methylphenyl)-2-oxoethyl (2-chloro-1,3-thiazol-4-yl)acetate; 2-(2-cyanothiophen-3-yl)acetic acid; octyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; 3-(2-chloro-1,3-thiazol-4-yl)-3-oxopropanoic acid; 2-(6-bromopyridin-2-yl)-2-oxoethyl (2-chlorothiophen-3-yl)acetate; 4-(2,5-dichloro-1,3-thiazol-4-yl)but-3-ynoic acid; 2-bromopyridine-4-carboxamide; (2E)-3-(6-chloropyridin-2-yl)prop-2-enoic acid; (2E)-3-(2-chloropyridin-3-yl)prop-2-enoic acid; (2E)-3-(2-bromopyridin-3-yl)prop-2-enoic acid; (2E)-3-(2-bromopyridin-4-yl)prop-2-enoic acid; 2-bromo-N-(2-bromopyridin-4-yl)pyridine-4-carboxamide; (2E)-3-(2-bromopyridin-4-yl)-N-(4-hydroxyphenyl)prop-2-enamide; 3-(2-bromopyridin-4-yl)-2-oxopropanoic acid; 2-(2,6-dibromopyridin-4-yl)ethan-1-amine; 4-(2-aminoethyl)-6-bromopyridine-2-carbonitrile; 2,2-difluoro-2-(pyridin-4-yl)acetic acid; 2-[4-(pyridin-4-yloxy)phenyl]acetic acid; 3-amino-3-(2-bromopyridin-4-yl)propanamide; 2-(6-bromopyridin-2-yl)-2,2-difluoroacetic acid; 3-[(2-bromopyridin-4-yl)formamido]-2,2-

difluoropropanoic acid; 2,2-difluoro-2-(pyrimidin-2-yl)acetic acid; 2-(6-bromopyridin-3-yl)-2,2-difluoroacetic acid; 2-(6-bromopyrimidin-4-yl)ethan-1-amine; 2-[2-amino-3-(4-hydroxyphenyl)propanamido]-3-phenylpropanoic acid hydrochloride; 2-(2-phenoxy-4-yl)ethan-1-amine; (2-bromopyridin-4-yl)(oxo)acetic acid; 1-chloroisoquinoline-7-carboxylic acid; 2-(2,6-dichloropyridin-4-yl)-2,2-difluoroacetic acid; methyl 2-(2-bromopyridin-4-yl)-2,2-difluoroacetate; (2,6-dibromopyridin-4-yl)-2,2-difluoroacetic acid; 2-(2,6-dibromopyridin-4-yl)-2,2-difluoroacetamide; 6-bromopyridine-2-carboximidamide hydrochloride; ethyl 2-(6-bromopyridin-2-yl)acetate; N-[(6-bromopyridin-2-yl)methyl]guanidine; N-(6-bromopyridin-2-yl)guanidine hydrochloride; (2E)-3-(6-bromopyridin-3-yl)-2,3-difluoroprop-2-enoic acid; ethyl 2-(6-bromopyridin-2-yl)-2,2-difluoroacetate; 2-(6-bromopyridin-2-yl)-2,2-difluoroethan-1-ol ; [2-(6-bromopyridin-2-yl)ethyl]trimethylazanium; 2-bromo-6-phenoxy-4-pyridine; benzyl (6-bromopyridin-2-yl)(difluoro)acetate; 2-amino-3-(6-bromopyridin-2-yl)propan-1-ol; 2-(6-bromopyridin-2-yl)ethanimidamide hydrochloride; 3-(2-bromopyridin-4-yl)propan-1-amine; 2-bromo-6-[difluoro(phenyl)methyl]pyridine; 2,2-difluoro-2-[6-(trifluoromethyl)pyridin-2-yl]acetic acid; 2,2-difluoro-2-[4-(trifluoromethyl)pyrimidin-2-yl]acetic acid; 2-(6-chloropyrazin-2-yl)-2,2-difluoroacetic acid; 2,2-difluoro-2-[6-(trifluoromethyl)pyrazin-2-yl]acetic acid; 2-[6-(4-chloro-2-fluorophenyl)pyridin-2-yl]-2,2-difluoroacetic acid; 2-(6-bromopyridin-2-yl)ethan-1-amine; 2-[6-(2,5-dichlorothiophen-3-yl)pyridin-2-yl]-2,2-difluoroacetic acid; 2,2-difluoro-2-[6-[2-(trifluoromethyl)-1,3-thiazol-4-yl]pyridin-2-yl]acetic acid; 2,2-difluoro-2-[6-[2-fluoro-4-(trifluoromethyl)phenyl]pyridin-2-yl]acetic acid; difluoro(3,5,6-trifluoropyridin-2-yl)acetic acid; 2-fluoro-2-(3,5,6-trifluoropyridin-2-yl)acetic acid; 2-[6-(2-chloro-1,3-thiazol-4-yl)pyridin-2-yl]-2,2-difluoroacetic acid; (6-bromo-5-fluoropyridin-2-yl)(difluoro)acetic acid; difluoro(6-fluoropyridin-2-yl)acetic acid; difluoro[6-(methylideneamino)pyridin-2-yl]acetic acid; (6-chloropyridin-2-yl)(difluoro)acetic acid; (6-bromo-5-fluoropyridin-2-yl)(difluoro)acetic acid; octyl (2-bromo-6-cyanopyridin-3-yl)acetate; octyl (6-bromo-2-cyanopyridin-3-yl)acetate; and at least one acceptable carrier.

According to some embodiments of the above methods and compositions, the application dose for pre-emergence application is from 200 g/Ha to 600 g/Ha.

According to some embodiments of the above methods and compositions, the application dose for pre-emergence application is from 250 g/Ha to 500 g/Ha.

According to some embodiments of the above methods and compositions, the application dose for pre-emergence application is 150 g/Ha; 175 g/Ha; 200 g/Ha; 225 g/Ha; 250 g/Ha; 275 g/Ha; 300 g/Ha; 325 g/Ha; 350 g/Ha; 375 g/Ha; 400 g/Ha; 425 g/Ha; 450 g/Ha; 475 g/Ha; 500 g/Ha; 525 g/Ha; 550 g/Ha; 575 g/Ha and 600 g/Ha.

- 5 According to some embodiments of the above methods and compositions, the application dose for post-emergence application is from 700 g/Ha to 2200 g/Ha.

According to some embodiments of the above methods and compositions, the application dose for pre-emergence application is from 1000 g/Ha to 2000 g/Ha.

- 10 According to some embodiments of the above methods and compositions, the application dose for pre-emergence application is 700 g/Ha; 750 g/Ha; 800 g/Ha; 850 g/Ha; 900 g/Ha; 950 g/Ha; 1000 g/Ha; 1050 g/Ha; 1100 g/Ha; 1150 g/Ha; 1200 g/Ha; 1250 g/Ha; 1300 g/Ha; 1350 g/Ha; 1400 g/Ha; 1450 g/Ha; 1500 g/Ha; 1550 g/Ha; 1600 g/Ha; 1650 g/Ha; 1700 g/Ha; 1750 g/Ha; 1800 g/Ha; 1850 g/Ha; 1900 g/Ha; 1950 g/Ha; 2000 g/Ha; 2050 g/Ha; 2100 g/Ha; 2150 g/Ha; and 2200 g/Ha.

- 15 According to some embodiments of the above methods and compositions, the application dose is effective to block the growth and/or kill a majority of broadleaf weeds.

- According to some embodiments of the above methods and compositions, the locus of undesired vegetation is a field of a crop. According to some embodiments, the crop is a cereal. According to some embodiments the non-limiting list of crops includes soybean, corn (*Zea*),
 20 wheat (*Triticum*), rye (*Secale*), barley (*Hordeum*), oat (*Avena*), rice (*Oryza*), millet (*Pennisetum*), sorghum (*Sorghum*), and triticale.

In the context of the embodiments of the above methods and compositions, the term “weed” is interchangeable with the term “bad weed” and refers to plants growing in the vicinity of crops and jeopardize prosperity of the crops.

- 25 According to some embodiments of the above methods and compositions, the non-limiting list of weeds includes *Amaranthus tuberculatus*, *Amaranthus palmeri*, *Chenopodium album*, *Chenopodium murale*, *Malva nicaeensis*, *Abutilon theophrasti*, *Chrysanthemum coronarium*,

Silybum marianum, *Bidens*, *Verbesina encelioides*, *Lactuca serriola*, *Erigeron canadensis*, *Erigeron bonariensis*, *Ormenis mixta*, *Xanthium strumarium*, *Heterotheca subaxillaris*, *Sonchus oleraceus*, *Sinapis arvensis*, *Datura innoxia*, *Datura ferox*, *Portulaca oleracea*, *Convolvulus althaeoides*, *Ipomoea hederacea*, *Medicago scutellata*, or any other weed that can be
 5 eradicated by the compounds, compositions and uses of the inventions.

According to some embodiments of the above methods and compositions, the non-limiting list of weeds includes Noxious Weed Species, that have been designated by a (national or international) authority as harmful (or injurious) to crops, ecosystems, animals or humans. According to some embodiments, the invention provides an agricultural composition
 10 comprising a compound or a salt thereof selected from compounds listed in Table 1 and at least one acceptable carrier.

According to some embodiments, the invention provides a method of controlling undesired vegetation comprising to the locus of such vegetation a herbicidally effective amount of an agricultural composition comprising a compound or a salt thereof selected from compounds
 15 listed in Table 1 and at least one acceptable carrier.

Examples

In the examples below, if an abbreviation is not defined above, it has its generally accepted meaning. Further, all temperatures are in degrees Celsius (unless otherwise indicated). The compounds can be identified with 3 or 4 digit ID number (such as 548 or 5601), with or
 20 without a prefix (such as FP5666). The following methods were used to prepare the compounds set forth below as indicated

Example 1: Derivatives of heterocyclic amino acids with herbicidal activity

Table 1: non-exclusive list of derivatives of non-coded heterocyclic amino acids exemplifying the claims:

ID	Chemical Name
584	2-(2,5-dichlorothiophen-3-yl)ethan-1-amine

585	3-(2,5-dichlorothiophen-3-yl)-2-hydroxypropanoic acid
586	2-(2,5-dichlorothiophen-3-yl)acetic acid
587	1-(2,5-dichlorothiophen-3-yl)methanamine
588	2-(thiophen-3-yl)ethan-1-amine
589	2-(thiophen-3-yl)ethan-1-ol
590	2-amino-1-(thiophen-3-yl)ethan-1-ol
591	2-(thiophen-3-yl)acetamide
592	2-(1H-1,2,4-triazol-5-yl)ethan-1-amine
592	2-(1H-1,2,4-triazol-5-yl)ethan-1-amine
593	3-(thiophen-3-yl)propan-1-amine
596	2,5-dichloro-1,3-thiazole-4-carboxylic acid
597	4-(2,5-dichlorothiophen-3-yl)butanoic acid
598	ethyl 3-[5-(chloromethyl)-1,3,4-thiadiazol-2-yl]-2-acetamido-3,3-difluoropropanoate
599	2-amino-3-(1H-indazol-3-yl)propanoic acid hydrochloride [HCl]
678	(2-bromopyridin-4-yl)acetic acid
680	3-(2-bromopyridin-4-yl)-2-hydroxypropanoic acid
681	2-(2-bromopyridin-4-yl)ethan-1-amine
684	4-(2-aminoethyl)phenol
686	bis[(2-bromopyridin-4-yl)methyl]amine
687	2-(pyridin-3-yl)acetamide
689	2-(2,6-dibromopyridin-4-yl)acetic acid

690	2-bromo-4-(2-bromoethyl)pyridine
691	naphthalene-2-carboxylic acid
692	2-bromopyridine-4-carboxylic acid
694	(2E)-3-(2,6-dichloropyridin-3-yl)prop-2-enoic acid
695	2-amino-N-(2-bromopyridin-4-yl)ethane-1-sulfonamide
5600	4-(2,5-dichlorothiophen-3-yl)butanamide
5601	2-(thiophen-3-yl)ethane-1-thiol
5602	(2-aminoethyl)[(2,5-dichlorothiophen-3-yl)methyl]amine
5603	2-{{2-(thiophen-3-yl)ethyl}sulfanyl}ethan-1-amine
5604	3-(thiophen-3-yl)propane-1,2-diol
5605	3-[(2,5-dichlorothiophen-3-yl)formamido]-2,2-difluoropropanoic acid
5606	3-(2,5-dichlorothiophen-3-yl)propanoic acid
5607	(2E)-3-(5-chlorothiophen-2-yl)prop-2-enoic acid
5608	(2E)-3-(1,3-thiazol-5-yl)prop-2-enoic acid
5609	2-(2,5-dichlorothiophen-3-yl)acetamide
5610	[(2,5-dichlorothiophen-3-yl)methyl]hydrazine
5611	3-{{(2,5-dichlorothiophen-3-yl)methyl}amino}-2,2-difluoropropanoic acid
5612	3-(2,5-dichlorothiophen-3-yl)-2-oxopropanoic acid
5613	2,5-dichloro-1,3-thiazole-4-carbonyl chloride
5614	2-bromo-N-[(2,5-dichlorothiophen-3-yl)methyl]pyridine-4-carboxamide
5615	2-{{(2,5-dichlorothiophen-3-yl)methyl}amino}acetic acid

5616	dichloro-1,3-thiazole-4-carboxamide
5618	N-(2,5-dichloro-1,3-thiazol-4-yl)acetamide
5620	(3E)-4-(2,5-dichlorothiophen-3-yl)-2-oxobut-3-enoic acid
5621	(2E)-3-(3-chloro-1H-1,2,4-triazol-5-yl)prop-2-enoic acid
5622	(2E)-3-(2,4-dichloro-1,3-thiazol-5-yl)prop-2-enoic acid
5623	2-(2-chlorothiophen-3-yl)-2,2-difluoroacetic acid
5624	3-{[(2,5-dichlorothiophen-3-yl)methyl]amino}-2,2-difluoropropanoic acid
5625	2-(5-chlorothiophen-3-yl)-2,2-difluoroacetic acid
5626	3-{4-[(2,5-dichlorothiophen-3-yl)methyl]piperazin-1-yl}propanoic acid
5627	trichloro-1,3-thiazole
5628	3-(1H-1,2,4-triazol-1-yl)propanoic acid
5629	N-[2-(2,5-dichlorothiophen-3-yl)ethyl]acetamide
5630	4-(2,5-dichlorothiophen-3-yl)-2,2-dimethylbutanoic acid
5631	2-(2,5-dichlorothiophen-3-yl)-2-oxoacetic acid
5632	4-(2,5-dichlorothiophen-3-yl)-4,4-difluorobutanoic acid
5633	2-amino-3-(1H-1,2,4-triazol-1-yl)propanoic acid dihydrochloride [HCl]
5634	N-propyl-3-(4H-1,2,4-triazol-3-yl)propanamide
5635	propyl 3-(4H-1,2,4-triazol-3-yl)propanoate
5636	2-(2,5-dichlorothiophen-3-yl)-2,2-difluoroacetamide
5637	2-(2,5-dichloro-1,3-thiazol-4-yl)acetic acid
5638	3-(2,5-dichloro-1,3-thiazol-4-yl)-N-propylpropanamide

5639	ethyl 3-(2,5-dichloro-1,3-thiazol-4-yl)propanoate
5640	(2,5-dichlorothiophen-3-yl)(difluoro)acetic acid
5642	2-(3-bromo-1H-1,2,4-triazol-5-yl)ethan-1-amine
5643	ethyl (2,5-dichlorothiophen-3-yl)(difluoro)acetate
5644	[2-(2,5-dichlorothiophen-3-yl)(difluoro)acetamido]acetic acid
5645	2-oxo-2-(2,4,5-trichlorothiophen-3-yl)acetic acid
5646	3-(2,5-dichlorothiophen-3-yl)-N-ethylpropanamide
5647	3-[(2,5-dibromothiophene-3-sulfonyl)amino]propanoic acid
5648	N-(2-aminoethyl)-2,5-dibromothiophene-3-sulfonamide
5649	ethyl 3-(2,5-dichlorothiophen-3-yl)propanoate
5650	N-[2-(2,5-dichloro-1,3-thiazol-4-yl)ethyl]acetamide
5651	2,2-difluoro-2-(2,4,5-trichlorothiophen-3-yl)acetic acid
5652	methyl oxo(2,4,5-trichlorothiophen-3-yl)acetate
5653	1-(2,5-dichloro-1,3-thiazol-4-yl)methanamine
5654	2,2-difluoro-2-(2-oxo-2,3-dihydro-1H-1,3-benzodiazol-5-yl)acetic acid
5655	ethyl (2,5-dichloro-1,3-thiazol-4-yl)(difluoro)acetate
5656	methyl 2-chloro-2-(2,5-dichlorothiophen-3-yl)acetate
5657	4-(2,5-dichlorothiophen-3-yl)butan-1-amine
5659	2-amino-2-(2,5-dichlorothiophen-3-yl)acetic acid
5660	propyl[2-(1H-1,2,4-triazol-3-yl)ethyl]amine
5661	ethyl 2-(2-bromo-5-methyl-1,3-thiazol-4-yl)acetate

5662	ethyl 2-bromo-2-(2-bromo-5-methyl-1,3-thiazol-4-yl)acetate
5663	ethyl 2-(2-bromo-1,3-thiazol-4-yl)acetate
5666	sodium (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate
5667	2-(2,5-dichloro-1,3-thiazol-4-yl)-2,2-difluoroacetic acid,
5668	ethyl (2,5-dichlorothiophen-3-yl)acetate
5669	benzyl 2-(2,5-dichlorothiophen-3-yl)acetate
5670	2-(2,5-dichlorothiophen-3-yl)-N-methoxyethan-1-amine
5671	2-(2,5-dichlorothiophen-3-yl)-N,N,N-trimethylethan-1-aminium
5672	ethyl 2-(5-bromo-2-methyl-1,3-thiazol-4-yl)acetate
5673	2-amino-4,5,6,7-tetrahydro-1,3-benzothiazole-4- carboxylic acid hydrochloride
5674	5-(2,5-dichlorothiophen-3-yl)imidazolidine-2,4-dione
5676	2-chloro-4-phenyl-1,3-thiazole
5678	2-(2-amino-1,3-thiazol-4-yl)-2,2-difluoroacetic acid
5679	2,2-difluoro-2-[2-(trifluoromethyl)-1,3-thiazol-4-yl]acetic acid
5680	2-(2,5-dichloro-1,3-thiazol-4-yl)-N,N,N-trimethylethan-1-aminium
5681	2-chloro-4-(phenoxyethyl)-1,3-thiazole
5683	2-chloro[1,3]thiazolo[5,4-b]pyridine-6-carboxylic acid
5685	4-benzyl-2-chloro-1,3-thiazole
5687	3-({[2-(2,5-dichloro-1,3-thiazol-4-yl)ethyl]amino}methyl)phenol
5688	2,2-difluoro-2-(1H-1,2,3,4-tetrazol-5-yl)acetic acid
5689	dibenzyl[(2-chloro-1,3-thiazol-4-yl)methyl]amine

5690	dichloro-1,3-thiazole-4-sulfinic acid
5691	2-(2,5-dichloro-1,3-thiazol-4-yl)ethan-1-amine
5692	2,5-dichlorothiophene-3-carboxylic acid
5693	(thiophen-3-yl)acetic acid
5694	benzyl[2-(2,5-dichlorothiophen-3-yl)ethyl]amine
5695	(thiophen-3-yl)propanedioic acid
5696	N-[2-(2,5-dichloro-1,3-thiazol-4-yl)ethyl]-2-(3-hydroxyphenyl)acetamide
5697	4-[difluoro(phenyl)methyl]-1,3-thiazol-2-amine
5698	4-[difluoro(phenyl)methyl]-1H-imidazole
5699	2-chloro-4-[difluoro(phenyl)methyl]-1,3-thiazole
5700	2,2-difluoro[2-(trifluoromethyl)-1,3-thiazol-5-yl]acetic acid
5701	ethyl 2,2-difluoro-2-[5-(trifluoromethyl)thiophen-2-yl]acetate
5702	2-chloro-4-(2-hydrazinyethyl)-1,3-thiazole
5703	ethyl difluoro(thiophen-3-yl)acetate
5704	2-(2-chloro-1,3-thiazol-4-yl)acetohydrazide
5705	[2-(2,5-dichlorothiophen-3-yl)ethyl]hydrazine
5707	ethyl difluoro[5-(trifluoromethyl)thiophen-3-yl]acetate
5708	N-[2-(2,5-dichlorothiophen-3-yl)ethyl]-2-phenylacetamide
5709	benzyl (2,5-dichlorothiophen-3-yl)(difluoro)acetate
5710	2,2-difluoro-2-[5-(trifluoromethyl)-1,3-thiazol-2-yl]acetic acid
5711	[2-(5-chlorothiophen-3-yl)ethyl]hydrazine

5713	[(2-chloro-1,3-thiazol-4-yl)methyl]phosphonic acid
5714	1-(2-chloro-1,3-thiazol-4-yl)-3-phenylpropan-2-one
5715	2-(2-chloro-1,3-thiazol-4-yl)-N'-methylacetohydrazide
5716	2-[2-(5-chloro-3-fluoropyridin-2-yl)-1,3-thiazol-4-yl]acetic acid
5717	2,2-difluoro-2-[5-methyl-2-(trifluoromethyl)-1,3-thiazol-4-yl]acetic acid
5724	2-(2-chloro-1,3-thiazol-4-yl)-2,2-difluoroethan-1-ol
5725	N'-[2-(2,5-dichlorothiophen-3-yl)ethyl]-N-(3-hydroxypropyl)guanidine
5726	2-carbamimidamido-N-[2-(2,5-dichlorothiophen-3-yl)ethyl]acetamide
5727	N-[2-(2,5-dichlorothiophen-3-yl)ethyl]-N'-(2-hydroxypropyl)guanidine
5728	difluoro[2-(trifluoromethyl)thiophen-3-yl]acetic acid
5729	ethyl 2-(2-amino-5-chloro-1,3-thiazol-4-yl)-2,2-difluoroacetate
5730	2-(2-bromo-1,3-thiazol-4-yl)-2,2-difluoroacetic acid
5731	2-[2-(2,5-dichlorothiophen-3-yl)ethyl]-1,4,5,6-tetrahydropyrimidin-5-ol
5732	2-(2-{[2-(2,5-dichlorothiophen-3-yl)ethyl]amino}-4,5-dihydro-1H-imidazol-1-yl)ethan-1-ol
5733	2-{[2-(2,5-dichlorothiophen-3-yl)ethyl](4,5-dihydro-1H-imidazol-2-yl)amino}ethan-1-ol
5734	2-[2-(4-chloro-2-fluorophenyl)-1,3-thiazol-4-yl]-2,2-difluoroacetic acid
5735	(4-bromophenyl)methyl (2,5-dichlorothiophen-3-yl)acetate
5736	2,2-difluoro-2-[2-[3-fluoro-5-(trifluoromethyl)pyridin-2-yl]-1,3-thiazol-4-yl]acetic acid
5737	[(2-bromo-1,3-thiazol-4-yl)(difluoro)methyl]phosphonic acid
5738	2-(4-methylphenyl)-2-oxoethyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate
5739	4-amino-5-(2-chlorothiophen-3-yl)pentanoic acid

5740	2-oxo-2-(pyridin-2-yl)ethyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate
5741	2-oxo-2-phenylethyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate
5742	2-(2-([2-(2,5-dichlorothiophen-3-yl)ethyl]amino)-4,5-dihydro-1H-imidazol-1-yl)ethan-1-ol
5743	3-acetyl-1-[2-(2,5-dichlorothiophen-3-yl)ethyl]piperidin-4-one
5744	[2,5-bis(trifluoromethyl)-1,3-thiazol-4-yl](difluoro)acetic acid
5745	2-[2-(benzyloxy)ethoxy]ethyl 2-(2-chloro-1,3-thiazol-4-yl)-2,2-difluoroacetate
5746	2-(2-methoxyethoxy)ethyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate
5747	(2-bromophenyl)methyl (2,5-dichlorothiophen-3-yl)(difluoro)acetate
5748	2-(1,2,3-thiadiazol-4-yl)acetic acid
5749	[2-(2,4-dimethylbenzene-1-sulfonyl)-1,3-thiazol-4-yl](difluoro)acetic acid
5750	5H,6H-thieno[3,2-d][1,2,3]thiadiazole-5-carboxylic acid
5751	(2-chloro-5-fluoro-1,3-thiazol-4-yl)(difluoro)acetic acid
5752	{2-[(6-amino-9H-purin-9-yl)methoxy]ethoxy}methyl (2-chloro-1,3-thiazol-4-yl)acetate
5753	(2-chloro-1,3-thiazol-4-yl)(cyano)acetic acid
5754	(2-chloro-5-fluoro-1,3-thiazol-4-yl)(difluoro)acetic acid
5755	(6-cyanopyridin-2-yl)(difluoro)acetic acid
5757	(6-bromopyridin-2-yl)methyl 2-(2,5-dichlorothiophen-3-yl)-2,2-difluoroacetate
5759	(6-bromopyridin-2-yl)methyl (2,5-dichlorothiophen-3-yl)acetate
5764	difluoro[4-(trifluoromethyl)thiophen-3-yl]acetic acid
5768	(4-bromophenyl)methyl (2,5-dichlorothiophen-3-yl)(difluoro)acetate

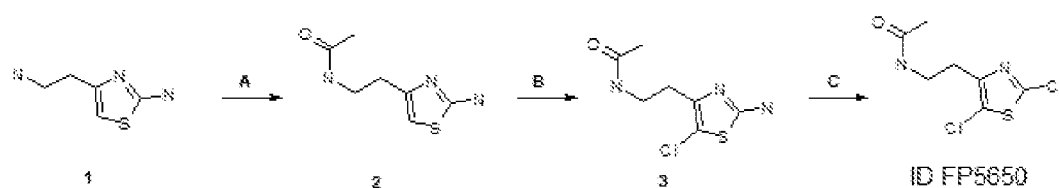
5771	2-(2-methoxyethoxy)ethyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate
5772	(2-bromophenyl)methyl (2,5-dichlorothiophen-3-yl)(difluoro)acetate
5773	2-(3-chloro-1,2-thiazol-4-yl)-2,2-difluoroacetic acid
5778	2,5,8,11,14-pentaoxahexadecan-16-yl 2-(2-chloro-1,3-thiazol-4-yl)-2,2-difluoroacetate
5784	ethyl 2-(2-chloro-1,3-thiazol-4-yl)-2,2-difluoroacetate
5786	2-(2-chloro-1,3-benzothiazol-4-yl)-2,2-difluoroacetic acid
5791	2-[5-chloro-2-(trifluoromethyl)-1,3-thiazol-4-yl]-2,2-difluoroacetic acid
5792	2-[2-chloro-5-(2-phenylethynyl)-1,3-thiazol-4-yl]-2,2-difluoroacetic acid
5795	2-(4-methylphenyl)-2-oxoethyl (2-chloro-1,3-thiazol-4-yl)acetate
5803	2-(2-cyanothiophen-3-yl)acetic acid
5805	octyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate
5818	3-(2-chloro-1,3-thiazol-4-yl)-3-oxopropanoic acid
5831	2-(6-bromopyridin-2-yl)-2-oxoethyl (2-chlorothiophen-3-yl)acetate
5834	4-(2,5-dichloro-1,3-thiazol-4-yl)but-3-ynoic acid
6600	2-bromopyridine-4-carboxamide
6603	(2E)-3-(6-chloropyridin-2-yl)prop-2-enoic acid
6604	(2E)-3-(2-chloropyridin-3-yl)prop-2-enoic acid
6605	(2E)-3-(2-bromopyridin-3-yl)prop-2-enoic acid
6606	(2E)-3-(2-bromopyridin-4-yl)prop-2-enoic acid
6607	2-bromo-N-(2-bromopyridin-4-yl)pyridine-4-carboxamide
6610	(2E)-3-(2-bromopyridin-4-yl)-N-(4-hydroxyphenyl)prop-2-enamide

6611	3-(2-bromopyridin-4-yl)-2-oxopropanoic acid
6612	2-(2,6-dibromopyridin-4-yl)ethan-1-amine
6613	4-(2-aminoethyl)-6-bromopyridine-2-carbonitrile
6614	2,2-difluoro-2-(pyridin-4-yl)acetic acid
6615	2-[4-(pyridin-4-yloxy)phenyl]acetic acid
6616	3-amino-3-(2-bromopyridin-4-yl)propanamide
6617	2-(6-bromopyridin-2-yl)-2,2-difluoroacetic acid
6618	3-[(2-bromopyridin-4-yl)formamido]-2,2-difluoropropanoic acid
6619	2,2-difluoro-2-(pyrimidin-2-yl)acetic acid
6620	2-(6-bromopyridin-3-yl)-2,2-difluoroacetic acid
6621	2-(6-bromopyrimidin-4-yl)ethan-1-amine
6622	2-[2-amino-3-(4-hydroxyphenyl)propanamido]-3-phenylpropanoic acid hydrochloride
6625	2-(2-phenoxy pyridin-4-yl)ethan-1-amine
6626	(2-bromopyridin-4-yl)(oxo)acetic acid
6627	1-chloroisoquinoline-7-carboxylic acid
6628	2-(2,6-dichloropyridin-4-yl)-2,2-difluoroacetic acid
6629	methyl 2-(2-bromopyridin-4-yl)-2,2-difluoroacetate
6632	(2,6-dibromopyridin-4-yl)-2,2-difluoroacetic acid
6633	2-(2,6-dibromopyridin-4-yl)-2,2-difluoroacetamide
6634	6-bromopyridine-2-carboximidamide hydrochloride
6635	ethyl 2-(6-bromopyridin-2-yl)acetate

6636	N-[(6-bromopyridin-2-yl)methyl]guanidine
6637	N-(6-bromopyridin-2-yl)guanidine hydrochloride
6638	(2E)-3-(6-bromopyridin-3-yl)-2,3-difluoroprop-2-enoic acid
6640	ethyl 2-(6-bromopyridin-2-yl)-2,2-difluoroacetate
6643	2-(6-bromopyridin-2-yl)-2,2-difluoroethan-1-ol
6644	[2-(6-bromopyridin-2-yl)ethyl]trimethylazanium
6645	2-bromo-6-phenoxy pyridine
6646	benzyl (6-bromopyridin-2-yl)(difluoro)acetate
6647	2-amino-3-(6-bromopyridin-2-yl)propan-1-ol
6648	2-(6-bromopyridin-2-yl)ethanimidamide hydrochloride
6649	3-(2-bromopyridin-4-yl)propan-1-amine
6650	2-bromo-6-[difluoro(phenyl)methyl]pyridine
6651	2,2-difluoro-2-[6-(trifluoromethyl)pyridin-2-yl]acetic acid
6652	2,2-difluoro-2-[4-(trifluoromethyl)pyrimidin-2-yl]acetic acid
6653	2-(6-chloropyrazin-2-yl)-2,2-difluoroacetic acid
6654	2,2-difluoro-2-[6-(trifluoromethyl)pyrazin-2-yl]acetic acid
6655	2-[6-(4-chloro-2-fluorophenyl)pyridin-2-yl]-2,2-difluoroacetic acid
6656	2-(6-bromopyridin-2-yl)ethan-1-amine
6657	2-[6-(2,5-dichlorothiophen-3-yl)pyridin-2-yl]-2,2-difluoroacetic acid
6658	2,2-difluoro-2-{6-[2-(trifluoromethyl)-1,3-thiazol-4-yl]pyridin-2-yl}acetic acid
6659	2,2-difluoro-2-{6-[2-fluoro-4-(trifluoromethyl)phenyl]pyridin-2-yl}acetic acid

6660	difluoro(3,5,6-trifluoropyridin-2-yl)acetic acid
6661	2-fluoro-2-(3,5,6-trifluoropyridin-2-yl)acetic acid
6662	2-[6-(2-chloro-1,3-thiazol-4-yl)pyridin-2-yl]-2,2-difluoroacetic acid
6663	(6-bromo-5-fluoropyridin-2-yl)(difluoro)acetic acid
6664	difluoro(6-fluoropyridin-2-yl)acetic acid
6665	difluoro[6-(methylideneamino)pyridin-2-yl]acetic acid
6667	(6-chloropyridin-2-yl)(difluoro)acetic acid
6681	(6-bromo-5-fluoropyridin-2-yl)(difluoro)acetic acid
6691	octyl (2-bromo-6-cyanopyridin-3-yl)acetate
6692	octyl (6-bromo-2-cyanopyridin-3-yl)acetate

Example 2: Synthesis of N-[2-{2,5-dichloro-1,3-thiazol-4-yl}ethyl]acetamide



- 5 Step A: 4-(2-aminoethyl)thiazol-2-amine dihydrochloride (5 g, 23.3 mmol) was suspended in DCM and cooled to 0°C, following by the consequent addition of TEA (7g, 70 mmol) and acetic anhydride (2.4g, 24 mmol) in a dropwise manner. After the reaction was complete, the mixture was evaporated to dryness and re-evaporated with toluene 3 times to give crude N-(2-(2-aminothiazol-4-yl)ethyl)acetamide (4.5g, crude) which was used in the next step without
- 10 purification.

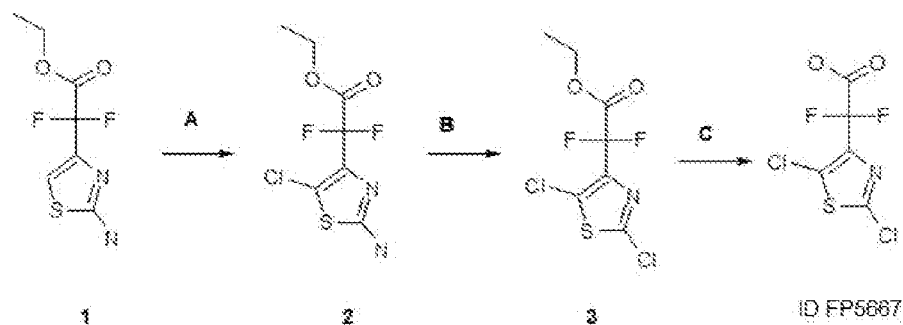
Step B: N-(2-(2-aminothiazol-4-yl)ethyl)acetarnide (4.5 g, 24.2 mmol) was dissolved in CH₃CN (50 mL), cooled to 0°C and NCS (3.33 g, 25 mmol) was added in one portion. After the reaction was complete (concluded by HNMR) the organic solvent was evaporated to dryness and the crude mixture was partitioned between EtOAc (50 mL) and H₂O (50mL). The organic layer was washed with H₂O and brine, dried over Na₂SO₄ and evaporated under reduced pressure to give ethyl N-(2-(2-arnino-5-chlorothiazol-4-yl)ethyl)acetarnide (3.7 g, 17.0 mmol, 70% yield) as yellow oil.

Step C: To the pre-cooled to ODC solution of N-(2-(2-arnino-5-chlorothiazol-4-yl)ethyl)acetarnide (3.7 g, 17.0 mmol) in CH:CN (50 mL) anhydrous CuCl₂ (2.3g, 17 mmol) was added in one portion. After 10 min, tert-butyl nitrite (1.8g, 17.5 mmol) was added in a dropwise manner (reaction starts after addition of about 10% of the reagent; the start can be identified by the beginning of vigorous gas evolution). After the reaction was complete (concluded by HNMR) the volume of the reaction mixture was carefully reduced under reduced pressure to a half; the resulted crude mixture was dissolved in EtOAc (100 mL) and thoroughly washed with 5% aq. HCl and brine. The organic layer was dried over Na₂SO₄ and evaporated under reduced pressure to give crude product, which was purified by FCC to give N-(2-(2,5-dichlorothiazol-4-yl)ethyl)acetamide (1.22g, 5.1mmol, 30% yield).

¹H NMR (500 MHz, DMSO-d₆) δ 7.94 (s, 1H), 3.29 (q, J=6.4 Hz, 2H), 2.76 (t, J=6.8 Hz, 2H), 1.76 (s, 3H).

LCMS 239 [M+H]⁺. MW 239.12; Melting point 87°C, Purity 90%.

Example 3: Synthesis of 2-(2,5-dichloro-1,3-thiazol-4-yl)-2,2- difluoroacetic acid (ID FP5667)



Step A: Ethyl 2-(2-aminothiazol-4-yl)-2,2-difluoroacetate (350 g, 1.58 mol) was dissolved in CH₃CN (3 L), cooled to 0°C and NCS (215 g, 1.6 mol) was added in one portion. After the reaction was complete (concluded by HNMR) the organic solvent was evaporated to dryness and the crude mixture was partitioned between EtOAc (3 L) and H₂O (1 L). The organic layer was washed with H₂O and brine, dried over Na₂SO₄ and evaporated under reduced pressure to give ethyl 2-(2-amino-5-chlorothiazol-4-yl)-2,2- difluoroacetate (283 g, 1.1 mol, 70% yield) as yellow solid.

Step B: To the pre-cooled to 0°C solution of ethyl 2-(2-amino-5-chlorothiazol-4-yl)-2,2-difluoroacetate (283 g, 1.1 mol) in CH₃CN (3 L) anhydrous CuCl₂ (155 g, 1.15 mol) was added in one portion. After 10 min, tert-butyl nitrite (121 g, 1.16 mol) was added in a dropwise manner (reaction starts after addition of about 10% of the reagent; the start can be identified by the beginning of vigorous gas evolution). After the reaction was complete (concluded by HNMR) the volume of the reaction mixture was carefully reduced under reduced pressure to a half; the resulted crude mixture was dissolved in EtOAc (3 L) and thoroughly washed with 5% aq. HCl and brine. The organic layer was dried over Na₂SO₄ and evaporated under reduced pressure to give crude ethyl 2-(2,5-dichlorothiazol-4-yl)-2,2-difluoroacetate (210 g, crude) as dark brown oil, which was used in the next step without purification.

Step C: Crude ethyl 2-(2,5-dichlorothiazol-4-yl)-2,2- difluoroacetate (210 g, crude) from the previous step was dissolved in EtOH (2 L), and the 20% aq. K₂CO₃ (0.5 L) was added in one portion. After the reaction was complete (typically 3 hr.) the solvents were evaporated to dryness, and the crude mixture was dissolved in H₂O (0.5 L); the clear solution was washed with CHCl₃ (3*200 mL) and MTBE (100 mL). The water layer was acidified with NaHSO₄ to pH = 4 and extracted with diethyl ether (3*150 mL). Combined organic layer was washed with brine, dried over Na₂SO₄ and evaporated under reduced pressure to give oily product. After column chromatography and trituration with pentane pure 2-(2,5-dichlorothiazol-4-yl)-2,2-difluoroacetic acid was obtained (113 g, 0.46 mol, 27% yield on 3 steps) as yellow solid.

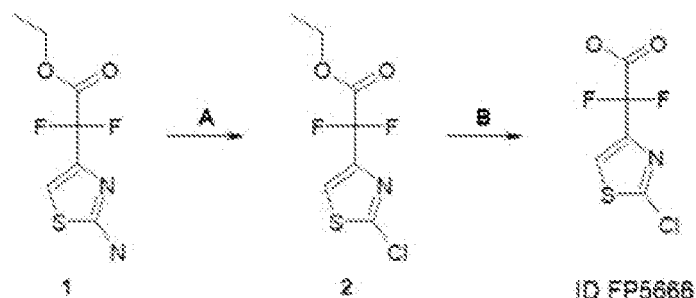
¹H NMR (500MHz, cdc13) δ 10.38 (s, 1H)

¹³C NMR (126 MHz, cdc13) δ 165.29 (t, J 13.4Hz), 149 (s), 140.45 (t, J = 29.7 Hz), 129.24 (s), 109.64 (t, J = 253.2 Hz).

¹⁹F NMR (470 MHz, cdc13) δ -102.57 (s).

LCMS 248 [M+H]⁺. Purity >95%

Example 4: Synthesis of 2-chloro-1,3-thiazol-4-yl)-2,2-difluoro acetic acid



- 5 Step A: To the pre-cooled to 0°C solution of ethyl 2-(2-aminothiazol-4-yl)-2,2-difluoroacetate (250 g, 1.12 mol) in CH₃CN (3 L) anhydrous CuCl₂ (155 g, 1.15 mol) was added in one portion (Caution! Exothermic effect is observed! Heating up to 10°C). After 10 min, tert-butyl nitrite (121 g, 1.16 mol) was added in a dropwise manner (reaction starts after addition of about 10% of the reagent; the start can be identified by the beginning of vigorous gas evolution). After the
- 10 reaction was complete (concluded by HNMR) the volume of the reaction mixture was carefully reduced under reduced pressure to a half; the resulted crude mixture was dissolved in EtOAc (3 L) and thoroughly washed with 5% aq. HCl and brine. The organic layer was dried over Na₂SO₄ and evaporated under reduced pressure to give crude ethyl 2-(2-chlorothiazol-4-yl)-2,2-difluoroacetate (205 g, crude) which was used in the next step without purification.
- 15 Step B: Crude ethyl 2-(2-chlorothiazol-4-yl)-2,2-difluoroacetate (205 g, crude) from the previous step was dissolved in EtOH (1.5 L), and the 20% aq. K₂CO₃ (0.5 L) was added in one portion. After the reaction was complete (typically 3 hr.) the solvents were evaporated to dryness, and the crude mixture was dissolved in H₂O (500 mL); the clear solution was washed with CHCl₃ (3* 200 mL) and MTBE (100 mL). The water layer was acidified with NaHSO₄ to pH =
- 20 4 and extracted with diethyl ether (3*150 mL). Combined organic layer was washed with brine, dried over Na₂SO₄ and evaporated under reduced pressure to give oily product. After column chromatography and trituration with pentane pure 2-(2-chlorothiazol-4-yl)-2,2-difluoroacetic acid (108 g, 0.5 mol, 45% yield on 2 steps) was obtained as yellow solid.

^1H NMR (400 MHz, CDCl_3) δ 11.61 (s, 1H), 7.70 (s, 1H).

^{13}C NMR (101 MHz, CDCl_3) δ 165.10 (t, $J = 33.6$ Hz), 154.53 (s), 145.63 (t, $J=30.9$ Hz), 122.62 (t, $J=4.7$ Hz), 109.40 (t, $J=251.0$ Hz)

^{19}F NMR (376 MHz, CDCl_3) δ -103.92 (s)

5 LCMS 214 $[\text{M}+\text{H}]^+$. MP 92°C; Purity >95%

Example 5: Effect of derivatives of heterocyclic amino acids on germination & early plants development

Materials: Seeds of Lettuce R. (Super-Jericho, non-sterilized) were obtained from Ben Shahar Moshe Ltd., 99% purity. The test compounds listed in the Table 2 below were synthesized de novo or purchased from different vendors.

Filter Paper Bioassays with Lettuce seeds: following the protocol of Bertin et al. 2009 and Movellan et al. 2014, specified modifications as described below.

Seeds were placed on Whatman no. 1 filter paper (Whatman, Middlesex, U.K.) in Petri dishes (10 seeds per plate) with 2.0 ml of aqueous solution of a test material in concentration ranged from 0 (control) to 1 mmol/l were placed in a tray tilted at 45°. The trays were kept in dark for 48 hours and then transferred to the growth chamber with 6/18 dark/ light cycle for 4 days. Each experiment was performed at least with two repeats. The development of plants' radicle and shoots were visually assessed 6 days after the beginning of the test to determine Minimal Effective Concentration (MEC) of a test material. In the context of the invention, MEC is defined as the lowest concentration level of a test material that caused deviation (absence of germination or malformation of radicle or shoots) from the plant's development in the Control group. MEC is expressed in an arbitrary unit as activity score, as presented in Table 1:

MEC	Activity score
Higher than 0.1 mM	Weak
0.1 mM	Moderate

0.01 mM	Strong
0.001 mM and less	Very strong

Herbicidal activity of selected compounds on seeds germination and early plant development are summarized in Table 2:

ID	Chemical name	MEC
584	2-(2,5-dichlorothiophen-3-yl)ethan-1-amine	Strong
585	3-(2,5-dichlorothiophen-3-yl)-2-hydroxypropanoic acid	Strong
586	2-(2,5-dichlorothiophen-3-yl)acetic acid	Strong
587	1-(2,5-dichlorothiophen-3-yl)methanamine	Strong
588	2-(thiophen-3-yl)ethan-1-amine	Strong
589	2-(thiophen-3-yl)ethan-1-ol	Strong
590	2-amino-1-(thiophen-3-yl)ethan-1-ol	Weak
591	2-(thiophen-3-yl)acetamide	Strong
592	2-(1H-1,2,4-triazol-5-yl)ethan-1-amine	Weak
593	3-(thiophen-3-yl)propan-1-amine	Weak
596	2,5-dichloro-1,3-thiazole-4-carboxylic acid	Moderate
597	4-(2,5-dichlorothiophen-3-yl)butanoic acid	Strong
598	ethyl 3-[5-(chloromethyl)-1,3,4-thiadiazol-2-yl]-2-acetamido-3,3-difluoropropanoate	Strong
599	2-amino-3-(1H-indazol-3-yl)propanoic acid	Strong
678	(2-bromopyridin-4-yl)acetic acid	Strong
680	3-(2-bromopyridin-4-yl)-2-hydroxypropanoic acid	Weak
681	2-(2-bromopyridin-4-yl)ethan-1-amine	Weak

684	4-(2-aminoethyl)phenol	Weak
686	bis[(2-bromopyridin-4-yl)methyl]amine	Weak
687	2-(pyridin-3-yl)acetamide	Weak
689	2-(2,6-dibromopyridin-4-yl)acetic acid	Strong
690	2-bromo-4-(2-bromoethyl)pyridine	Weak
692	2-bromopyridine-4-carboxylic acid	Moderate
694	(2E)-3-(2,6-dichloropyridin-3-yl)prop-2-enoic acid	Moderate
695	2-amino-N-(2-bromopyridin-4-yl)ethane-1-sulfonamide	Weak
699	1-chloroisoquinoline-6-carboxylic acid	Weak
5600	4-(2,5-dichlorothiophen-3-yl)butanamide	Moderate
5601	2-(thiophen-3-yl)ethane-1-thiol	Moderate
5602	(2-aminoethyl)[(2,5-dichlorothiophen-3-yl)methyl]amine	Strong
5603	2-[[2-(thiophen-3-yl)ethyl]sulfanyl]ethan-1-amine	Moderate
5604	3-(thiophen-3-yl)propane-1,2-diol	Strong
5605	3-[(2,5-dichlorothiophen-3-yl)formamido]-2,2-difluoropropanoic acid	Moderate
5606	3-(2,5-dichlorothiophen-3-yl)propanoic acid	Strong
5607	(2E)-3-(5-chlorothiophen-2-yl)prop-2-enoic acid	Strong
5608	(2E)-3-(1,3-thiazol-5-yl)prop-2-enoic acid	Moderate
5609	2-(2,5-dichlorothiophen-3-yl)acetamide	Strong
5610	[(2,5-dichlorothiophen-3-yl)methyl]hydrazine	Moderate
5611	(2E)-3-(2,5-dichlorothiophen-3-yl)prop-2-enoic acid	Moderate
5612	3-(2,5-dichlorothiophen-3-yl)-2-oxopropanoic acid	Strong
5613	2,5-dichloro-1,3-thiazole-4-carbonyl chloride	Moderate

5614	2-bromo-N-[(2,5-dichlorothiophen-3-yl)methyl]pyridine-4-carboxamide	Strong
5615	2-[[[(2,5-dichlorothiophen-3-yl)methyl]amino}acetic acid	Moderate
5616	dichloro-1,3-thiazole-4-carboxamide	Strong
5618	N-(2,5-dichloro-1,3-thiazol-4-yl)acetamide	Strong
5620	(3E)-4-(2,5-dichlorothiophen-3-yl)-2-oxobut-3-enoic acid	Moderate
5621	(2E)-3-(3-chloro-1H-1,2,4-triazol-5-yl)prop-2-enoic acid	Moderate
5622	(2E)-3-(2,4-dichloro-1,3-thiazol-5-yl)prop-2-enoic acid	Strong
5623	2-(2-chlorothiophen-3-yl)-2,2-difluoroacetic acid	Strong
5624	3-[[[(2,5-dichlorothiophen-3-yl)methyl]amino}-2,2- difluoropropanoic acid	Moderate
5625	2-(5-chlorothiophen-3-yl)-2,2-difluoroacetic acid	Strong
5626	3-{4-[(2,5-dichlorothiophen-3-yl)methyl]piperazin-1- yl}propanoic acid	Moderate
5627	trichloro-1,3-thiazole	Weak
5628	3-(1H-1,2,4-triazol-1-yl)propanoic acid	Moderate
5629	N-[2-(2,5-dichlorothiophen-3-yl)ethyl]acetamide	Weak
5630	4-(2,5-dichlorothiophen-3-yl)-2,2-dimethylbutanoic acid	Moderate
5631	2-(2,5-dichlorothiophen-3-yl)-2-oxoacetic acid	Moderate
5632	4-(2,5-dichlorothiophen-3-yl)-4,4-difluorobutanoic acid	Strong
5633	2-amino-3-(1H-1,2,4-triazol-1-yl)propanoic acid dihydrochloride [HCl]	Strong
5634	N-propyl-3-(4H-1,2,4-triazol-3-yl)propanamide	Weak
5635	propyl 3-(4H-1,2,4-triazol-3-yl)propanoate	Weak
5636	2-(2,5-dichlorothiophen-3-yl)-2,2-difluoroacetamide	Strong
5637	2-(2,5-dichloro-1,3-thiazol-4-yl)acetic acid	Strong
5638	3-(2,5-dichloro-1,3-thiazol-4-yl)-N-propylpropanamide	Weak

5639	ethyl 3-(2,5-dichloro-1,3-thiazol-4-yl)propanoate	Moderate
5640	(2,5-dichlorothiophen-3-yl)(difluoro)acetic acid	Strong
5642	2-(3-bromo-1H-1,2,4-triazol-5-yl)ethan-1-amine	Weak
5643	ethyl (2,5-dichlorothiophen-3-yl)(difluoro)acetate	Strong
5644	[2-(2,5-dichlorothiophen-3-yl)(difluoro)acetamido]acetic acid	Strong
5645	2-oxo-2-(2,4,5-trichlorothiophen-3-yl)acetic acid	Strong
5646	3-(2,5-dichlorothiophen-3-yl)-N-ethylpropanamide	Strong
5647	3-[(2,5-dibromothiophene-3-sulfonyl)amino]propanoic acid	Weak
5648	N-(2-aminoethyl)-2,5-dibromothiophene-3-sulfonamide	Weak
5649	ethyl 3-(2,5-dichlorothiophen-3-yl)propanoate	Weak
5650	N-[2-(2,5-dichloro-1,3-thiazol-4-yl)ethyl]acetamide	Strong
5651	2,2-difluoro-2-(2,4,5-trichlorothiophen-3-yl)acetic acid	Moderate
5652	methyl oxo(2,4,5-trichlorothiophen-3-yl)acetate	Moderate
5653	1-(2,5-dichloro-1,3-thiazol-4-yl)methanamine	Moderate
5654	2,2-difluoro-2-(2-oxo-2,3-dihydro-1H-1,3-benzodiazol-5-yl)acetic acid	Weak
5655	ethyl(2,5-dichloro-1,3-thiazol-4-yl)(difluoro)acetate	Strong
5656	methyl 2-chloro-2-(2,5-dichlorothiophen-3-yl)acetate	Weak
5657	4-(2,5-dichlorothiophen-3-yl)butan-1-amine	Strong
5659	2-amino-2-(2,5-dichlorothiophen-3-yl)acetic acid	Weak
5660	propyl[2-(1H-1,2,4-triazol-3-yl)ethyl]amine	Weak
5661	ethyl 2-(2-bromo-5-methyl-1,3-thiazol-4-yl)acetate	Strong
5662	ethyl 2-bromo-2-(2-bromo-5-methyl-1,3-thiazol-4-yl)acetate	Moderate
5663	ethyl 2-(2-bromo-1,3-thiazol-4-yl)acetate	Strong

5664	2-(2H-1,2,3-triazol-4-yl)acetamide	Weak
5665	(2,5-dichlorothiophen-3-yl)ethanimidamide	Weak
5666	sodium (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate	Very strong
5667	2-(2,5-dichloro-1,3-thiazol-4-yl)-2,2-difluoroacetic acid	Very strong
5668	ethyl (2,5-dichlorothiophen-3-yl)acetate	Strong
5669	benzyl 2-(2,5-dichlorothiophen-3-yl)acetate	Strong
5670	2-(2,5-dichlorothiophen-3-yl)-N-methoxyethan-1-amine	Strong
5671	2-(2,5-dichlorothiophen-3-yl)-N,N,N-trimethylethan-1-aminium	Moderate
5672	ethyl 2-(5-bromo-2-methyl-1,3-thiazol-4-yl)acetate	Moderate
5673	2-amino-4,5,6,7-tetrahydro-1,3-benzothiazole-4-carboxylic acid hydrochloride	Weak
5674	5-(2,5-dichlorothiophen-3-yl)imidazolidine-2,4-dione	Weak
5676	2-chloro-4-phenyl-1,3-thiazole	Weak
5678	2-(2-amino-1,3-thiazol-4-yl)-2,2-difluoroacetic acid	Moderate
5679	2,2-difluoro-2-[2-(trifluoromethyl)-1,3-thiazol-4-yl]acetic acid	Very strong
5680	2-(2,5-dichloro-1,3-thiazol-4-yl)-N,N,N-trimethylethan-1-aminium	Moderate
5681	2-chloro-4-(phenoxymethyl)-1,3-thiazole	Weak
5683	2-chloro[1,3]thiazolo[5,4-b]pyridine-6-carboxylic acid	Strong
5685	4-benzyl-2-chloro-1,3-thiazole	Weak
5687	3-({[2-(2,5-dichloro-1,3-thiazol-4-yl)ethyl]amino}methyl)phenol	Moderate
5688	2,2-difluoro-2-(1H-1,2,3,4-tetrazol-5-yl)acetic acid	Weak
5689	dibenzyl[(2-chloro-1,3-thiazol-4-yl)methyl]amine	Moderate
5690	dichloro-1,3-thiazole-4-sulfinic acid	Moderate

5691	2-(2,5-dichloro-1,3-thiazol-4-yl)ethan-1-amine	Strong
5692	2,5-dichlorothiophene-3-carboxylic acid	Moderate
5693	(thiophen-3-yl)acetic acid	Moderate
5694	benzyl[2-(2,5-dichlorothiophen-3-yl)ethyl]amine	Strong
5695	(thiophen-3-yl)propanedioic acid	Moderate
5696	N-[2-(2,5-dichloro-1,3-thiazol-4-yl)ethyl]-2-(3-hydroxyphenyl)acetamide	Strong
5697	4-[difluoro(phenyl)methyl]-1,3-thiazol-2-amine	Strong
5698	4-[difluoro(phenyl)methyl]-1H-imidazole	Strong
5699	2-chloro-4-[difluoro(phenyl)methyl]-1,3-thiazole	Strong
5700	2,2-difluoro[2-(trifluoromethyl)-1,3-thiazol-5-yl]acetic acid	Moderate
5701	ethyl 2,2-difluoro-2-[5-(trifluoromethyl)thiophen-2-yl]acetate	Weak
5702	2-chloro-4-(2-hydrazinylethyl)-1,3-thiazole	Strong
5703	ethyl difluoro(thiophen-3-yl)acetate	Weak
5704	2-(2-chloro-1,3-thiazol-4-yl)acetohydrazide	Strong
5705	[2-(2,5-dichlorothiophen-3-yl)ethyl]hydrazine	Weak
5707	ethyl difluoro[5-(trifluoromethyl)thiophen-3-yl]acetate	Moderate
5708	N-[2-(2,5-dichlorothiophen-3-yl)ethyl]-2-phenylacetamide	Strong
5709	benzyl (2,5-dichlorothiophen-3-yl)(difluoro)acetate	Very strong
5710	2,2-difluoro[5-(trifluoromethyl)-1,3-thiazol-2-yl]acetic acid	Strong
5711	[2-(5-chlorothiophen-3-yl)ethyl]hydrazine	Weak
5713	[(2-chloro-1,3-thiazol-4-yl)methyl]phosphonic acid	Weak
5714	1-(2-chloro-1,3-thiazol-4-yl)-3-phenylpropan-2-one	Weak
5715	2-(2-chloro-1,3-thiazol-4-yl)-N'-methylacetohydrazide	Strong

5716	2-[2-(5-chloro-3-fluoropyridin-2-yl)-1,3-thiazol-4-yl]acetic acid	Strong
5717	2,2-difluoro-2-[5-methyl-2-(trifluoromethyl)-1,3-thiazol-4-yl]acetic acid	Strong
5724	2-(2-chloro-1,3-thiazol-4-yl)-2,2-difluoroethan-1-ol	Moderate
5725	N'-[2-(2,5-dichlorothiophen-3-yl)ethyl]-N-(3-hydroxypropyl)guanidine	Moderate
5726	2-carbamimidamido-N-[2-(2,5-dichlorothiophen-3-yl)ethyl]acetamide	Moderate
5727	2-[[2-(2,5-dichlorothiophen-3-yl)ethyl]amino]-1,4,5,6-tetrahydropyrimidin-5-ol	Moderate
5728	2,2-difluoro-2-[2-(trifluoromethyl)thiophen-3-yl]acetic acid	Moderate
5729	ethyl 2-(2-amino-5-chloro-1,3-thiazol-4-yl)-2,2-difluoroacetate	Moderate
5730	2-(2-bromo-1,3-thiazol-4-yl)-2,2-difluoroacetic acid	Moderate
5731	2-[2-(2,5-dichlorothiophen-3-yl)ethyl]-1,4,5,6-tetrahydropyrimidin-5-ol	Moderate
5732	N-{2-[3-(2,5-dichlorothiophen-3-yl)propoxy]phenyl}guanidine	Moderate
5733	2-[[2-(2,5-dichlorothiophen-3-yl)ethyl](4,5-dihydro-1H-imidazol-2-yl)amino]ethan-1-ol	Moderate
5734	2-[2-(4-chloro-2-fluorophenyl)-1,3-thiazol-4-yl]-2,2-difluoroacetic acid	Moderate
5735	(4-bromophenyl)methyl (2,5-dichlorothiophen-3-yl)acetate	Moderate
5736	2,2-difluoro-2-[2-[3-fluoro-5-(trifluoromethyl)pyridin-2-yl]-1,3-thiazol-4-yl]acetic acid	Moderate
5738	2-(4-methylphenyl)-2-oxoethyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate	Moderate
5739	4-amino-5-(2-chlorothiophen-3-yl) pentanoic acid	Moderate
5740	2-oxo-2-(pyridin-2-yl)ethyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate	Moderate
5741	2-oxo-2-phenylethyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate	Moderate
5742	2-(2-[[2-(2,5-dichlorothiophen-3-yl)ethyl]amino]-4,5-dihydro-1H-imidazol-1-yl)ethan-1-ol	Moderate
5743	3-acetyl-1-[2-(2,5-dichlorothiophen-3-yl)ethyl]piperidin-4-one	Moderate

5744	[2,5-bis(trifluoromethyl)-1,3-thiazol-4-yl](difluoro)acetic acid	Moderate
5745	2-[2-(benzyloxy)ethoxy]ethyl 2-(2-chloro-1,3-thiazol-4-yl)-2,2-difluoroacetate	Strong
5746	2-(2-methoxyethoxy)ethyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate	Strong
5747	(2-bromophenyl)methyl 2-(2,5-dichlorothiophen-3-yl)-2,2-difluoroacetate	Strong
5748	2-(1,2,3-thiadiazol-4-yl)acetic acid	Strong
5749	[2-(2,4-dimethylbenzene-1-sulfonyl)-1,3-thiazol-4-yl](difluoro)acetic acid	Strong
5750	5H,6H-thieno[3,2-d][1,2,3]thiadiazole-5-carboxylic acid	Strong
5751	(2-chloro-5-fluoro-1,3-thiazol-4-yl)(difluoro)acetic acid	Strong
5752	2-{2-[2-(6-amino-9H-purin-9-yl)ethoxy]ethoxy}ethyl 2-(2-chloro-1,3-thiazol-4-yl)acetate	Strong
5753	(2-chloro-1,3-thiazol-4-yl)(cyano)acetic acid	Strong
5754	(2-chloro-5-fluoro-1,3-thiazol-4-yl)(difluoro)acetic acid	Strong
5755	(6-cyanopyridin-2-yl)(difluoro)acetic acid	Strong
6600	2-bromopyridine-4-carboxamide	Weak
6603	(2E)-3-(6-chloropyridin-2-yl)prop-2-enoic acid	Weak
6604	(2E)-3-(2-chloropyridin-3-yl)prop-2-enoic acid	Strong
6605	(2E)-3-(2-bromopyridin-3-yl)prop-2-enoic acid	Strong
6606	(2E)-3-(2-bromopyridin-4-yl)prop-2-enoic acid	Weak
6607	2-bromo-N-(2-bromopyridin-4-yl)pyridine-4-carboxamide	Moderate
6610	(2E)-3-(2-bromopyridin-4-yl)-N-(4-hydroxyphenyl)prop-2-enamide	Weak
6611	3-(2-bromopyridin-4-yl)-2-oxopropanoic acid	Weak
6612	2-(2,6-dibromopyridin-4-yl)ethan-1-amine	Moderate
6613	4-(2-aminoethyl)-6-bromopyridine-2-carbonitrile	Weak

6614	2,2-difluoro-2-(pyridin-4-yl)acetic acid	Weak
6615	2-[4-(pyridin-4-yloxy)phenyl]acetic acid	Weak
6616	3-amino-3-(2-bromopyridin-4-yl)propanamide	Weak
6617	2-(6-bromopyridin-2-yl)-2,2-difluoroacetic acid	Strong
6618	3-[(2-bromopyridin-4-yl)formamido]-2,2-difluoropropanoic acid	Moderate
6619	2,2-difluoro-2-(pyrimidin-2-yl)acetic acid	Weak
6620	2-(6-bromopyridin-3-yl)-2,2-difluoroacetic acid	Moderate
6621	2-(6-bromopyrimidin-4-yl)ethan-1-amine	Moderate
6622	2-[2-amino-3-(4-hydroxyphenyl)propanamido]-3-phenylpropanoic acid hydrochloride	Weak
6625	2-(2-phenoxy pyridin-4-yl)ethan-1-amine	Weak
6626	(2-bromopyridin-4-yl)(oxo)acetic acid	Moderate
6627	1-chloroisoquinoline-7-carboxylic acid	Moderate
6628	2-(2,6-dichloropyridin-4-yl)-2,2-difluoroacetic acid	Weak
6629	methyl 2-(2-bromopyridin-4-yl)-2,2-difluoroacetate	Moderate
6632	(2,6-dibromopyridin-4-yl)-2,2-difluoroacetic acid	Weak
6633	2-(2,6-dibromopyridin-4-yl)-2,2-difluoroacetamide	Weak
6634	6-bromopyridine-2-carboximidamide hydrochloride [HCl]	Moderate
6635	ethyl 2-(6-bromopyridin-2-yl)acetate	Strong
6636	N-[(6-bromopyridin-2-yl)methyl]guanidine	Moderate
6637	N-(6-bromopyridin-2-yl)guanidine hydrochloride	Weak
6638	(2E)-3-(6-bromopyridin-3-yl)-2,3-difluoroprop-2-enoic acid	Weak
6640	ethyl 2-(6-bromopyridin-2-yl)-2,2-difluoroacetate	Strong

6643	2-(6-bromopyridin-2-yl)-2,2-difluoroethan-1-ol	Moderate
6644	[2-(6-bromopyridin-2-yl)ethyl]trimethylazanium	Weak
6645	2-bromo-6-phenoxy pyridine	Moderate
6646	benzyl (6-bromopyridin-2-yl)(difluoro)acetate	Very Strong
6647	2-amino-3-(6-bromopyridin-2-yl)propan-1-ol	Weak
6648	2-(6-bromopyridin-2-yl)ethanimidamide hydrochloride	Weak
6649	3-(2-bromopyridin-4-yl)propan-1-amine	Moderate
6650	2-bromo-6-[difluoro(phenyl)methyl]pyridine	Weak
6651	2,2-difluoro-2-[6-(trifluoromethyl)pyridin-2-yl]acetic acid	Weak
6652	2,2-difluoro-2-[4-(trifluoromethyl)pyrimidin-2-yl]acetic acid	Weak
6653	2-(6-chloropyrazin-2-yl)-2,2-difluoroacetic acid	Weak
6654	2,2-difluoro-2-[6-(trifluoromethyl)pyrazin-2-yl]acetic acid	Weak
6655	2-[6-(4-chloro-2-fluorophenyl)pyridin-2-yl]-2,2-difluoroacetic acid	Weak
6656	2-(6-bromopyridin-2-yl)ethan-1-amine	Weak
6657	2-[6-(2,5-dichlorothiophen-3-yl)pyridin-2-yl]-2,2-difluoroacetic acid	Weak
6658	2,2-difluoro-2-{6-[2-(trifluoromethyl)-1,3-thiazol-4-yl]pyridin-2-yl}acetic acid	Moderate
6659	2,2-difluoro-2-{6-[2-fluoro-4-(trifluoromethyl)phenyl]pyridin-2-yl}acetic acid	Moderate
6660	2,2-difluoro-2-(3,5,6-trifluoropyridin-2-yl)acetic acid	Strong
6661	2-fluoro-2-(3,5,6-trifluoropyridin-2-yl)acetic acid	Strong
6662	difluoro(3,5,6-trifluoropyridin-2-yl)acetic acid	Strong
6663	(6-bromo-5-fluoropyridin-2-yl)(difluoro)acetic acid	Strong
6664	difluoro(6-fluoropyridin-2-yl)acetic acid	Strong
6665	difluoro[6-(methyldieneamino)pyridin-2-yl]acetic acid	Strong

Example 6: Post-emergence herbicidal activity of selected derivatives of non-coded amino acids (DNAA).

The tests were performed on Romaine lettuce (*Lactuca sativa L.*) plants at the stage 2 to 3 leaves. The plants were grown in mini-pots packed with soil, dimensions 2 X 2 X 5 cm, one plant per mini-pot. Test compounds were dissolved in 0.1% aqueous solution water solution of Silwet adjuvant to final concentrations ranging from 0 (Control) to 0.01%. The test compounds were applied on soil (1 ml per pot) or foliar with airbrush (0.1 ml per pot). Each concentration was tested on 20 plants. Two weeks after the treatment the herbicidal effects of the respective test material were visually evaluated (above ground part and roots. Then the aboveground part of the plants was neatly cut and weighed (wet weight) to assess the growth inhibition caused by the test compound. The growth inhibition (GI) was calculated as following:

$$GI = 1 - Mt * 100\% / Mc$$

Where Mt and Mc are median wet weight of treated and control plants, respectively. In the context of the invention, the herbicidal effect was assessed by GI or plant damage caused by test compound (0.01 and 0.05 mg a.i./well). The herbicidal effect was assessed at 14-21 days after application using the following Damage Score: 0 = less than 10% growth inhibition; 1 = 10%-30% growth inhibition, minor damage symptoms; 2 = 30%-50% growth inhibition, clear damage symptoms; 3 = 50%-70% growth inhibition, significant damage symptoms; 4 = 70%-90%, severe damage symptoms; 5 = 90%-100% growth inhibition/full lethality. Herbicidal activity of selected DHAAs is summarized in Table 3 (soil application) and Table 4 (foliar application).

Table 3: Herbicidal activity of selected DNAAs (soil application):

ID	Herbicidal Activity	ID	Herbicidal Activity
584	2	5724	4
585	1	5728	5
586	3	5730	5
597	2	5738	5
678	2	5745	5
689	2	5747	3
692	2	5757	5

5600	3	5759	5
5609	3	5764	2
5616	1	5768	3
5623	4	5771	5
5625	4	5772	5
5629	3	5773	3
5636	2	5778	5
5637	4	5781	5
5640	5	5791	5
5644	2	5792	3
5650	3	5805	5
5655	5	5818	2
5657	2	5831	2
5663	2	5834	2
5666	5	6600	2
5667	4	6606	2
5669	3	6612	2
5670	2	6617	4
5672	1	6635	2
5679	4	6640	3
5691	2	6643	4
5707	2	6646	2
5709	2	6651	3
5710	3	6667	4
5717	2		

Table 5. Herbicidal activity of selected DNAAs (foliar application).

ID	Herbicidal activity	ID	Herbicidal activity
584	3	5746	4
586	2	5757	2
5623	3	5768	4
5625	5	5772	3
5637	2	5778	4
5640	3	5781	4

5663	3	5791	4
5666	5	5803	2
5667	4	5805	5
5679	5	6617	4
5709	3	6640	3
5728	3	6643	2
5730	3	6681	4
5738	3		

Example 7: Herbicidal activity of selected DNAA's on the development of weeds.

Herbicidal effect of claimed compounds on weeds is exemplified using compounds 5623, 5625, 5666, 5679, 5738, 5746, 5784, 5791, 6651, and 6617. Weeds were sown in 7X7X6 cm pots, containing sandy soil media (pH 7). In this set of tests we used following weeds: *Amaranthus tuberculatus*, *Amaranthus palmeri*, *Chenopodium album*, *Chenopodium murale*, *Malva nicaeensis*, *Abutilon theophrasti*, *Chrysanthemum coronarium*, *Silybum marianum*, *Bidens*, *Verbesina encelioides*, *Lactuca serriola*, *Erigeron canadensis*, *Erigeron bonariensis*, *Ormenis mixta*, *Xanthium strumarium*, *Heterotheca subaxillaris*, *Sonchus oleraceus*, *Sinapis arvensis*, *Datura innoxia*, *Datura ferox*, *Portulaca oleracea*, *Convolvulus althaeoides*, *Ipomoea hederacea*, *Medicago scutellate*.

The tested compounds were applied on soil (pre-emergence) by spraying the soil surface by water solution of a tested compound (rate 0 to 1 kg a.i./Ha), at volume of 200 L/Ha. After spraying, the pots were watered with 10ml/pot, and 21 days after the treatment, the herbicidal effect was examined and assessed using the Damage Scale as in the Example 6. The effective dose resulting in Damage Score ≥ 4 ranged from 0.05 to 0.25 kg a.i./Ha. Reference is made to Figure 1, showing the pre-emergence herbicidal effect of compound 5666 on *Amaranthus palmeri*, 21 DPA. Damage Score 5

Example 8: Post-emergence herbicidal effect of derivatives of non-coded amino acids (DNAA) on weeds.

Herbicidal effect of claimed compounds on weeds is exemplified using compounds 5623, 5625, 5666, 5679, 5738, 5746, 5784, 5791, 6651, and 6617. Foliar application: Weeds were grown in 7X7X6 cm pots, containing Nursery media (pH 5-6). The tests we performed on *Amaranthus tuberculatus*, *Chenopodium album*, *Chenopodium murale*, *Malva nicaeensis*, *Abutilon theophrasti*, *Chrysanthemum coronarium*, *Silybum marianum*, *Bidens*, *Verbesina encelioides*, *Lactuca serriola*, *Erigeron canadensis*, *Erigeron bonariensis*, *Ormenis mixta*, *Xanthium strumarium*, *Heterotheca subaxillaris*, *Sonchus oleraceus*, *Sinapis arvensis*, *Datura innoxia*, *Datura ferox*, *Portulaca oleracea*, *Convolvulus althaeoides*, *Ipomoea hederacea*, *Medicago scutellate*.

The tested compounds were applied by spraying the foliage when plants reached 2-4 true leaves at volume of 200 L/Ha (rate from 0 to 1 kg a.i./Ha) or by drench application. The herbicidal effect was examined 14 days after the treatment and assessed using the Damage Score described in the Example 6. In foliar application the effective dose resulting in Damage Score of ≥ 4 was from 0.1 to 1 Kg a.i./Ha (fig. 2 and fig. 3).

Reference is made to Figure 2 demonstrating the post-emergence herbicidal effect of compound 5679 on *Amaranth tuberculatus*, 14 DPA, foliar application (Damage Score 5), and to Figure 3, showing the herbicidal effect of compounds 5679, 5666 and 6651 in drench application on *Malva nicaeensis*, 14 DPA (Damage Score 4).

Example 9: Selectivity of DNAA to cereals

Selectivity to cereals of claimed compounds was exemplified using the compounds: 5623, 5625, 5666, 5679, 5738, 5746, 5784, 5791, 6651, 6617, 5629, 5609, 5602, 5657. The tests were performed on cereal crops such as wheat, maize, rice, barley, sorghum, and oat in comparison to weed *Amaranth palmeri* (Figures 4, 5, and 6). The test plants were grown and treated as described in the Example 7 (pre-emergence application) or as described in the Example 8 (post-emergence foliar or drench applications).

The herbicidal effect was assessed using the Damage Score as detailed in Example 6.

Selectivity of tested compounds to cereals was observed up to the doses 5 kg a.i./Ha, 0.05% and 0.5 kg a.i./Ha in foliar, drench and soil applications respectively.

Reference is made Figure 4, showing the selectivity of compound 5666 to cereals in soil application at a dose of 0.25 Kg/Ha, 21 DPA

Reference is made to Figure 5, demonstrating the selectivity of compound 5746 and 5666 to corn in foliar application, 1 Kg/Ha, 21 DPA.

Reference is made to figure 6, showing the selectivity compounds 5657, 5602, 5609, 5629 to cereals (corn and barley) in drench application (0.05%), 14 DPA

10 **Example 10. Herbicidal effect of DNAA on weeds resistant to other herbicides**

Herbicidal effect of claimed compounds on resistant weeds is exemplified using compound 5679. The tests were performed on herbicide-resistant weeds in foliar applications as described in Example 8. The herbicidal effect was assessed as detailed in Example 6. Compound 5679 were tested on weeds resistant to herbicides of Group 2 (ALS inhibitors); group 22 (Photosystem I, Paraquat) and Group 9 (EPSP Synthase inhibitors, Glyphosate). Compound 5679 at dose of 0.5 kg a.i. /ha damaged (Damage Score ≥ 4) both in sensitive and resistant weeds.

Reference is made to Figure 7, showing the herbicidal effect of compound 5679 in foliar application on Glyphosate resistance (Group 9) and Paraquat (Group 22) resistant Conyza bonariensis, 14 DPA. Reference is made to figure 8, showing the Herbicidal effect of compound 5679 (0.5 kg a.i./ Ha, foliar application) on Sonchus oleraceus resistant to Sulfonylurea (Group 2 herbicide), 14 DPA.

Discussion:

Crop protection with herbicides is a key elements of global food sustainability. Unfortunately, herbicide resistance may be developed shortly after the introduction of the herbicides. According to the herbicide resistance mechanisms, all processes can be grouped as follows:

target-site resistance, non-target-site resistance, cross-resistance and multiple-resistance. Target-site resistance is generally due to a single or several mutations in the gene encoding the herbicide-target enzyme, which, in turn, decreases the affinity for herbicide binding to that enzyme. Non-target-site resistance is caused by mechanisms that reduce the amount of herbicidal active compound before it can attack the plant through the reduced absorption or altered translocation, increased herbicide sequestration or enhanced herbicide metabolism. Cross-resistance means that a single-resistance mechanism causes resistance to several herbicides with some mode of action. Multiple-resistance is a situation where two or more resistance mechanisms are present within the same plant, often due to sequential selection by herbicides with different modes of action. Currently, herbicide resistance has been reported in a multitude of weed biotypes around the globe. Many of those biotypes are resistant to acetolactate synthase (ALS) inhibitors PS I and PS II inhibitors, ACC-ase inhibitors and EPSPS inhibitors (herbicides of Groups 2, 1, 22, 5, and 9, respectively).

Unless otherwise defined, all technical and/or scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which the invention pertains. Although methods and materials similar or equivalent to those described herein can be used in the practice or testing of embodiments of the invention, exemplary methods and/or materials are described below. In case of conflict, the patent specification, including definitions, will prevail. In addition, the materials, methods, and examples are illustrative only and are not intended to be necessarily limiting.

As used herein the terms "comprises", "comprising", "includes", "including", "having" and their conjugates mean "including but not limited to".

The term "consisting of" means "including and limited to".

As used herein, the singular form "a", "an" and "the" include plural references unless the context clearly dictates otherwise. For example, the term "a compound" or "at least one compound" may include a plurality of compounds, including mixtures thereof.

It will be understood that when an element is referred to as being "on," "attached" to, "connected" to, "coupled" with, "contacting," etc., another element, it can be directly on,

attached to, connected to, coupled with and/or contacting the other element or intervening elements can also be present. In contrast, when an element is referred to as being, for example, "directly on," "directly attached" to, "directly connected" to, "directly coupled" with or "directly contacting" another element, there are no intervening elements present. It will also be appreciated by those of skill in the art that references to a structure or feature that is disposed "adjacent" another feature can have portions that overlap or underlie the adjacent feature.

It will be understood that, although the terms first, second, etc., may be used herein to describe various elements, components, regions, layers and/or sections, these elements, components, regions, layers and/or sections should not be limited by these terms. Rather, these terms are only used to distinguish one element, component, region, layer and/or section, from another element, component, region, layer and/or section.

As will be appreciated by those of skill in the art, the compounds of the various formulas disclosed herein may contain chiral centers, e.g., asymmetric carbon atoms. Thus, the present disclosure is concerned with the synthesis of both: (i) racemic mixtures of the active compounds, and (ii) enantiomeric forms of the active compounds. The resolution of racemates into enantiomeric forms and racemization of optically active enantiomeric form can be done in accordance with known procedures in the art. Geometric isomers of double bonds and the like may also be present in the compounds disclosed herein, and all such stable isomers are included within the present disclosure unless otherwise specified. Also included in the compounds of the disclosure are tautomers (e.g., tautomers of triazole and/or imidazole) and rotamers. All chains defined by the formulas herein which include three or more carbons may be saturated or unsaturated unless otherwise indicated.

It is understood that substituents and substitution patterns on the compounds used in the method of the present invention can be selected by one of ordinary skill in the art to provide compounds that are chemically stable and that can be readily synthesized by techniques known in the art from readily available starting materials. If a substituent is itself substituted with more than one group, it is understood that these multiple groups may be on the same carbon or on different carbons, so long as a stable structure results.

An “optionally substituted” group refers to a functional group in which one or more bonds to a hydrogen atom contained therein are replaced by a bond to non-hydrogen or non-carbon atoms, provided that normal valences are maintained and that the substitution results in a stable compound. Substituted groups also include groups in which one or more bonds to a carbon(s) or hydrogen(s) atom are replaced by one or more bonds, including double or triple bonds, to a heteroatom. Where multiple substituent moieties are disclosed or claimed, the substituted compound can be independently substituted by one or more of the disclosed or claimed substituent moieties, singly or plurality. By independently substituted, it is meant that the (two or more) substituents can be the same or different. In choosing the compounds of the present invention, one of ordinary skill in the art will recognize that the various substituents are to be chosen in conformity with well-known principles of chemical structure connectivity.

As used herein, “H” refers to a hydrogen atom. “C” refers to a carbon atom. “N” refers to a nitrogen atom. “O” refers to an oxygen atom. “Halo” refers to F, Cl, Br or I. The term “hydroxy,” as used herein, refers to an -OH moiety. “Br” refers to a bromine atom. “Cl” refers to a chlorine atom. “I” refers to an iodine atom. “F” refers to a fluorine atom. An “acyl group” is intended to mean a group -C(O)-R, where R is a suitable substituent, for example, an acetyl group, a propionyl group, a butyryl group, a benzoyl group, or an alkylbenzoyl group. “Alkyl,” as used herein, refers to a straight or branched chain hydrocarbon containing from 1 or 2 to 10 or 20 or more carbon atoms (e.g., C₂, C₃, C₄, C₅, C₆, C₇, C₈, C₉, C₁₀, C₁₁, C₁₂, C₁₃, C₁₄, C₁₅, etc.).

In some embodiments the alkyl can be a lower alkyl. “Lower alkyl” refers to straight or branched chain alkyl having from 1 to 3, or from 1 to 5, or from 1 to 8 carbon atoms. Representative examples of alkyl include, but are not limited to, methyl, ethyl, n-propyl, iso-propyl, n-butyl, sec-butyl, iso-butyl, tert-butyl, n-pentyl, isopentyl, neopentyl, n-hexyl, 3-methylhexyl, 2,2-dimethylpentyl, 2,3-dimethylpentyl, n-heptyl, n-octyl, n-nonyl, n-decyl, and the like. As used herein, the identification of a carbon number range, e.g., C₁-C₁₂ alkyl, is intended to include each of the component carbon number moieties within such range, so that each intervening carbon number and any other stated or intervening carbon number value in that stated range is encompassed, such that sub-ranges of carbon number within specified carbon number ranges may independently be specified. For example, C₁-C₁₂ alkyl is intended to include methyl, ethyl, propyl, butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl and dodecyl,

including straight chain as well as branched groups, as noted above, and the carbon number range C1-C12 alkyl may also be more restrictively specified as sub-ranges such as C1-C4 alkyl, C2-C8 alkyl, C2-C4 alkyl, C3-C5 alkyl, or any other sub-range within the broader carbon number range. In addition, ranges of carbon numbers specifically excluding a carbon number or numbers are contemplated, as are sub-ranges excluding either or both of carbon number limits of specified ranges. As generally understood by those of ordinary skill in the art, "saturation" refers to the state in which all available valence bonds of an atom (e.g., carbon) are attached to other atoms. Similarly, "unsaturation" refers to the state in which not all the available valence bonds are attached to other atoms; in such compounds the extra bonds usually take the form of double or triple bonds (usually with carbon). For example, a carbon chain is "saturated" when there are no double or triple bonds present along the chain or directly connected to the chain (e.g., a carbonyl), and is "unsaturated" when at least one double or triple bond is present along the chain or directly connected to the chain (e.g., a carbonyl). Further, the presence or absence of a substituent depending upon chain saturation will be understood by those of ordinary skill in the art to depend upon the valence requirement of the atom or atoms to which the substituent binds (e.g., carbon). "Alkenyl," as used herein, refers to a straight or branched chain hydrocarbon containing from 1 or 2 to 10 or 20 or more carbons, and containing at least one carbon-carbon double bond, formed structurally, for example, by the replacement of two hydrogens. Representative examples of "alkenyl" include, but are not limited to, ethenyl, 2-propenyl, 2-methyl-2-propenyl, 3-butenyl, 4-pentenyl, 5-hexenyl, 2-heptenyl, 2-methyl-1-heptenyl, 3-decenyl and the like. "Alkynyl," as used herein, refers to a straight or branched chain hydrocarbon group containing from 1 or 2 to 10 or 20 or more carbon atoms, and containing at least one carbon-carbon triple bond. Representative examples of alkynyl include, but are not limited, to acetylenyl, 1-propynyl, 2-propynyl, 3-butylnyl, 2-pentynyl, 1-butylnyl and the like. The term "cycloalkyl," as used herein, refers to a saturated cyclic hydrocarbon group containing from 3 to 8 carbons or more.

As understood in the art, the term "optionally substituted" indicates that the specified group is either unsubstituted or substituted by one or more suitable substituents. A "substituent" that is "substituted" is an atom or group which takes the place of a hydrogen atom on the parent chain or cycle of an organic molecule. "Heterocycle," as used herein, refers to a monocyclic,

bicyclic or tricyclic ring system. Monocyclic heterocycle ring systems are exemplified by any 5 to 9-membered ring containing 1, 2, 3, or 4 heteroatoms independently selected from the group consisting of: O, N, and S. "Aryl" as used herein refers to a ring system having one or more aromatic rings. Representative examples of aryl include azulenyl, indanyl, indenyl, 5 naphthyl, phenyl, tetrahydronaphthyl, and the like. "Heteroaryl" means a cyclic, aromatic hydrocarbon in which one or more carbon atoms have been replaced with heteroatoms (e.g., N, O or S). If the heteroaryl group contains more than one heteroatom, the heteroatoms may be the same or different. "Alkoxy," as used herein, refers to an alkyl group, as defined herein, appended to the parent molecular moiety through an oxy group, as defined herein. An "amine" 10 or "amino" is intended to mean the group -NH_2 . "Primary amines" have one of three hydrogen atoms replaced by an alkyl or aromatic group. "Secondary amines" have two organic substituents bound to the nitrogen together with one hydrogen. "Tertiary amines" have three organic substituents bound to the nitrogen. An "amide" as used herein, refers to a functional group having a carbonyl group (C=O) linked to a nitrogen atom (N), or an organic compound 15 that contains this group, generally depicted as: wherein, R and R' can independently be any covalently linked atom or atoms.

The term "oxo," as used herein, refers to a =O moiety. The term "oxy," as used herein, refers to a -O- moiety. "Nitro" refers to the organic compound functional group -NO_2 . "Carbonyl" is a functional group having a carbon atom double-bonded to an oxygen atom (-C=O). "Carboxy" 20 as used herein refers to a -COOH functional group, also written as $\text{-CO}_2\text{H}$ or -(C=O)-OH .

It will be understood that the compounds, compositions and methods provided herein may be further specified in some embodiments by provisos or limitations excluding specific substituents, groups, moieties, structures, ingredients, steps, or conditions, as applicable, in relation to various broader specifications and exemplifications set forth herein.

25 "Agriculturally acceptable carriers" of the invention include, without limitation, adjuvants, mixers, enhancers, etc. beneficial for application of the chemical formula. Suitable carriers should not be phytotoxic to valuable crops, particularly at the concentrations employed in applying the compositions for selective weed control in the presence of crops and should not react chemically with the compounds of the chemical formula herein or other composition

ingredients. Such mixtures can be designed for application directly to weeds or their locus or can be concentrates or formulations which are normally diluted with additional carriers and adjuvants before application. They may include inert or active components and can be solids, such as, for example, dusts, granules, water dispersible granules, or wettable powders, or liquids, such as, for example, emulsifiable concentrates, solutions, emulsions or suspensions. Suitable agricultural carriers useful in preparing agricultural compositions of the present invention are well known to those skilled in the art. For example, liquid carriers that can be employed include water, toluene, xylene, petroleum naphtha, crop oil, acetone, methyl ethyl ketone, cyclohexanone, trichloroethylene, perchloroethylene, ethyl acetate, amyl acetate, butyl acetate, propylene glycol monomethyl ether and diethylene glycol monomethyl ether, methanol, ethanol, isopropanol, amyl alcohol, ethylene glycol, propylene glycol, glycerine, and the like. Water is generally the carrier of choice for the dilution of concentrates. Suitable solid carriers include talc, pyrophyllite clay, silica, attapulgius clay, kieselguhr, chalk, diatomaceous earth, lime, calcium carbonate, bentonite clay, Fuller's earth, cotton seed hulls, wheat flour, soybean flour, pumice, wood flour, walnut shell flour, lignin, and the like.

It is frequently desirable to incorporate one or more surface-active agents into the compositions of the present invention. Such surface-active agents are advantageously employed in both solid and liquid compositions, especially those designed to be diluted with carrier before application. The surface-active agents can be anionic, cationic or nonionic in character and can be employed as emulsifying agents, wetting agents, suspending agents, or for other purposes. Typical surface active agents include salts of alkyl sulfates, such as diethanolammonium lauryl sulfate; alkylarylsulfonate salts, such as calcium dodecylbenzenesulfonate; alkylphenol-alkylene oxide addition products, such as nonylphenol-C.sub.18 ethoxylate; alcohol-alkylene oxide addition products, such as tridecyl alcohol-C.sub.16 ethorylate; soaps, such as sodium stearate; alkylnaphthalenesulfonate salts, such as sodium dibutylnaphthalenesulfonate; dialkyl esters of sulfosuccinate salts, such as sodium di(2-ethylhexyl) sulfosuccinate; sorbitol esters, such as sorbitol oleate; quaternary amines, such as lauryl trimethylammonium chloride; polyethylene glycol esters of fatty acids, such as polyethylene glycol stearate; block copolymers of ethylene oxide and propylene oxide; and salts of mono and dialkyl phosphate esters.

Other adjuvants commonly utilized in agricultural compositions include antifoam agents, compatibilizing agents, sequestering agents, neutralizing agents and buffers, corrosion inhibitors, dyes, odorants, penetrations aids, spreading agents, sticking agents, dispersing agents, thickening agents, freeze point depressants, antimicrobial agents, and the like. The compositions can also contain other compatible components, for example, other herbicides, plant growth regulators, fungicides, insecticides, and the like and can be formulated with liquid fertilizers or solid, particulate fertilizer carriers such as ammonium nitrate, urea and the like.

“Agriculturally acceptable salt” or “acceptable salt” is intended to mean a salt that retains the biological effectiveness of the free acids and bases of a specified compound and that is not biologically or otherwise undesirable. Examples of agriculturally acceptable salts include sulfates, pyrosulfates, bisulfates, sulfites, bisulfites, phosphates, monohydrogenphosphates, dihydrogenphosphates, metaphosphates, pyrophosphates, chlorides, bromides, iodides, acetates, propionates, decanoates, caprylates, acrylates, formates, isobutyrate, caproates, heptanoates, propiolates, oxalates, malonates, succinates, suberates, sebacates, fumarates, maleates, butyne-1,4-dioates, hexyne-1,6-dioates, benzoates, chlorobenzoates, methylbenzoates, dinitrobenzoates, hydroxybenzoates, methoxybenzoates, phthalates, sulfonates, xylenesulfonates, phenylacetates, phenylpropionates, phenylbutyrates, citrates, lactates, γ -hydroxybutyrates, glycolates, tartrates, methane-sulfonates, propanesulfonates, naphthalene-1-sulfonates, naphthalene-2-sulfonates, and mandelates.

Throughout this application, various embodiments of this invention may be presented in a range format. It should be understood that the description in range format is merely for convenience and brevity and should not be construed as an inflexible limitation on the scope of the invention. Accordingly, the description of a range should be considered to have specifically disclosed all the possible subranges as well as individual numerical values within that range. For example, description of a range such as from 1 to 6 should be considered to have specifically disclosed subranges such as from 1 to 3, from 1 to 4, from 1 to 5, from 2 to 4, from 2 to 6, from 3 to 6 etc., as well as individual numbers within that range, for example, 1, 2, 3, 4, 5, and 6. This applies regardless of the breadth of the range.

Whenever a numerical range is indicated herein, it is meant to include any cited numeral (fractional or integral) within the indicated range. The phrases “ranging/ranges between” a first indicate number and a second indicate number and “ranging/ranges from” a first indicate number “to” a second indicate number are used herein interchangeably and are meant to include the first and second indicated numbers and all the fractional and integral numerals therebetween.

Certain features of the invention, which are, for clarity, described in the context of separate embodiments, may also be provided in combination in a single embodiment. Conversely, various features of the invention, which are, for brevity, described in the context of a single embodiment, may also be provided separately or in any suitable sub-combination or as suitable in any other described embodiment of the invention. Certain features described in the context of various embodiments are not to be considered essential features of those embodiments, unless the embodiment is inoperative without those elements.

As used herein the term "method" refers to manners, means, techniques and procedures for accomplishing a given task including, but not limited to, those manners, means, techniques and procedures either known to, or readily developed from known manners, means, techniques and procedures by practitioners of the chemical, agricultural, biological, and biochemical arts.

As used herein the term “plant growth regulator” refers but not limited to a compound, either natural or synthetic, that modifies or controls one or more specific physiological processes within a plant.

As used herein the term “plant” refers but not limited to whole plants, ancestors and progeny of the plants and plant parts, including seeds, shoots, stems, roots (including tubers), and plant cells, tissues and organs. The plant may be in any form including suspension cultures, embryos, meristematic regions, callus tissue, leaves, gametophytes, sporophytes, pollen, and microspores.

As used herein the term “crop protection agent” refers but not limited to an agent which is a pesticide (or a mixture of more than one pesticide) or a plant growth regulator.

As used herein the term “pesticide” refers to, but not limited to a chemical or biological agent that deters, incapacitates, kills, or otherwise discourages pests.

Compounds of this invention will generally be used as an herbicidal active ingredient in a composition. As used herein the term “composition” refers but not limited to a formulation, with at least one additional component selected from surfactants, solid diluents and liquid diluents, which serves as a carrier. The formulation or composition ingredients are selected to be consistent with the physical properties of the active ingredient, mode of application and environmental factors such as oil type, moisture and temperature. Useful compositions may include both liquid and solid formulation. Liquid formulations may include solutions (including emulsifiable concentrates), suspensions, emulsions (including microemulsions, oil-in-water emulsions, flowable concentrates and/or suspoemulsions) and alike, which optionally can be thickened into gels. The general types of aqueous liquid compositions are soluble concentrate, suspension concentrate, capsule suspension, concentrated emulsion, microemulsion, oil-in-water emulsion, flowable concentrate and uspo-emulsion. The general types of nonaqueous liquid compositions are emulsifiable oncentrate, microemulsifiable concentrate, dispersible concentrate and oil dispersion.

The general types of solid formulations are dusts, powders, granules, pellets, prills, astilles, tablets, filled films (including seed coatings) and the like, which can be ater-dispersible (“wetttable”) or water-soluble. Films and coatings formed from film-forming solutions or flowable suspensions are particularly useful for seed treatment. Active ingredient can be (micro)encapsulated and further formed into a suspension or solid formulation; alternatively, the entire formulation of active ingredient can be encapsulated (or “overcoated”). Encapsulation can control or delay release of the active ingredient. Sprayable formulations are typically extended in a suitable medium before spraying. Such liquid and solid formulations are formulated to be readily diluted in the spray medium, usually water, but occasionally another suitable medium like an aromatic or paraffinic hydrocarbon or vegetable oil. Spray volumes can range from about one to several thousand liters per hectare, but more typically are in the range from about ten to several hundred liters per hectare. Sprayable formulations can be tank mixed with water or another suitable medium for foliar treatment by aerial or ground application, or

for application to the growing medium of the plant. Liquid and dry formulations can be metered directly into drip irrigation systems or metered into the furrow during planting.

The formulations will typically contain effective amounts of active ingredient, diluent and surfactant within the following approximate ranges which add up to 100 percent by weight.

- 5 The compounds of the invention have (both preemergent and postemergent) herbicidal activity. As used herein the term “controlling undesired plant growth” refers to killing or injuring the vegetation or reducing its growth.

The compounds and compositions of the invention can be usefully applied by a variety of methods involving contacting a herbicidally effective amount of a compound of the invention, or a composition comprising said compound and at least one of a surfactant, a solid diluent or a liquid diluent, to the foliage or other part of the undesired plant or to the environment of the undesired plant growth such as the soil or water in which the undesired plant is growing or which surrounds the seed or other propagule of the undesired plant.

A herbicidally effective amount of the compounds of this invention is determined by a number of factors: formulation selected, method of application, amount and type of undesired plant growth present, growing conditions, etc. In general, a herbicidally effective amount of compounds of this invention is about 0.001 to 20 kg/ha with a preferred range of about 0.004 to 1 kg/ha. One skilled in the art can easily determine the herbicidally effective amount necessary for the desired level of weed control.

20 The compounds of the invention are applied, typically in a form of formulated composition, to a locus comprising desired vegetation (e.g., crops) and undesired plant growth (i.e. weeds), both of which may be seeds, seedlings and/or larger plants, in contact with a growth medium (e.g., soil). In this locus, a composition comprising the compounds of the invention can be directly applied to a plant or any part of a plant thereof, particularly of the undesired plant growth, and/or to the growth medium in contact with the plant.

Compounds of this invention can also be mixed with one or more other biologically active compounds or agents including herbicides, herbicide safeners, fungicides, insecticides,

nematocides, bactericides, acaricides, plant growth regulators such as insect molting inhibitors and rooting stimulants, chemosterilants, semiochemicals, repellents, attractants, pheromones, feeding stimulants, plant nutrients, other biologically active compounds or bacteria, virus or fungi to form a multi-component pesticide giving broader spectrum of agricultural protection.

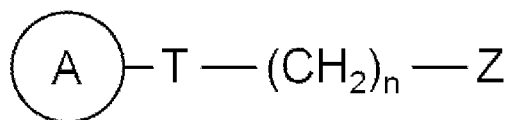
- 5 Mixtures of the compounds of the invention with other herbicides can broaden the spectrum of activity against additional weed species and suppress the proliferation of any resistant biotypes.

Throughout this application various publications, published patent applications and published patents are referenced. The disclosures of these publications in their entireties are hereby
10 incorporated by reference into this application in order to more fully describe the state of the art to which this invention pertains.

Certain features of the invention, which are, for clarity, described in the context of separate embodiments, may also be provided in combination in a single embodiment. Conversely, various features of the invention, which are, for brevity, described in the context of a single
15 embodiment, may also be provided separately or in any suitable subcombination or as suitable in any other described embodiment of the invention. Certain features described in the context of various embodiments are not to be considered essential features of those embodiments, unless the embodiment is inoperative without those elements.

Claims:

1. An agricultural composition comprising a compound or a salt thereof having the structure



or a salt thereof, wherein:

A is cyclopentadiene, benzene or indene scaffold comprising from 1 to 4 heteroatoms; wherein each of the heteroatoms is independently selected from the group consisting of N, S, Se, and O; and wherein one or more of the carbon atoms of the ring are optionally chemically attached to at least one of the groups consisting of: $-\text{SO}_2\text{CF}_3$, $-\text{O}-\text{SO}_2\text{CF}_3$, $-\text{NR}_3^+$, $-\text{SO}_2\text{R}$, $-\text{CX}_3$, $-\text{CX}_2\text{R}$, $-\text{COX}$, $-\text{CHO}$, $-\text{COR}$, $-\text{CO}_2\text{R}$, $-\text{CONH}_2$, $-\text{CONHR}$, $-\text{CONR}_2$, $-\text{N}=\text{O}$, $-\text{N}\equiv\text{N}^+$, $-\text{N}=\text{NR}$, $-\text{CR}=\text{NR}$, $-\text{N}=\text{CR}_2$, $-\text{F}$, $-\text{Cl}$, $-\text{Br}$, and $-\text{I}$, and wherein X is selected from F, Cl, Br and I;

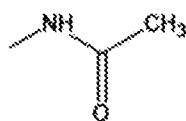
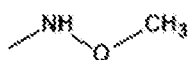
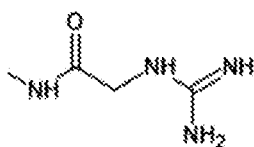
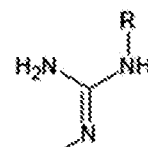
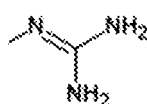
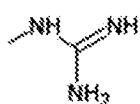
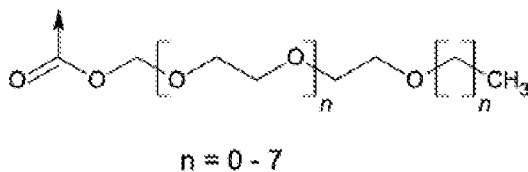
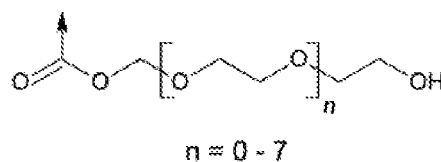
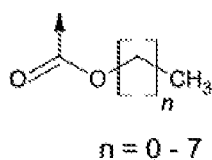
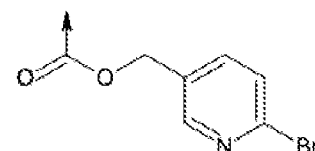
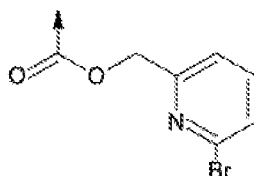
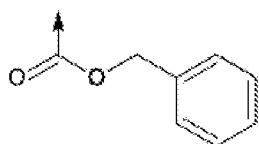
n is 0 to 5;

T is unsubstituted or substituted methylene group with one or two halides, $-\text{SO}_2\text{CF}_3$, $-\text{O}-\text{SO}_2\text{CF}_3$, $-\text{NR}_3^+$, $-\text{SO}_2\text{R}$, $-\text{CX}_3$, $-\text{CX}_2\text{R}-\text{COX}$, $-\text{CHO}$, $-\text{COR}$, $-\text{CO}_2\text{R}$, $-\text{CONH}_2$, $-\text{CONHR}$, $-\text{CONR}_2$, $-\text{F}$, $-\text{N}=\text{O}$, $-\text{N}\equiv\text{N}^+$, $-\text{N}=\text{NR}$, $-\text{CR}=\text{NR}$, $-\text{N}=\text{CR}_2$, and wherein X is selected from $-\text{F}$, $-\text{Cl}$, $-\text{Br}$ and $-\text{I}$; and,

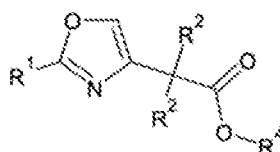
Z is $-\text{COOH}$, $-\text{COO}-$, $-\text{OH}$, $-\text{O}-\text{R}$, $-\text{COOR}$ with saturated or non-saturated alcohol residues with straight, branched, cyclic, aromatic or heteroaromatic chain; $-\text{O}-(\text{CH}_2\text{CH}_2\text{O})_n\text{R}$ ($n\geq 1$); $-\text{O}-(\text{CHMeCH}_2\text{O})_n\text{R}$ ($n\geq 1$); substituted or unsubstituted phosphate group, sulfonyl group, carbamoyl group, primary amine, secondary amine, tertiary amine, carboxamide, $-\text{NR}-\text{O}-\text{R}$, $-\text{O}-\text{NR}_2$, hydrazine, $-\text{NH}-\text{COR}$, and methanimidamide moiety or a salt thereof;

wherein R is selected from H, substituted or non-substituted alkyl, and substituted or non-substituted aryl group; and, wherein the composition comprises at least one agriculturally acceptable carrier.

2. The composition of claim 1, wherein Z is selected from

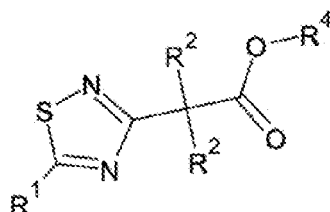


3. The agricultural composition of claim 1, comprising the compound or an agriculturally acceptable salt thereof, having the structure



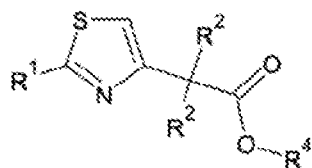
Wherein R^1 is selected from Cl; Br; I; and CF_3 ; R^2 is H or F; and R^4 is selected from H, saturated or non-saturated aliphatic straight, branched, cyclic or aromatic chain; ethylene glycol, polyethylene glycol, propylene glycol, polypropylene glycol, ethylpyridine, ethylbenzene, 1-(bromophenyl)ethan-1-one, 1-(1H-inden-3-yl)ethan-1-one, 1-(2,3-dihydro-1H-inden-1-yl)ethan-1-one, 1-(2,3-dihydro-1H-inden-1-yl)propan-1-one, and 1-(1H-inden-3-yl)propan-1-one.

4. The agricultural composition of claim 1, comprising the compound or an agriculturally acceptable salt thereof, having the structure



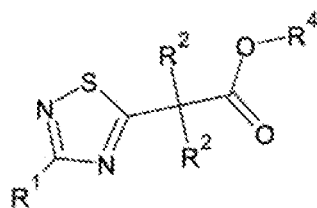
Wherein R^1 is selected from Cl; Br; I; and $-CF_3$; R^2 is H or F; and R^4 is selected from H, saturated or non-saturated aliphatic straight, branched, cyclic or aromatic chain; ethylene glycol; polyethylene glycol; propylene glycol, polypropylene glycol, ethylpyridine, ethylbenzene, 1-(bromophenyl)ethan-1-one, 1-(1H-inden-3-yl)ethan-1-one, 1-(2,3-dihydro-1H-inden-1-yl)ethan-1-one; 1-(2,3-dihydro-1H-inden-1-yl)propan-1-one; and 1-(1H-inden-3-yl)propan-1-one.

5. The agricultural composition of claim 1, comprising the compound or an agriculturally acceptable salt thereof, having the structure



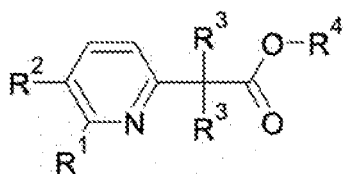
Wherein R^1 is selected from Cl; Br; I; and $-CF_3$; R^2 is H or F; and R^4 is selected from H, saturated or non-saturated aliphatic straight, branched, cyclic or aromatic chain; ethylene glycol; polyethylene glycol; propylene glycol, polypropylene glycol, ethylpyridine, ethylbenzene, 1-(bromophenyl)ethan-1-one, 1-(1H-inden-3-yl)ethan-1-one, 1-(2,3-dihydro-1H-inden-1-yl)ethan-1-one; 1-(2,3-dihydro-1H-inden-1-yl)propan-1-one; and 1-(1H-inden-3-yl)propan-1-one.

6. The agricultural composition of claim 1, comprising the compound or an agriculturally acceptable salt thereof, having the structure



Wherein R^1 is selected from Cl; Br; I; and $-CF_3$; R^2 is H or F; and R^4 is selected from H, saturated or non-saturated aliphatic straight, branched, cyclic or aromatic chain; ethylene glycol; polyethylene glycol; propylene glycol, polypropylene glycol, ethylpyridine, ethylbenzene, 1-(bromophenyl)ethan-1-one, 1-(1H-inden-3-yl)ethan-1-one, 1-(2,3-dihydro-1H-inden-1-yl)ethan-1-one; 1-(2,3-dihydro-1H-inden-1-yl)propan-1-one; and 1-(1H-inden-3-yl)propan-1-one.

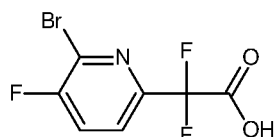
7. The agricultural composition of claim 1, comprising the compound or an agriculturally acceptable salt thereof, having the structure



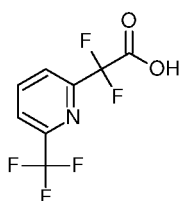
Wherein R^1 is selected from Cl; Br; I; and $-CF_3$; R^2 and R^3 is each independently selected from H or F; and R^4 is selected from H, saturated or non-saturated aliphatic straight,

branched, cyclic or aromatic chain; ethylene glycol; polyethylene glycol; propylene glycol, polypropylene glycol, ethylpyridine, ethylbenzene, 1-(bromophenyl)ethan-1-one, 1-(1H-inden-3-yl)ethan-1-one, 1-(2,3-dihydro-1H-inden-1-yl)ethan-1-one; 1-(2,3-dihydro-1H-inden-1-yl)propan-1-one; and 1-(1H-inden-3-yl)propan-1-one.

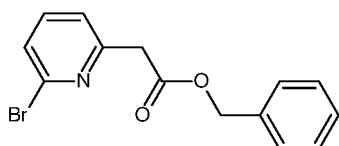
8. The agricultural composition of claim 1 or 2, comprising the compound or an agriculturally acceptable salt, having the structure



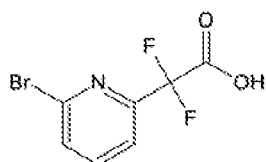
9. The composition of claim 1 or 2, comprising the compound or an agriculturally acceptable salt, having the structure



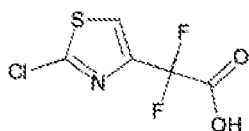
10. The composition of claim 1 or 2, comprising the compound or an agriculturally acceptable salt, having the structure



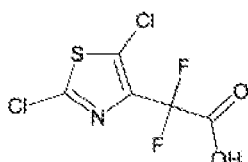
11. The composition of claim 1 or 2, comprising the compound or an agriculturally acceptable salt, having the structure



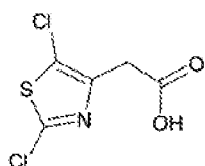
12. The composition of claim 1 or 2, comprising the compound or an agriculturally acceptable salt, having the structure



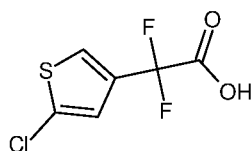
13. The composition of claim 1 or 2, comprising the compound or an agriculturally acceptable salt, having the structure



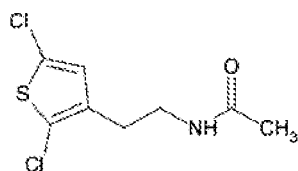
14. The composition of claim 1 or 2, comprising the compound or an agriculturally acceptable salt, having the structure



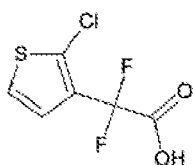
15. The composition of claim 1 or 2, comprising the compound or an agriculturally acceptable salt, having the structure



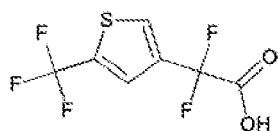
16. The composition of claim 1 or 2, comprising the compound or an agriculturally acceptable salt, having the structure



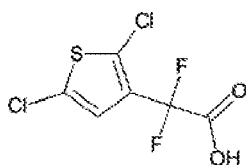
17. The composition of claim 1 or 2, comprising the compound or an agriculturally acceptable salt, having the structure



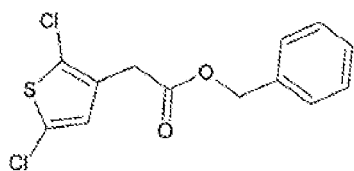
18. The composition of claim 1 or 2, comprising the compound or an agriculturally acceptable salt, having the structure



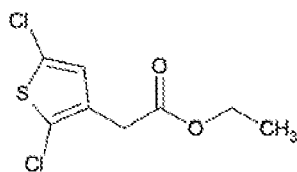
19. The composition of claim 1 or 2, comprising the compound or an agriculturally acceptable salt, having the structure



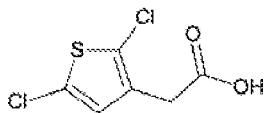
20. The composition of claim 1 or 2, comprising the compound or an agriculturally acceptable salt, having the structure



21. The composition of claim 1 or 2, comprising the compound having the structure



22. The composition of claim 1 or 2, comprising the compound or an agriculturally acceptable salt, having the structure



23. The composition of claim 1, comprising a compound selected from the group consisting of 2-(2,5-dichlorothiophen-3-yl)ethan-1-amine; 3-(2,5-dichlorothiophen-3-yl)-2-hydroxypropanoic acid; 2-(2,5-dichlorothiophen-3-yl)acetic acid; 1-(2,5-dichlorothiophen-3-yl)methanamine; 2-(thiophen-3-yl)ethan-1-amine; 2-(thiophen-3-yl)ethan-1-ol; 2-amino-1-(thiophen-3-yl)ethan-1-ol; 2-(thiophen-3-yl)acetamide; 2-(1H-1,2,4-triazol-5-yl)ethan-1-amine; 2-(1H-1,2,4-triazol-5-yl)ethan-1-amine; 3-(thiophen-3-yl)propan-1-amine; 2,5-dichloro-1,3-thiazole-4-carboxylic acid; 4-(2,5-dichlorothiophen-3-yl)butanoic acid; ethyl 3-[5-(chloromethyl)-1,3,4-thiadiazol-2-yl]-2-acetamido-3,3-difluoropropanoate; 2-amino-3-(1H-indazol-3-yl)propanoic acid hydrochloride [HCl]; (2-bromopyridin-4-yl)acetic acid; 3-(2-bromopyridin-4-yl)-2-hydroxypropanoic acid; 2-(2-bromopyridin-4-yl)ethan-1-amine; 4-(2-aminoethyl)phenol; bis[(2-bromopyridin-4-yl)methyl]amine; 2-(pyridin-3-yl)acetamide; 2-(2,6-dibromopyridin-4-yl)acetic acid; 2-bromo-4-(2-bromoethyl)pyridine; naphthalene-2-carboxylic acid; 2-bromopyridine-4-carboxylic acid; (2E)-3-(2,6-dichloropyridin-3-yl)prop-2-enoic acid; 2-amino-N-(2-bromopyridin-4-yl)ethane-1-sulfonamide; 4-(2,5-dichlorothiophen-3-yl)butanamide; 2-(thiophen-3-yl)ethane-1-thiol; (2-aminoethyl)[(2,5-dichlorothiophen-3-yl)methyl]amine; 2-[[2-(thiophen-3-yl)ethyl]sulfanyl]ethan-1-amine; 3-(thiophen-3-yl)propane-1,2-diol; 3-[(2,5-dichlorothiophen-3-yl)formamido]-2,2-difluoropropanoic acid; 3-(2,5-dichlorothiophen-3-yl)propanoic acid; (2E)-3-(5-chlorothiophen-2-yl)prop-2-enoic acid; (2E)-3-(1,3-thiazol-5-yl)prop-2-enoic acid; 2-(2,5-dichlorothiophen-3-yl)acetamide; [(2,5-dichlorothiophen-3-yl)methyl]hydrazine; 3-[(2,5-dichlorothiophen-3-yl)methyl]amino}-2,2-difluoropropanoic acid; 3-(2,5-dichlorothiophen-3-yl)-2-oxopropanoic acid; 2,5-dichloro-1,3-thiazole-4-carbonyl chloride; 2-bromo-N-[(2,5-dichlorothiophen-3-yl)methyl]pyridine-4-carboxamide; 2-[(2,5-dichlorothiophen-3-yl)methyl]amino}acetic acid; dichloro-1,3-thiazole-4-carboxamide; N-(2,5-dichloro-1,3-thiazol-4-yl)acetamide; (3E)-4-(2,5-dichlorothiophen-3-yl)-2-oxobut-3-enoic acid; (2E)-3-(3-chloro-1H-1,2,4-triazol-5-yl)prop-2-enoic acid; (2E)-3-(2,4-dichloro-1,3-thiazol-5-yl)prop-2-enoic acid; 2-(2-chlorothiophen-3-yl)-2,2-difluoroacetic acid; 3-[(2,5-

dichlorothiophen-3-yl)methyl]amino}-2,2-difluoropropanoic acid; 2-(5-chlorothiophen-3-yl)-2,2-difluoroacetic acid; 3-{4-[(2,5-dichlorothiophen-3-yl)methyl]piperazin-1-yl}propanoic acid; trichloro-1,3-thiazole; 3-(1H-1,2,4-triazol-1-yl)propanoic acid; N-[2-(2,5-dichlorothiophen-3-yl)ethyl]acetamide; 4-(2,5-dichlorothiophen-3-yl)-2,2-dimethylbutanoic acid; 2-(2,5-dichlorothiophen-3-yl)-2-oxoacetic acid; 4-(2,5-dichlorothiophen-3-yl)-4,4-difluorobutanoic acid; 2-amino-3-(1H-1,2,4-triazol-1-yl)propanoic acid dihydrochloride [HCl]; N-propyl-3-(4H-1,2,4-triazol-3-yl)propanamide; propyl 3-(4H-1,2,4-triazol-3-yl)propanoate; 2-(2,5-dichlorothiophen-3-yl)-2,2-difluoroacetamide; 2-(2,5-dichloro-1,3-thiazol-4-yl)acetic acid; 3-(2,5-dichloro-1,3-thiazol-4-yl)-N-propylpropanamide; ethyl 3-(2,5-dichloro-1,3-thiazol-4-yl)propanoate; (2,5-dichlorothiophen-3-yl)(difluoro)acetic acid; 2-(3-bromo-1H-1,2,4-triazol-5-yl)ethan-1-amine; ethyl (2,5-dichlorothiophen-3-yl)(difluoro)acetate; [2-(2,5-dichlorothiophen-3-yl)(difluoro)acetamido]acetic acid; 2-oxo-2-(2,4,5-trichlorothiophen-3-yl)acetic acid; 3-(2,5-dichlorothiophen-3-yl)-N-ethylpropanamide; 3-[(2,5-dibromothiophene-3-sulfonyl)amino]propanoic acid; N-(2-aminoethyl)-2,5-dibromothiophene-3-sulfonamide; ethyl 3-(2,5-dichlorothiophen-3-yl)propanoate; N-[2-(2,5-dichloro-1,3-thiazol-4-yl)ethyl]acetamide; 2,2-difluoro-2-(2,4,5-trichlorothiophen-3-yl)acetic acid; methyl oxo(2,4,5-trichlorothiophen-3-yl)acetate; 1-(2,5-dichloro-1,3-thiazol-4-yl)methanamine; 2,2-difluoro-2-(2-oxo-2,3-dihydro-1H-1,3-benzodiazol-5-yl)acetic acid; ethyl (2,5-dichloro-1,3-thiazol-4-yl)(difluoro)acetate; methyl 2-chloro-2-(2,5-dichlorothiophen-3-yl)acetate; 4-(2,5-dichlorothiophen-3-yl)butan-1-amine; 2-amino-2-(2,5-dichlorothiophen-3-yl)acetic acid; propyl[2-(1H-1,2,4-triazol-3-yl)ethyl]amine; ethyl 2-(2-bromo-5-methyl-1,3-thiazol-4-yl)acetate; ethyl 2-bromo-2-(2-bromo-5-methyl-1,3-thiazol-4-yl)acetate; ethyl 2-(2-bromo-1,3-thiazol-4-yl)acetate; sodium (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; 2-(2,5-dichloro-1,3-thiazol-4-yl)-2,2-difluoroacetic acid;; ethyl (2,5-dichlorothiophen-3-yl)acetate; benzyl 2-(2,5-dichlorothiophen-3-yl)acetate; 2-(2,5-dichlorothiophen-3-yl)-N-methoxyethan-1-amine; 2-(2,5-dichlorothiophen-3-yl)-N,N,N-trimethylethan-1-aminium; ethyl 2-(5-bromo-2-methyl-1,3-thiazol-4-yl)acetate; 2-amino-4,5,6,7-tetrahydro-1,3-benzothiazole-4-carboxylic acid hydrochloride; 5-(2,5-dichlorothiophen-3-yl)imidazolidine-2,4-dione; 2-chloro-4-phenyl-1,3-thiazole; 2-(2-amino-1,3-thiazol-4-yl)-2,2-difluoroacetic acid; 2,2-difluoro-2-[2-(trifluoromethyl)-1,3-thiazol-4-yl]acetic acid; 2-(2,5-dichloro-1,3-thiazol-4-yl)-N,N,N-trimethylethan-1-

aminium; 2-chloro-4-(phenoxyethyl)-1,3-thiazole; 2-chloro[1,3]thiazolo[5,4-b]pyridine-6-carboxylic acid; 4-benzyl-2-chloro-1,3-thiazole; 3-({[2-(2,5-dichloro-1,3-thiazol-4-yl)ethyl]amino}methyl)phenol; 2,2-difluoro-2-(1H-1,2,3,4-tetrazol-5-yl)acetic acid; dibenzyl[(2-chloro-1,3-thiazol-4-yl)methyl]amine; dichloro-1,3-thiazole-4-sulfinic acid; 2-(2,5-dichloro-1,3-thiazol-4-yl)ethan-1-amine; 2,5-dichlorothiophene-3-carboxylic acid; (thiophen-3-yl)acetic acid; benzyl[2-(2,5-dichlorothiophen-3-yl)ethyl]amine; (thiophen-3-yl)propanedioic acid; N-[2-(2,5-dichloro-1,3-thiazol-4-yl)ethyl]-2-(3-hydroxyphenyl)acetamide; 4-[difluoro(phenyl)methyl]-1,3-thiazol-2-amine; 4-[difluoro(phenyl)methyl]-1H-imidazole; 2-chloro-4-[difluoro(phenyl)methyl]-1,3-thiazole; 2,2-difluoro[2-(trifluoromethyl)-1,3-thiazol-5-yl]acetic acid; ethyl 2,2-difluoro-2-[5-(trifluoromethyl)thiophen-2-yl]acetate; 2-chloro-4-(2-hydrazinylethyl)-1,3-thiazole; ethyl difluoro(thiophen-3-yl)acetate; 2-(2-chloro-1,3-thiazol-4-yl)acetohydrazide; [2-(2,5-dichlorothiophen-3-yl)ethyl]hydrazine; ethyl difluoro[5-(trifluoromethyl)thiophen-3-yl]acetate; N-[2-(2,5-dichlorothiophen-3-yl)ethyl]-2-phenylacetamide; benzyl (2,5-dichlorothiophen-3-yl)(difluoro)acetate; 2,2-difluoro-2-[5-(trifluoromethyl)-1,3-thiazol-2-yl]acetic acid; [2-(5-chlorothiophen-3-yl)ethyl]hydrazine; [(2-chloro-1,3-thiazol-4-yl)methyl]phosphonic acid; 1-(2-chloro-1,3-thiazol-4-yl)-3-phenylpropan-2-one; 2-(2-chloro-1,3-thiazol-4-yl)-N'-methylacetohydrazide; 2-[2-(5-chloro-3-fluoropyridin-2-yl)-1,3-thiazol-4-yl]acetic acid; 2,2-difluoro-2-[5-methyl-2-(trifluoromethyl)-1,3-thiazol-4-yl]acetic acid; 2-(2-chloro-1,3-thiazol-4-yl)-2,2-difluoroethan-1-ol; N'-[2-(2,5-dichlorothiophen-3-yl)ethyl]-N-(3-hydroxypropyl)guanidine; 2-carbamimidamido-N-[2-(2,5-dichlorothiophen-3-yl)ethyl]acetamide; N-[2-(2,5-dichlorothiophen-3-yl)ethyl]-N'-(2-hydroxypropyl)guanidine; difluoro[2-(trifluoromethyl)thiophen-3-yl]acetic acid; ethyl 2-(2-amino-5-chloro-1,3-thiazol-4-yl)-2,2-difluoroacetate; 2-(2-bromo-1,3-thiazol-4-yl)-2,2-difluoroacetic acid; 2-[2-(2,5-dichlorothiophen-3-yl)ethyl]-1,4,5,6-tetrahydropyrimidin-5-ol; 2-(2-{[2-(2,5-dichlorothiophen-3-yl)ethyl]amino}-4,5-dihydro-1H-imidazol-1-yl)ethan-1-ol; 2-{[2-(2,5-dichlorothiophen-3-yl)ethyl]}(4,5-dihydro-1H-imidazol-2-yl)amino}ethan-1-ol; 2-[2-(4-chloro-2-fluorophenyl)-1,3-thiazol-4-yl]-2,2-difluoroacetic acid; (4-bromophenyl)methyl (2,5-dichlorothiophen-3-yl)acetate; 2,2-difluoro-2-[2-[3-fluoro-5-(trifluoromethyl)pyridin-2-yl]-1,3-thiazol-4-yl]acetic acid; [(2-bromo-1,3-thiazol-4-yl)(difluoro)methyl]phosphonic acid; 2-(4-methylphenyl)-2-oxoethyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; 4-amino-5-(2-chlorothiophen-3-

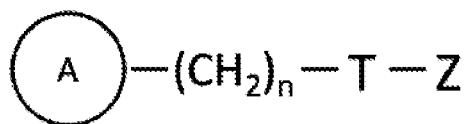
yl)pentanoic acid; 2-oxo-2-(pyridin-2-yl)ethyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; 2-oxo-2-phenylethyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; 2-(2-[[2-(2,5-dichlorothiophen-3-yl)ethyl]amino]-4,5-dihydro-1H-imidazol-1-yl)ethan-1-ol; 3-acetyl-1-[2-(2,5-dichlorothiophen-3-yl)ethyl]piperidin-4-one; [2,5-bis(trifluoromethyl)-1,3-thiazol-4-yl](difluoro)acetic acid; 2-[2-(benzyloxy)ethoxy]ethyl 2-(2-chloro-1,3-thiazol-4-yl)-2,2-difluoroacetate; 2-(2-methoxyethoxy)ethyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; (2-bromophenyl)methyl (2,5-dichlorothiophen-3-yl)(difluoro)acetate; 2-(1,2,3-thiadiazol-4-yl)acetic acid; [2-(2,4-dimethylbenzene-1-sulfonyl)-1,3-thiazol-4-yl](difluoro)acetic acid; 5H,6H-thieno[3,2-d][1,2,3]thiadiazole-5-carboxylic acid; (2-chloro-5-fluoro-1,3-thiazol-4-yl)(difluoro)acetic acid; {2-[(6-amino-9H-purin-9-yl)methoxy]ethoxy}methyl (2-chloro-1,3-thiazol-4-yl)acetate; (2-chloro-1,3-thiazol-4-yl)(cyano)acetic acid; (2-chloro-5-fluoro-1,3-thiazol-4-yl)(difluoro)acetic acid; (6-cyanopyridin-2-yl)(difluoro)acetic acid; (6-bromopyridin-2-yl)methyl 2-(2,5-dichlorothiophen-3-yl)-2,2-difluoroacetate; (6-bromopyridin-2-yl)methyl (2,5-dichlorothiophen-3-yl)acetate; difluoro[4-(trifluoromethyl)thiophen-3-yl]acetic acid; (4-bromophenyl)methyl (2,5-dichlorothiophen-3-yl)(difluoro)acetate; 2-(2-methoxyethoxy)ethyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; (2-bromophenyl)methyl (2,5-dichlorothiophen-3-yl)(difluoro)acetate; 2-(3-chloro-1,2-thiazol-4-yl)-2,2-difluoroacetic acid; 2,5,8,11,14-pentaoxahexadecan-16-yl 2-(2-chloro-1,3-thiazol-4-yl)-2,2-difluoroacetate; ethyl 2-(2-chloro-1,3-thiazol-4-yl)-2,2-difluoroacetate; 2-(2-chloro-1,3-benzothiazol-4-yl)-2,2-difluoroacetic acid; 2-[5-chloro-2-(trifluoromethyl)-1,3-thiazol-4-yl]-2,2-difluoroacetic acid; 2-[2-chloro-5-(2-phenylethynyl)-1,3-thiazol-4-yl]-2,2-difluoroacetic acid; 2-(4-methylphenyl)-2-oxoethyl (2-chloro-1,3-thiazol-4-yl)acetate; 2-(2-cyanothiophen-3-yl)acetic acid; octyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; 3-(2-chloro-1,3-thiazol-4-yl)-3-oxopropanoic acid; 2-(6-bromopyridin-2-yl)-2-oxoethyl (2-chlorothiophen-3-yl)acetate; 4-(2,5-dichloro-1,3-thiazol-4-yl)but-3-ynoic acid; 2-bromopyridine-4-carboxamide; (2E)-3-(6-chloropyridin-2-yl)prop-2-enoic acid; (2E)-3-(2-chloropyridin-3-yl)prop-2-enoic acid; (2E)-3-(2-bromopyridin-3-yl)prop-2-enoic acid; (2E)-3-(2-bromopyridin-4-yl)prop-2-enoic acid; 2-bromo-N-(2-bromopyridin-4-yl)pyridine-4-carboxamide; (2E)-3-(2-bromopyridin-4-yl)-N-(4-hydroxyphenyl)prop-2-enamide; 3-(2-bromopyridin-4-yl)-2-oxopropanoic acid; 2-(2,6-dibromopyridin-4-yl)ethan-1-amine; 4-(2-aminoethyl)-6-bromopyridine-2-

carbonitrile; 2,2-difluoro-2-(pyridin-4-yl)acetic acid; 2-[4-(pyridin-4-yloxy)phenyl]acetic acid; 3-amino-3-(2-bromopyridin-4-yl)propanamide; 2-(6-bromopyridin-2-yl)-2,2-difluoroacetic acid; 3-[(2-bromopyridin-4-yl)formamido]-2,2-difluoropropanoic acid; 2,2-difluoro-2-(pyrimidin-2-yl)acetic acid; 2-(6-bromopyridin-3-yl)-2,2-difluoroacetic acid; 2-(6-bromopyrimidin-4-yl)ethan-1-amine; 2-[2-amino-3-(4-hydroxyphenyl)propanamido]-3-phenylpropanoic acid hydrochloride; 2-(2-phenoxy pyridin-4-yl)ethan-1-amine; (2-bromopyridin-4-yl)(oxo)acetic acid; 1-chloroisoquinoline-7-carboxylic acid; 2-(2,6-dichloropyridin-4-yl)-2,2-difluoroacetic acid; methyl 2-(2-bromopyridin-4-yl)-2,2-difluoroacetate; (2,6-dibromopyridin-4-yl)-2,2-difluoroacetic acid; 2-(2,6-dibromopyridin-4-yl)-2,2-difluoroacetamide; 6-bromopyridine-2-carboximidamide hydrochloride; ethyl 2-(6-bromopyridin-2-yl)acetate; N-[(6-bromopyridin-2-yl)methyl]guanidine; N-(6-bromopyridin-2-yl)guanidine hydrochloride; (2E)-3-(6-bromopyridin-3-yl)-2,3-difluoroprop-2-enoic acid; ethyl 2-(6-bromopyridin-2-yl)-2,2-difluoroacetate; 2-(6-bromopyridin-2-yl)-2,2-difluoroethan-1-ol; [2-(6-bromopyridin-2-yl)ethyl]trimethylazanium; 2-bromo-6-phenoxy pyridine; benzyl (6-bromopyridin-2-yl)(difluoro)acetate; 2-amino-3-(6-bromopyridin-2-yl)propan-1-ol; 2-(6-bromopyridin-2-yl)ethanimidamide hydrochloride; 3-(2-bromopyridin-4-yl)propan-1-amine; 2-bromo-6-[difluoro(phenyl)methyl]pyridine; 2,2-difluoro-2-[6-(trifluoromethyl)pyridin-2-yl]acetic acid; 2,2-difluoro-2-[4-(trifluoromethyl)pyrimidin-2-yl]acetic acid; 2-(6-chloropyrazin-2-yl)-2,2-difluoroacetic acid; 2,2-difluoro-2-[6-(trifluoromethyl)pyrazin-2-yl]acetic acid; 2-[6-(4-chloro-2-fluorophenyl)pyridin-2-yl]-2,2-difluoroacetic acid; 2-(6-bromopyridin-2-yl)ethan-1-amine; 2-[6-(2,5-dichlorothiophen-3-yl)pyridin-2-yl]-2,2-difluoroacetic acid; 2,2-difluoro-2-{6-[2-(trifluoromethyl)-1,3-thiazol-4-yl]pyridin-2-yl}acetic acid; 2,2-difluoro-2-{6-[2-fluoro-4-(trifluoromethyl)phenyl]pyridin-2-yl}acetic acid; difluoro(3,5,6-trifluoropyridin-2-yl)acetic acid; 2-fluoro-2-(3,5,6-trifluoropyridin-2-yl)acetic acid; 2-[6-(2-chloro-1,3-thiazol-4-yl)pyridin-2-yl]-2,2-difluoroacetic acid; (6-bromo-5-fluoropyridin-2-yl)(difluoro)acetic acid; difluoro(6-fluoropyridin-2-yl)acetic acid; difluoro[6-(methylideneamino)pyridin-2-yl]acetic acid; (6-chloropyridin-2-yl)(difluoro)acetic acid; (6-bromo-5-fluoropyridin-2-yl)(difluoro)acetic acid; octyl (2-bromo-6-cyanopyridin-3-yl)acetate; octyl (6-bromo-2-cyanopyridin-3-yl)acetate or an agriculturally acceptable salt; and at least one acceptable carrier.

24. The composition of any one of claims 1 to 23, further comprising at least one crop protection agent.
25. The composition of claim 24, wherein the at least one crop protection agent is selected from the group consisting of fungicide, insecticide, herbicide, and plant growth regulator.
26. The agricultural composition of claim 24, wherein the crop protection agent is herbicide.
27. The agricultural composition of claim 24, wherein the crop protection agent is plant growth regulator.
28. The agricultural composition of claim 24, wherein the at least one crop protection agent is selected from the group consisting of atrazine, terbutylazine, (S)-metolachlor, metolachlor, terbutryn, simazine, dimethenamid, (S)-dimethenamid, flufenacet, acetochlor, alachlor, isoxaflutole, isoxachlortole, mesotrione, sulcotrione, metosulam, flumetsulam, pendimethalin, bromoxynil, bentazone, carfentrazone-ethyl, clomazone, nicosulfuron, rimsulfuron, halosulfuron-methyl, metribuzin, flumiclorac-pentyl, prosulfuron, primisulfuron-methyl, dicamba, fluthiacet-methyl, pyridate, 2,4-D, clopyralide, diflufenzopyr, fluroxypyr, MCPA, MCPB, mecoprop (MCP), metobenzuron, thifensulfuron-methyl, aclonifen, EPTC, glyphosate, glufosinate, sulfosate, cyanazine, propaquizafop, metamitron, pyramin, phenmedipham, desmedipham, ethofumesate, triasulfuron, chloridazon, lenacil, triallate, fluazifop, sethoxydim, quizalofop, clopyralide, clethodim, oxasulfuron, acifluorfen, benazolin-ethyl, sulfentrazone, chlorimuron-ethyl, cloransulam-methyl, fomesafen, imazamox, imazaquin, imazethapyr, imazapyr, lactofen, fenoxaprop(P-ethyl), thidiazuron, tribufos, trifluralin, dimethachlor, napropamide, quinmerac, metazachlor, carbetamide, dimefuron, propyzamide, ethametsulfuron-methyl, tebutam, fluometuron, prometryn, norflurazon, pyriproxyfen-sodium, MSMA, DSMA, diuron, flurochloridone, dithiopyr, thiazopyr, oxyfluorfen, ethalfluralin, clodinafop, amidosulfuron, diclofop-methyl, diflufenican, ethoxysulfuron, fentrazamide, flazasulfuron, florasulam, fluazolate, flucarbazone, flupyrsulfuron-methyl sodium, flurtamone, iodosulfuron, isoproturon, chlortoluron, chlorsulfuron, metsulfuron-methyl, sulfosulfuron, tribenuron-methyl, 2,4-DB, 2,4-DP, bifenox, flamprop-M, imazamethabenz-methyl, ioxynil, tralkoxydim, fluoroglyphosate-ethyl,

methabenzthiazuron, isoxaben, prosulfocarb, difenzoquat-metilsulfate, pretilachlor, cinosulfuron, fenclorim, bensulfuron-methyl, imazosulfuron, pyrazosulfuron-ethyl, azimsulfuron, esprocarb, mefenacet, molinate, propanil, pyrazolate, cyhalofop-butyl, bispyribac-sodium, pyriminobac-methyl, cafenstrole, oxadiargyl, oxadiazon, bromobutide, MY-100, dymron, NB 061, MK243, HW-52, AC 014, ametryn, hexazinone, asulam, azafenidin, tebuthiuron, ethametsulfuron-methyl, or a combination thereof.

29. The composition of anyone of claims 1 to 28, wherein said composition is formulated for drench application, soil application or foliar application.
30. A method of controlling undesired plant growth comprising applying to the locus of said undesired plant growth the agricultural composition of any one of claims 1 to 29.
31. A method of controlling undesired plant growth, comprising applying to the locus of the undesired plant growth a herbicidally effective amount of a compound having the structure



or a salt thereof, wherein:

A is cyclopentadiene, benzene and indene scaffold comprising from 1 to 4 heteroatoms; wherein each of the heteroatoms is independently selected from the group consisting of N, S, Se, and O; and wherein one or more of the carbon atoms of the ring are optionally chemically attached to at least one of the groups consisting of: $-\text{SO}_2\text{CF}_3$, $-\text{O}-\text{SO}_2\text{CF}_3$, $-\text{NR}_3^+$, $-\text{SO}_2\text{R}$, $-\text{CX}_3$, CX_2R , $-\text{COX}$, $-\text{CHO}$, $-\text{COR}$, $-\text{CO}_2\text{R}$, $-\text{CONH}_2$, $-\text{CONHR}$, $-\text{CONR}_2$, $-\text{N}=\text{O}$, $-\text{N}\equiv\text{N}^+$, $-\text{N}=\text{NR}$, $-\text{CR}=\text{NR}$, $-\text{N}=\text{CR}_2$, $-\text{F}$, $-\text{Cl}$, $-\text{Br}$, and $-\text{I}$; and wherein X is selected from F, Cl, Br and I;

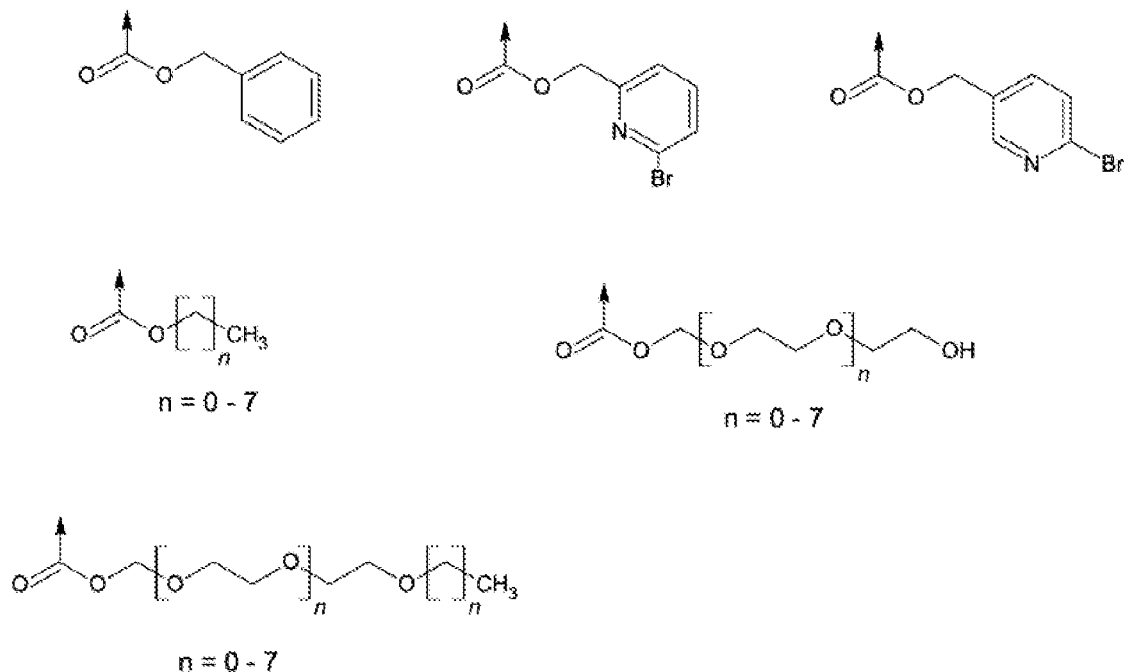
n is 0 to 5;

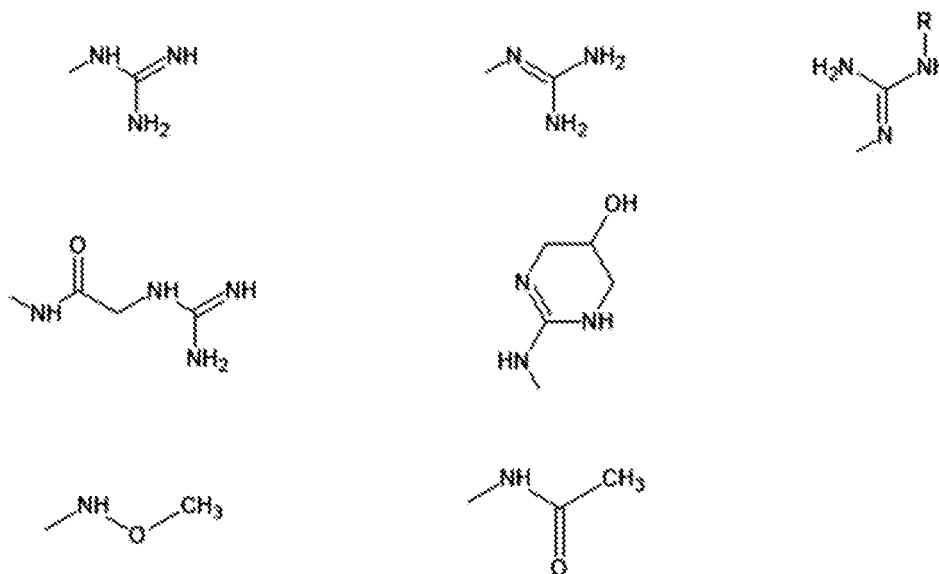
T is unsubstituted or substituted methylene group with one or two halides, $-\text{SO}_2\text{CF}_3$, $-\text{O}-\text{SO}_2\text{CF}_3$, $-\text{NR}_3^+$, $-\text{SO}_2\text{R}$, $-\text{CX}_3$, $-\text{CX}_2\text{R}$, $-\text{COX}$, $-\text{CHO}$, $-\text{COR}$, $-\text{CO}_2\text{R}$, $-\text{CONH}_2$, $-\text{CONHR}$, $-\text{CONR}_2$, $-\text{F}$, $-\text{N}=\text{O}$, $-\text{N}=\text{N}^+$, $-\text{N}=\text{NR}$, $-\text{CR}=\text{NR}$, $-\text{N}=\text{CR}_2$, and wherein X is selected from F, Cl, Br and I; and,

Z is $-\text{COOH}$, $-\text{COO}-$, $-\text{OH}$, $-\text{O}-\text{R}$, COOR with saturated or non-saturated alcohol residues with straight, branched, cyclic, aromatic or heteroaromatic chain; $-\text{O}-(\text{CH}_2\text{CH}_2\text{O})_n\text{R}$ ($n \geq 1$); $-\text{O}-(\text{CHMeCH}_2\text{O})_n\text{R}$ ($n \geq 1$); substituted or unsubstituted phosphate group, sulfonyl group, carbamoyl group, primary amine, secondary amine, tertiary amine, carboxamide, $-\text{NR}-\text{O}-\text{R}$, $-\text{O}-\text{NR}_2$, hydrazine, $-\text{NH}-\text{COR}$, and methanimidamide moiety or a salt thereof;

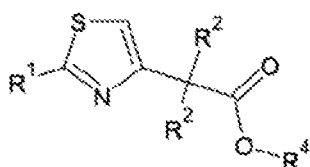
wherein R is selected from H, substituted or non-substituted alkyl, and substituted or non-substituted aryl group.

32. The method of claim 31, wherein Z is selected from



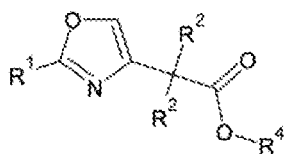


33. The method of claim 31, comprising applying to the locus of the undesired plant growth a herbicidally effective amount of a compound, or agriculturally acceptable salt, having the structure



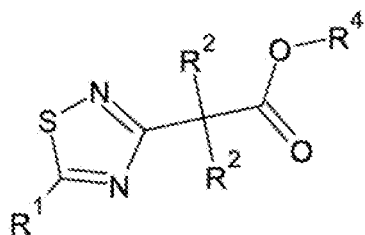
Wherein R^1 is selected from Cl; Br; I; and $-\text{CF}_3$; R^2 is H or F; and R^4 is selected from H, saturated or non-saturated aliphatic straight, branched, cyclic or aromatic chain; ethylene glycol; polyethylene glycol; propylene glycol, polypropylene glycol, ethylpyridine, ethylbenzene, 1-(bromophenyl)ethan-1-one, 1-(1H-inden-3-yl)ethan-1-one, 1-(2,3-dihydro-1H-inden-1-yl)ethan-1-one; 1-(2,3-dihydro-1H-inden-1-yl)propan-1-one; and 1-(1H-inden-3-yl)propan-1-one.

34. The method of claim 31, comprising applying to the locus of the undesired plant growth a herbicidally effective amount of a compound, or agriculturally acceptable salt, having the structure



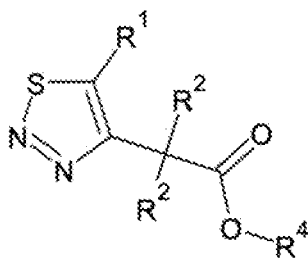
Wherein R^1 is selected from Cl; Br; I; and CF_3 ; R^2 is H or F; and R^4 is selected from H, saturated or non-saturated aliphatic straight, branched, cyclic or aromatic chain; ethylene glycol; polyethylene glycol; propylene glycol, polypropylene glycol, ethylpyridine, ethylbenzene, 1-(bromophenyl)ethan-1-one, 1-(1H-inden-3-yl)ethan-1-one, 1-(2,3-dihydro-1H-inden-1-yl)ethan-1-one; 1-(2,3-dihydro-1H-inden-1-yl)propan-1-one; and 1-(1H-inden-3-yl)propan-1-one.

35. The method of claim 31, comprising applying to the locus of the undesired plant growth a herbicidally effective amount of a compound, or agriculturally acceptable salt, having the structure



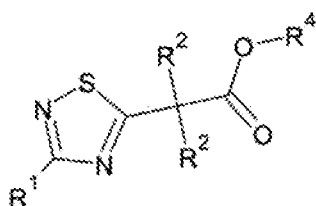
Wherein R^1 is selected from Cl; Br; I; and $-CF_3$; R^2 is H or F; and R^4 is selected from H, saturated or non-saturated aliphatic straight, branched, cyclic or aromatic chain; ethylene glycol; polyethylene glycol; propylene glycol, polypropylene glycol, ethylpyridine, ethylbenzene, 1-(bromophenyl)ethan-1-one, 1-(1H-inden-3-yl)ethan-1-one, 1-(2,3-dihydro-1H-inden-1-yl)ethan-1-one; 1-(2,3-dihydro-1H-inden-1-yl)propan-1-one; and 1-(1H-inden-3-yl)propan-1-one.

36. The method of claim 31, comprising applying to the locus of the undesired plant growth a herbicidally effective amount of a compound, or agriculturally acceptable salt, having the structure



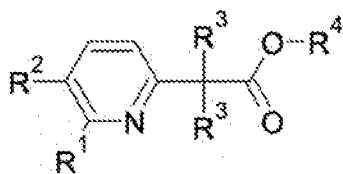
Wherein R^1 is selected from Cl; Br; I; and $-CF_3$; R^2 is H or F; and R^4 is selected from H, saturated or non-saturated aliphatic straight, branched, cyclic or aromatic chain; ethylene glycol; polyethylene glycol; propylene glycol, polypropylene glycol, ethylpyridine, ethylbenzene, 1-(bromophenyl)ethan-1-one, 1-(1H-inden-3-yl)ethan-1-one, 1-(2,3-dihydro-1H-inden-1-yl)ethan-1-one; 1-(2,3-dihydro-1H-inden-1-yl)propan-1-one; and 1-(1H-inden-3-yl)propan-1-one.

37. The method of claim 31, comprising applying to the locus of the undesired plant growth a herbicidally effective amount of a compound, or agriculturally acceptable salt, having the structure



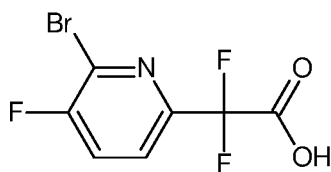
Wherein R^1 is selected from Cl; Br; I; and $-CF_3$; R^2 is H or F; and R^4 is selected from H, saturated or non-saturated aliphatic straight, branched, cyclic or aromatic chain; ethylene glycol; polyethylene glycol; propylene glycol, polypropylene glycol, ethylpyridine, ethylbenzene, 1-(bromophenyl)ethan-1-one, 1-(1H-inden-3-yl)ethan-1-one, 1-(2,3-dihydro-1H-inden-1-yl)ethan-1-one; 1-(2,3-dihydro-1H-inden-1-yl)propan-1-one; and 1-(1H-inden-3-yl)propan-1-one.

38. The method of claim 31, comprising applying to the locus of the undesired plant growth a herbicidally effective amount of a compound, or agriculturally acceptable salt, having the structure

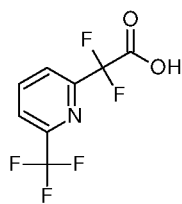


Wherein R^1 is selected from Cl; Br; I; and $-CF_3$; R^2 and R^3 is each independently selected from H or F; and R^4 is selected from H, saturated or non-saturated aliphatic straight, branched, cyclic or aromatic chain; ethylene glycol; polyethylene glycol; propylene glycol, polypropylene glycol, ethylpyridine, ethylbenzene, 1-(bromophenyl)ethan-1-one, 1-(1H-inden-3-yl)ethan-1-one, 1-(2,3-dihydro-1H-inden-1-yl)ethan-1-one; 1-(2,3-dihydro-1H-inden-1-yl)propan-1-one; and 1-(1H-inden-3-yl)propan-1-one.

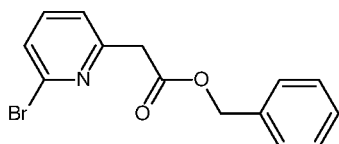
39. The method of claim 31 or 32, comprising applying to the locus of the undesired plant growth a herbicidally effective amount of a compound, or agriculturally acceptable salt, having the structure



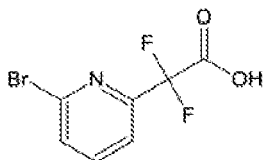
40. The method of claim 31 or 32, comprising applying to the locus of the undesired plant growth a herbicidally effective amount of a compound, or agriculturally acceptable salt, having the structure



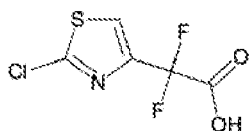
41. The method of claim 31 or 32, comprising applying to the locus of the undesired plant growth a herbicidally effective amount of a compound, or agriculturally acceptable salt, having the structure



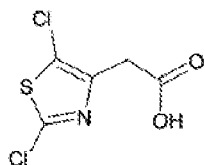
42. The method of claim 31 or 32, comprising applying to the locus of the undesired plant growth a herbicidally effective amount of a compound, or agriculturally acceptable salt, having the structure



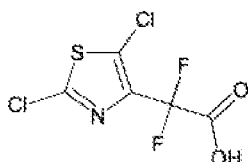
43. The method of claim 31 or 32, comprising applying to the locus of the undesired plant growth a herbicidally effective amount of a compound, or agriculturally acceptable salt, having the structure



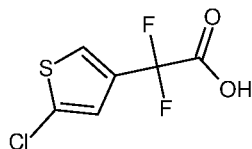
44. The method of claim 31 or 32, comprising applying to the locus of the undesired plant growth a herbicidally effective amount of a compound, or agriculturally acceptable salt, having the structure



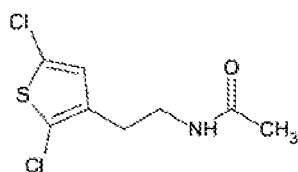
45. The method of claim 31 or 32, comprising applying to the locus of the undesired plant growth a herbicidally effective amount of a compound, or agriculturally acceptable salt, having the structure



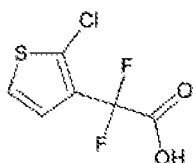
46. The method of claim 31 or 32, comprising applying to the locus of the undesired plant growth a herbicidally effective amount of a compound, or agriculturally acceptable salt, having the structure



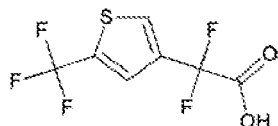
47. The method of claim 31 or 32, comprising applying to the locus of the undesired plant growth a herbicidally effective amount of a compound, or agriculturally acceptable salt, having the structure



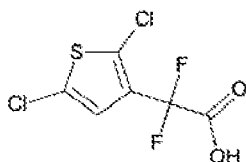
48. The method of claim 31 or 32, comprising applying to the locus of the undesired plant growth a herbicidally effective amount of a compound, or agriculturally acceptable salt, having the structure



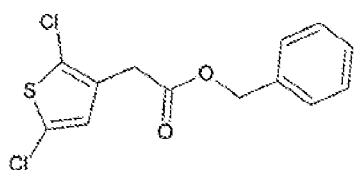
49. The method of claim 31 or 32, comprising applying to the locus of the undesired plant growth a herbicidally effective amount of a compound, or agriculturally acceptable salt, having the structure



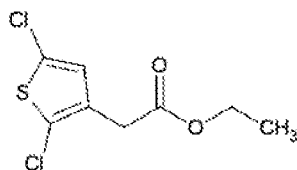
50. The method of claim 31 or 32, comprising applying to the locus of the undesired plant growth a herbicidally effective amount of a compound, or agriculturally acceptable salt, having the structure



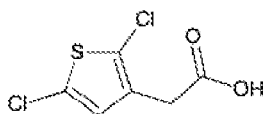
51. The method of claim 31 or 32, comprising applying to the locus of the undesired plant growth a herbicidally effective amount of a compound, or agriculturally acceptable salt, having the structure



52. The method of claim 31 or 32, comprising applying to the locus of the undesired plant growth a herbicidally effective amount of a compound, or agriculturally acceptable salt, having the structure



53. The method of claim 31 or 32, comprising applying to the locus of the undesired plant growth a herbicidally effective amount of a compound, or agriculturally acceptable salt, having the structure



54. The method of claim 31, comprising applying to the locus of the undesired plant growth a herbicidally effective amount of a compound, selected from the group consisting of 2-(2,5-dichlorothiophen-3-yl)ethan-1-amine; 3-(2,5-dichlorothiophen-3-yl)-2-hydroxypropanoic acid; 2-(2,5-dichlorothiophen-3-yl)acetic acid; 1-(2,5-dichlorothiophen-3-yl)methanamine; 2-(thiophen-3-yl)ethan-1-amine; 2-(thiophen-3-yl)ethan-1-ol; 2-amino-1-(thiophen-3-yl)ethan-1-ol; 2-(thiophen-3-yl)acetamide; 2-(1H-

1,2,4-triazol-5-yl)ethan-1-amine; 2-(1H-1,2,4-triazol-5-yl)ethan-1-amine; 3-(thiophen-3-yl)propan-1-amine; 2,5-dichloro-1,3-thiazole-4-carboxylic acid; 4-(2,5-dichlorothiophen-3-yl)butanoic acid; ethyl 3-[5-(chloromethyl)-1,3,4-thiadiazol-2-yl]-2-acetamido-3,3-difluoropropanoate; 2-amino-3-(1H-indazol-3-yl)propanoic acid hydrochloride[HCl]; (2-bromopyridin-4-yl)acetic acid; 3-(2-bromopyridin-4-yl)-2-hydroxypropanoic acid; 2-(2-bromopyridin-4-yl)ethan-1-amine; 4-(2-aminoethyl)phenol; bis[(2-bromopyridin-4-yl)methyl]amine; 2-(pyridin-3-yl)acetamide; 2-(2,6-dibromopyridin-4-yl)acetic acid; 2-bromo-4-(2-bromoethyl)pyridine; naphthalene-2-carboxylic acid; 2-bromopyridine-4-carboxylic acid; (2E)-3-(2,6-dichloropyridin-3-yl)prop-2-enoic acid; 2-amino-N-(2-bromopyridin-4-yl)ethane-1-sulfonamide; 4-(2,5-dichlorothiophen-3-yl)butanamide; 2-(thiophen-3-yl)ethane-1-thiol; (2-aminoethyl)[(2,5-dichlorothiophen-3-yl)methyl]amine; 2-[[2-(thiophen-3-yl)ethyl]sulfanyl]ethan-1-amine; 3-(thiophen-3-yl)propane-1,2-diol; 3-[(2,5-dichlorothiophen-3-yl)formamido]-2,2-difluoropropanoic acid; 3-(2,5-dichlorothiophen-3-yl)propanoic acid; (2E)-3-(5-chlorothiophen-2-yl)prop-2-enoic acid; (2E)-3-(1,3-thiazol-5-yl)prop-2-enoic acid; 2-(2,5-dichlorothiophen-3-yl)acetamide; [(2,5-dichlorothiophen-3-yl)methyl]hydrazine; 3-[[2,5-dichlorothiophen-3-yl)methyl]amino}-2,2-difluoropropanoic acid; 3-(2,5-dichlorothiophen-3-yl)-2-oxopropanoic acid; 2,5-dichloro-1,3-thiazole-4-carbonyl chloride; 2-bromo-N-[(2,5-dichlorothiophen-3-yl)methyl]pyridine-4-carboxamide; 2-[[2,5-dichlorothiophen-3-yl)methyl]amino}acetic acid; dichloro-1,3-thiazole-4-carboxamide; N-(2,5-dichloro-1,3-thiazol-4-yl)acetamide; (3E)-4-(2,5-dichlorothiophen-3-yl)-2-oxobut-3-enoic acid; (2E)-3-(3-chloro-1H-1,2,4-triazol-5-yl)prop-2-enoic acid; (2E)-3-(2,4-dichloro-1,3-thiazol-5-yl)prop-2-enoic acid; 2-(2-chlorothiophen-3-yl)-2,2-difluoroacetic acid; 3-[[2,5-dichlorothiophen-3-yl)methyl]amino}-2,2-difluoropropanoic acid; 2-(5-chlorothiophen-3-yl)-2,2-difluoroacetic acid; 3-{4-[(2,5-dichlorothiophen-3-yl)methyl]piperazin-1-yl}propanoic acid; trichloro-1,3-thiazole; 3-(1H-1,2,4-triazol-1-yl)propanoic acid; N-[2-(2,5-dichlorothiophen-3-yl)ethyl]acetamide; 4-(2,5-dichlorothiophen-3-yl)-2,2-dimethylbutanoic acid; 2-(2,5-dichlorothiophen-3-yl)-2-oxoacetic acid; 4-(2,5-dichlorothiophen-3-yl)-4,4-difluorobutanoic acid; 2-amino-3-(1H-1,2,4-triazol-1-yl)propanoic acid dihydrochloride [HCl]; N-propyl-3-(4H-1,2,4-triazol-3-yl)propanamide; propyl 3-(4H-1,2,4-triazol-3-yl)propanoate; 2-(2,5-dichlorothiophen-3-yl)-2,2-difluoroacetamide; 2-(2,5-dichloro-1,3-thiazol-4-yl)acetic acid; 3-(2,5-dichloro-1,3-

thiazol-4-yl)-N-propylpropanamide; ethyl 3-(2,5-dichloro-1,3-thiazol-4-yl)propanoate; (2,5-dichlorothiophen-3-yl)(difluoro)acetic acid; 2-(3-bromo-1H-1,2,4-triazol-5-yl)ethan-1-amine; ethyl (2,5-dichlorothiophen-3-yl)(difluoro)acetate; [2-(2,5-dichlorothiophen-3-yl)(difluoro)acetamido]acetic acid; 2-oxo-2-(2,4,5-trichlorothiophen-3-yl)acetic acid; 3-(2,5-dichlorothiophen-3-yl)-N-ethylpropanamide; 3-[(2,5-dibromothiophene-3-sulfonyl)amino]propanoic acid; N-(2-aminoethyl)-2,5-dibromothiophene-3-sulfonamide; ethyl 3-(2,5-dichlorothiophen-3-yl)propanoate; N-[2-(2,5-dichloro-1,3-thiazol-4-yl)ethyl]acetamide; 2,2-difluoro-2-(2,4,5-trichlorothiophen-3-yl)acetic acid; methyl oxo(2,4,5-trichlorothiophen-3-yl)acetate; 1-(2,5-dichloro-1,3-thiazol-4-yl)methanamine; 2,2-difluoro-2-(2-oxo-2,3-dihydro-1H-1,3-benzodiazol-5-yl)acetic acid; ethyl (2,5-dichloro-1,3-thiazol-4-yl)(difluoro)acetate; methyl 2-chloro-2-(2,5-dichlorothiophen-3-yl)acetate; 4-(2,5-dichlorothiophen-3-yl)butan-1-amine; 2-amino-2-(2,5-dichlorothiophen-3-yl)acetic acid; propyl[2-(1H-1,2,4-triazol-3-yl)ethyl]amine; ethyl 2-(2-bromo-5-methyl-1,3-thiazol-4-yl)acetate; ethyl 2-bromo-2-(2-bromo-5-methyl-1,3-thiazol-4-yl)acetate; ethyl 2-(2-bromo-1,3-thiazol-4-yl)acetate; sodium (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; 2-(2,5-dichloro-1,3-thiazol-4-yl)-2,2-difluoroacetic acid; ethyl (2,5-dichlorothiophen-3-yl)acetate; benzyl 2-(2,5-dichlorothiophen-3-yl)acetate; 2-(2,5-dichlorothiophen-3-yl)-N-methoxyethan-1-amine; 2-(2,5-dichlorothiophen-3-yl)-N,N,N-trimethylethan-1-aminium; ethyl 2-(5-bromo-2-methyl-1,3-thiazol-4-yl)acetate; 2-amino-4,5,6,7-tetrahydro-1,3-benzothiazole-4-carboxylic acid hydrochloride; 5-(2,5-dichlorothiophen-3-yl)imidazolidine-2,4-dione; 2-chloro-4-phenyl-1,3-thiazole; 2-(2-amino-1,3-thiazol-4-yl)-2,2-difluoroacetic acid; 2,2-difluoro-2-[2-(trifluoromethyl)-1,3-thiazol-4-yl]acetic acid; 2-(2,5-dichloro-1,3-thiazol-4-yl)-N,N,N-trimethylethan-1-aminium; 2-chloro-4-(phenoxymethyl)-1,3-thiazole; 2-chloro[1,3]thiazolo[5,4-b]pyridine-6-carboxylic acid; 4-benzyl-2-chloro-1,3-thiazole; 3-([2-(2,5-dichloro-1,3-thiazol-4-yl)ethyl]amino)methylphenol; 2,2-difluoro-2-(1H-1,2,3,4-tetrazol-5-yl)acetic acid; dibenzyl[(2-chloro-1,3-thiazol-4-yl)methyl]amine; dichloro-1,3-thiazole-4-sulfinic acid; 2-(2,5-dichloro-1,3-thiazol-4-yl)ethan-1-amine; 2,5-dichlorothiophene-3-carboxylic acid; (thiophen-3-yl)acetic acid; benzyl[2-(2,5-dichlorothiophen-3-yl)ethyl]amine; (thiophen-3-yl)propanedioic acid; N-[2-(2,5-dichloro-1,3-thiazol-4-yl)ethyl]-2-(3-hydroxyphenyl)acetamide; 4-[difluoro(phenyl)methyl]-1,3-thiazol-2-amine; 4-[difluoro(phenyl)methyl]-1H-imidazole; 2-chloro-4-[difluoro(phenyl)methyl]-1,3-

thiazole; 2,2-difluoro[2-(trifluoromethyl)-1,3-thiazol-5-yl]acetic acid; ethyl 2,2-difluoro-2-[5-(trifluoromethyl)thiophen-2-yl]acetate; 2-chloro-4-(2-hydrazinylethyl)-1,3-thiazole; ethyl difluoro(thiophen-3-yl)acetate; 2-(2-chloro-1,3-thiazol-4-yl)acetohydrazide; [2-(2,5-dichlorothiophen-3-yl)ethyl]hydrazine; ethyl difluoro[5-(trifluoromethyl)thiophen-3-yl]acetate; N-[2-(2,5-dichlorothiophen-3-yl)ethyl]-2-phenylacetamide; benzyl (2,5-dichlorothiophen-3-yl)(difluoro)acetate; 2,2-difluoro-2-[5-(trifluoromethyl)-1,3-thiazol-2-yl]acetic acid; [2-(5-chlorothiophen-3-yl)ethyl]hydrazine; [(2-chloro-1,3-thiazol-4-yl)methyl]phosphonic acid; 1-(2-chloro-1,3-thiazol-4-yl)-3-phenylpropan-2-one; 2-(2-chloro-1,3-thiazol-4-yl)-N'-methylacetohydrazide; 2-[2-(5-chloro-3-fluoropyridin-2-yl)-1,3-thiazol-4-yl]acetic acid; 2,2-difluoro-2-[5-methyl-2-(trifluoromethyl)-1,3-thiazol-4-yl]acetic acid; 2-(2-chloro-1,3-thiazol-4-yl)-2,2-difluoroethan-1-ol; N'-[2-(2,5-dichlorothiophen-3-yl)ethyl]-N-(3-hydroxypropyl)guanidine; 2-carbamimidamido-N-[2-(2,5-dichlorothiophen-3-yl)ethyl]acetamide; N-[2-(2,5-dichlorothiophen-3-yl)ethyl]-N'-(2-hydroxypropyl)guanidine; difluoro[2-(trifluoromethyl)thiophen-3-yl]acetic acid; ethyl 2-(2-amino-5-chloro-1,3-thiazol-4-yl)-2,2-difluoroacetate; 2-(2-bromo-1,3-thiazol-4-yl)-2,2-difluoroacetic acid; 2-[2-(2,5-dichlorothiophen-3-yl)ethyl]-1,4,5,6-tetrahydropyrimidin-5-ol; 2-(2-[[2-(2,5-dichlorothiophen-3-yl)ethyl]amino]-4,5-dihydro-1H-imidazol-1-yl)ethan-1-ol; 2-[[2-(2,5-dichlorothiophen-3-yl)ethyl](4,5-dihydro-1H-imidazol-2-yl)amino]ethan-1-ol; 2-[2-(4-chloro-2-fluorophenyl)-1,3-thiazol-4-yl]-2,2-difluoroacetic acid; (4-bromophenyl)methyl (2,5-dichlorothiophen-3-yl)acetate; 2,2-difluoro-2-[2-[3-fluoro-5-(trifluoromethyl)pyridin-2-yl]-1,3-thiazol-4-yl]acetic acid; [(2-bromo-1,3-thiazol-4-yl)(difluoro)methyl]phosphonic acid; 2-(4-methylphenyl)-2-oxoethyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; 4-amino-5-(2-chlorothiophen-3-yl)pentanoic acid; 2-oxo-2-(pyridin-2-yl)ethyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; 2-oxo-2-phenylethyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; 2-(2-[[2-(2,5-dichlorothiophen-3-yl)ethyl]amino]-4,5-dihydro-1H-imidazol-1-yl)ethan-1-ol; 3-acetyl-1-[2-(2,5-dichlorothiophen-3-yl)ethyl]piperidin-4-one; [2,5-bis(trifluoromethyl)-1,3-thiazol-4-yl](difluoro)acetic acid; 2-[2-(benzyloxy)ethoxy]ethyl 2-(2-chloro-1,3-thiazol-4-yl)-2,2-difluoroacetate; 2-(2-methoxyethoxy)ethyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; (2-bromophenyl)methyl (2,5-dichlorothiophen-3-yl)(difluoro)acetate; 2-(1,2,3-thiadiazol-4-yl)acetic acid; [2-(2,4-dimethylbenzene-1-sulfonyl)-1,3-thiazol-4-yl](difluoro)acetic acid; 5H,6H-thieno[3,2-d][1,2,3]thiadiazole-5-

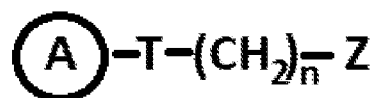
carboxylic acid; (2-chloro-5-fluoro-1,3-thiazol-4-yl)(difluoro)acetic acid; {2-[(6-amino-9H-purin-9-yl)methoxy]ethoxy)methyl (2-chloro-1,3-thiazol-4-yl)acetate; (2-chloro-1,3-thiazol-4-yl)(cyano)acetic acid; (2-chloro-5-fluoro-1,3-thiazol-4-yl)(difluoro)acetic acid; (6-cyanopyridin-2-yl)(difluoro)acetic acid; (6-bromopyridin-2-yl)methyl 2-(2,5-dichlorothiophen-3-yl)-2,2-difluoroacetate; (6-bromopyridin-2-yl)methyl (2,5-dichlorothiophen-3-yl)acetate; difluoro[4-(trifluoromethyl)thiophen-3-yl]acetic acid; 4-(bromophenyl)methyl (2,5-dichlorothiophen-3-yl)(difluoro)acetate; 2-(2-methoxyethoxy)ethyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; (2-bromophenyl)methyl (2,5-dichlorothiophen-3-yl)(difluoro)acetate; 2-(3-chloro-1,2-thiazol-4-yl)-2,2-difluoroacetic acid; 2,5,8,11,14-pentaoxahexadecan-16-yl 2-(2-chloro-1,3-thiazol-4-yl)-2,2-difluoroacetate; ethyl 2-(2-chloro-1,3-thiazol-4-yl)-2,2-difluoroacetate; 2-(2-chloro-1,3-benzothiazol-4-yl)-2,2-difluoroacetic acid; 2-[5-chloro-2-(trifluoromethyl)-1,3-thiazol-4-yl]-2,2-difluoroacetic acid; 2-[2-chloro-5-(2-phenylethynyl)-1,3-thiazol-4-yl]-2,2-difluoroacetic acid; 2-(4-methylphenyl)-2-oxoethyl (2-chloro-1,3-thiazol-4-yl)acetate; 2-(2-cyanothiophen-3-yl)acetic acid; octyl (2-chloro-1,3-thiazol-4-yl)(difluoro)acetate; 3-(2-chloro-1,3-thiazol-4-yl)-3-oxopropanoic acid; 2-(6-bromopyridin-2-yl)-2-oxoethyl (2-chlorothiophen-3-yl)acetate; 4-(2,5-dichloro-1,3-thiazol-4-yl)but-3-ynoic acid; 2-bromopyridine-4-carboxamide; (2E)-3-(6-chloropyridin-2-yl)prop-2-enoic acid; (2E)-3-(2-chloropyridin-3-yl)prop-2-enoic acid; (2E)-3-(2-bromopyridin-3-yl)prop-2-enoic acid; (2E)-3-(2-bromopyridin-4-yl)prop-2-enoic acid; 2-bromo-N-(2-bromopyridin-4-yl)pyridine-4-carboxamide; (2E)-3-(2-bromopyridin-4-yl)-N-(4-hydroxyphenyl)prop-2-enamide; 3-(2-bromopyridin-4-yl)-2-oxopropanoic acid; 2-(2,6-dibromopyridin-4-yl)ethan-1-amine; 4-(2-aminoethyl)-6-bromopyridine-2-carbonitrile; 2,2-difluoro-2-(pyridin-4-yl)acetic acid; 2-[4-(pyridin-4-yloxy)phenyl]acetic acid; 3-amino-3-(2-bromopyridin-4-yl)propanamide; 2-(6-bromopyridin-2-yl)-2,2-difluoroacetic acid; 3-[(2-bromopyridin-4-yl)formamido]-2,2-difluoropropanoic acid; 2,2-difluoro-2-(pyrimidin-2-yl)acetic acid; 2-(6-bromopyridin-3-yl)-2,2-difluoroacetic acid; 2-(6-bromopyrimidin-4-yl)ethan-1-amine; 2-[2-amino-3-(4-hydroxyphenyl)propanamido]-3-phenylpropanoic acid hydrochloride; 2-(2-phenoxy-pyridin-4-yl)ethan-1-amine; (2-bromopyridin-4-yl)(oxo)acetic acid; 1-chloroisoquinoline-7-carboxylic acid; 2-(2,6-dichloropyridin-4-yl)-2,2-difluoroacetic acid; methyl 2-(2-bromopyridin-4-yl)-2,2-difluoroacetate; (2,6-dibromopyridin-4-yl)-2,2-

difluoroacetic acid; 2-(2,6-dibromopyridin-4-yl)-2,2-difluoroacetamide; 6-bromopyridine-2-carboximidamide hydrochloride; ethyl 2-(6-bromopyridin-2-yl)acetate; N-[(6-bromopyridin-2-yl)methyl]guanidine; N-(6-bromopyridin-2-yl)guanidine hydrochloride; (2E)-3-(6-bromopyridin-3-yl)-2,3-difluoroprop-2-enoic acid; ethyl 2-(6-bromopyridin-2-yl)-2,2-difluoroacetate; 2-(6-bromopyridin-2-yl)-2,2-difluoroethan-1-ol; [2-(6-bromopyridin-2-yl)ethyl]trimethylazanium; 2-bromo-6-phenoxy pyridine; benzyl (6-bromopyridin-2-yl)(difluoro)acetate; 2-amino-3-(6-bromopyridin-2-yl)propan-1-ol; 2-(6-bromopyridin-2-yl)ethanimidamide hydrochloride; 3-(2-bromopyridin-4-yl)propan-1-amine; 2-bromo-6-[difluoro(phenyl)methyl]pyridine; 2,2-difluoro-2-[6-(trifluoromethyl)pyridin-2-yl]acetic acid; 2,2-difluoro-2-[4-(trifluoromethyl)pyrimidin-2-yl]acetic acid; 2-(6-chloropyrazin-2-yl)-2,2-difluoroacetic acid; 2,2-difluoro-2-[6-(trifluoromethyl)pyrazin-2-yl]acetic acid; 2-[6-(4-chloro-2-fluorophenyl)pyridin-2-yl]-2,2-difluoroacetic acid; 2-(6-bromopyridin-2-yl)ethan-1-amine; 2-[6-(2,5-dichlorothiophen-3-yl)pyridin-2-yl]-2,2-difluoroacetic acid; 2,2-difluoro-2-{6-[2-(trifluoromethyl)-1,3-thiazol-4-yl]pyridin-2-yl}acetic acid; 2,2-difluoro-2-{6-[2-fluoro-4-(trifluoromethyl)phenyl]pyridin-2-yl}acetic acid; difluoro(3,5,6-trifluoropyridin-2-yl)acetic acid; 2-fluoro-2-(3,5,6-trifluoropyridin-2-yl)acetic acid; 2-[6-(2-chloro-1,3-thiazol-4-yl)pyridin-2-yl]-2,2-difluoroacetic acid; (6-bromo-5-fluoropyridin-2-yl)(difluoro)acetic acid; difluoro(6-fluoropyridin-2-yl)acetic acid; difluoro[6-(methylideneamino)pyridin-2-yl]acetic acid; (6-chloropyridin-2-yl)(difluoro)acetic acid; (6-bromo-5-fluoropyridin-2-yl)(difluoro)acetic acid; octyl (2-bromo-6-cyanopyridin-3-yl)acetate; octyl (6-bromo-2-cyanopyridin-3-yl)acetate or an agriculturally acceptable salt.

55. The method of any one of claims 31 to 54, further comprising applying to the locus of the undesired plant growth at least one crop protection agent.
56. The method of claim 55, wherein the crop protection agent is selected from the group consisting of herbicides, fungicides, insecticides and plant growth regulators.
57. The method of claim 55, wherein the crop protection agent is herbicide.

58. The method of claim 55, wherein the crop protection agent is amino acid synthesis inhibitor herbicide.
59. The method of claim 58, wherein the amino acid synthesis inhibitor herbicide is selected from the group consisting of sulfonylurea herbicide, imidazolinone herbicide, sulfonamide herbicide and amino acid derivatives, or a combination thereof.
60. The method of claim 58, wherein the amino acid synthesis inhibitor herbicide is selected from the group consisting of imazamox, imazapic, imazethapyr, imazaquin, imazapyr and imazamethabenz, or a combination thereof.
61. The method of claim 58, wherein the amino acid synthesis inhibitor herbicide is selected from the group consisting of Chlorimuron, Primisulfuron, Thifensulfuron, Triasulfuron, Nicosulfuron, Metsulfuron, Tribenuron, Rimsulfuron and Triflusulfuron or a combination thereof.
62. The method of claim 58, wherein the amino acid synthesis inhibitor herbicide is glyphosate.
63. The method of claim 55, wherein the crop protection agent is a plant growth regulator.
64. The method of claim 63, wherein the plant growth regulator is selected from the group consisting of dicamba, 2,4-D, clopyralid and fluroxypyr.
65. The method of any one of claims 31 to 64, wherein the locus of the undesired plant growth is a field of a crop.
66. The method of claims 65, wherein the crop is selected from the group consisting of soybean, corn (*Zea*), wheat (*Triticum*), rye (*Secale*), barley (*Hordeum*), oat (*Avena*), rice (*Oryza*), millet (*Pennisetum*), sorghum (*Sorghum*), and triticale.
67. The method of any one of claims 31 to 64, wherein the application is selected from a drench application, a soil application and a foliar application.
68. A method of controlling undesired plant growth comprising applying to the locus of the undesired plant growth:

a. A first herbicide having the structure



or a salt thereof, wherein:

A is cyclopentadiene, benzene and indene scaffold comprising from 1 to 4 heteroatoms; wherein each of the heteroatoms is independently selected from the group consisting of N, S, Se, and O; and wherein one or more of the carbon atoms of the ring are optionally chemically attached to at least one of the groups consisting of: $-\text{SO}_2\text{CF}_3$, $-\text{O}-\text{SO}_2\text{CF}_3$, $-\text{NR}_3^+$, $-\text{SO}_2\text{R}$, $-\text{CX}_3$, $-\text{CX}_2\text{R}$, $-\text{COX}$, $-\text{CHO}$, $-\text{COR}$, $-\text{CO}_2\text{R}$, $-\text{CONH}_2$, $-\text{CONHR}$, $-\text{CONR}_2$, $-\text{F}$, $-\text{N}=\text{O}$, $-\text{N}\equiv\text{N}^+$, $-\text{N}=\text{NR}$, $-\text{CR}=\text{NR}$, $-\text{N}=\text{CR}_2$, $-\text{Cl}$, $-\text{Br}$, and $-\text{I}$; and wherein X is selected from F, Cl, Br and I;

n is 0 to 5;

T is unsubstituted or substituted methylene group with one or two halides, $-\text{SO}_2\text{CF}_3$, $-\text{O}-\text{SO}_2\text{CF}_3$, $-\text{NR}_3^+$, $-\text{SO}_2\text{R}$, $-\text{CX}_3$, $-\text{CX}_2\text{R}$, $-\text{COX}$, $-\text{CHO}$, $-\text{COR}$, $-\text{CO}_2\text{R}$, $-\text{CONH}_2$, $-\text{CONHR}$, $-\text{CONR}_2$, $-\text{F}$, $-\text{N}=\text{O}$, $-\text{N}\equiv\text{N}^+$, $-\text{N}=\text{NR}$, $-\text{CR}=\text{NR}$, $-\text{N}=\text{CR}_2$, and wherein X is selected from F, Cl, Br and I; and,

Z is $-\text{COOH}$, COO^- , $-\text{OH}$, $-\text{O}-\text{R}$, $-\text{COOR}$ with saturated or non-saturated alcohol residues with straight, branched, cyclic, aromatic or heteroaromatic chain; $-\text{O}-(\text{CH}_2\text{CH}_2\text{O})_n\text{R}$ ($n\geq 1$); $-\text{O}-(\text{CHMeCH}_2\text{O})_n\text{R}$ ($n\geq 1$); substituted or unsubstituted phosphate group, sulfonyl group, carbamoyl group, primary amine, secondary amine, tertiary amine, carboxamide, $-\text{NR}-\text{O}-\text{R}$, $-\text{O}-\text{NR}_2$, hydrazine, $-\text{NH}-\text{COR}$, and methanimidamide moiety or a salt thereof;

wherein R is selected from H, substituted or non-substituted alkyl, and substituted or non-substituted aryl group.

- b. A second herbicide, to effectively control the undesired plant growth.
69. The method of claim 68, wherein the second herbicide is amino acid synthesis inhibitor herbicide.
70. The method of claim 68, wherein the second herbicide is selected from the group consisting of sulfonylurea herbicide, imidazolinone herbicide, sulfonamide herbicide and amino acid derivative.
71. The method of claim 68, wherein the second herbicide is selected from the group consisting of imazamox, imazapic, imazethapyr, imazaquin, imazapyr, imazamethabenz, Chlorimuron, Primisulfuron, Thifensulfuron, Triasulfuron, Nicosulfuron, Metsulfuron, Tribenuron, Rimsulfuron, Triflusulfuron, Glyphosate, atrazine, terbuthylazine, (S)-metolachlor, metolachlor, terbutryn, simazine, dimethenamid, (S)-dimethenamid, flufenacet, acetochlor, alachlor, isoxaflutole, isoxachlortole, mesotrione, sulcotrione, metosulam, flumetsulam, pendimethalin, bromoxynil, bentazone, carfentrazone-ethyl, clomazone, nicosulfuron, rimsulfuron, halosulfuron-methyl, metribuzin, flumiclorac-pentyl, prosulfuron, primisulfuron-methyl, dicamba, fluthiacet-methyl, pyridate, 2,4-D, clopyralide, diflufenzopyr, fluroxypyr, MCPA, MCPB, mecoprop (MCP), metobenzuron, thifensulfuron-methyl, aclonifen, EPTC, glyphosate, glufosinate, sulfosate, cyanazine, propaquizafop, metamitron, pyramin, phenmedipham, desmedipham, ethofumesate, triasulfuron, chloridazon, lenacil, triallate, fluazifop, sethoxydim, quizalofop, clopyralide, clethodim, oxasulfuron, acifluorfen, benazolin-ethyl, sulfentrazone, chlorimuron-ethyl, cloransulam-methyl, fomesafen, imazamox, imazaquin, imazethapyr, imazapyr, lactofen, fenoxaprop(P-ethyl), thidiazuron, tribufos, trifluralin, dimethachlor, napropamide, quinmerac, metazachlor, carbetamide, dimefuron, propyzamide, ethametsulfuron-methyl, tebutam, fluometuron, prometryn, norflurazon, pyriithiobac-sodium, MSMA, DSMA, diuron, flurochloridone, dithiopyr, thiazopyr, oxyfluorfen, ethalfluralin, clodinafop, amidosulfuron, diclofop-methyl, diflufenican, ethoxysulfuron, fentrazamide, flazasulfuron, florasulam, fluazolate, flucarbazone, flupyrsulfuron-methyl sodium,

flurtamone, iodosulfuron, isoproturon, chlortoluron, chlorsulfuron, metsulfuron-methyl, sulfosulfuron, tribenuron-methyl, 2,4-DB, 2,4-DP, bifenox, flamprop-M, imazamethabenz-methyl, ioxynil, tralkoxydim, fluoroglycofen-ethyl, methabenzthiazuron, isoxaben, prosulfocarb, difenzoquat-metilsulfate, pretilachlor, cinosulfuron, fenclorim, bensulfuron-methyl, imazosulfuron, pyrazosulfuron-ethyl, azimsulfuron, esprocarb, mefenacet, molinate, propanil, pyrazolate, cyhalofop-butyl, bispyribac-sodium, pyriminobac-methyl, cafenstrole, oxadiargyl, oxadiazon, bromobutide, MY-100, dymron, NB 061, MK243, HW-52, AC 014, ametryn, hexazinone, asulam, azafenidin, tebuthiuron, and ethametsulfuron-methyl.

72. The method of any one of claims 68 to 71 further comprising applying a third herbicide or a plant growth regulator.
73. A method of selectively controlling undesired vegetation, comprising applying to a locus of the undesired vegetation and agricultural composition of any one of claims 1 to 29, wherein the locus of the undesired vegetation is a field of a crop.
74. The method of claim 73, wherein the crop is cereal.
75. The method of claim 73, wherein the crop is selected from the group consisting of soybean, corn (*Zea*), wheat (*Triticum*), rye (*Secale*), barley (*Hordeum*), oat (*Avena*), rice (*Oryza*), millet (*Pennisetum*), sorghum (*Sorghum*), and triticale.

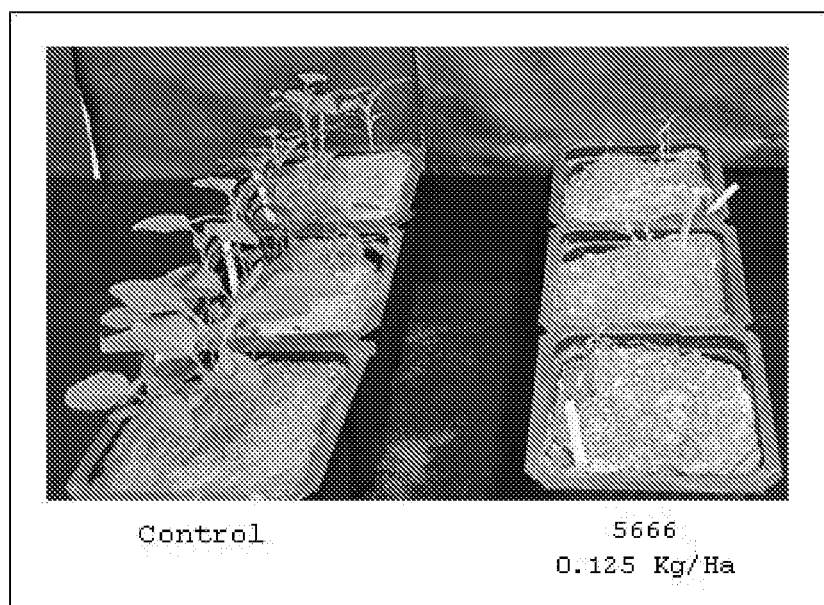


Figure 1

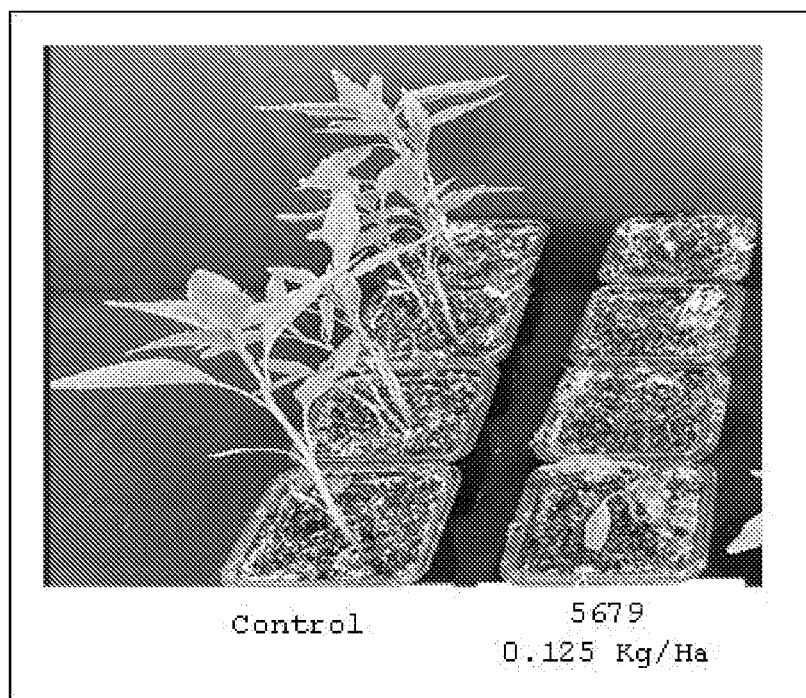
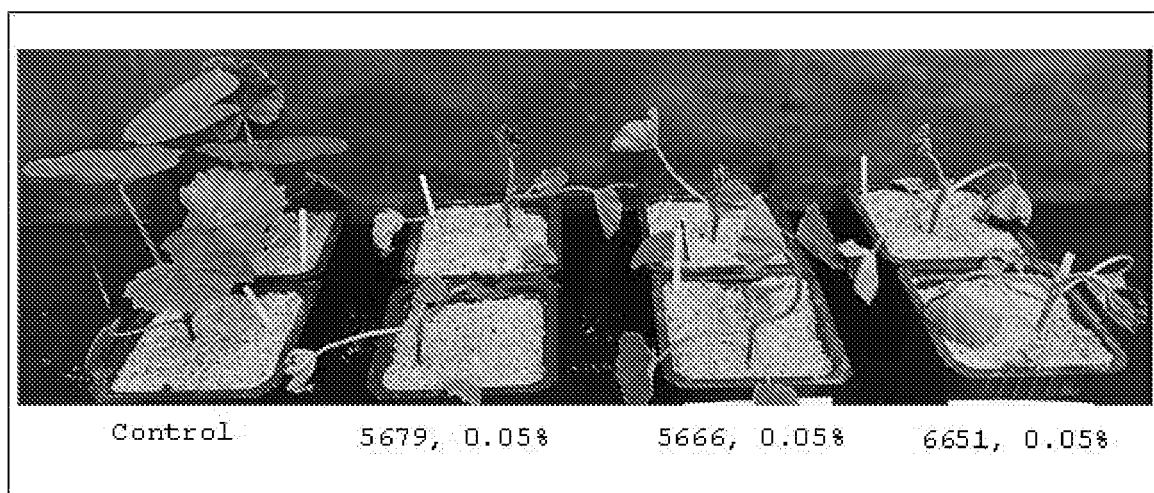


Figure 2

3/8

**Figure 3**

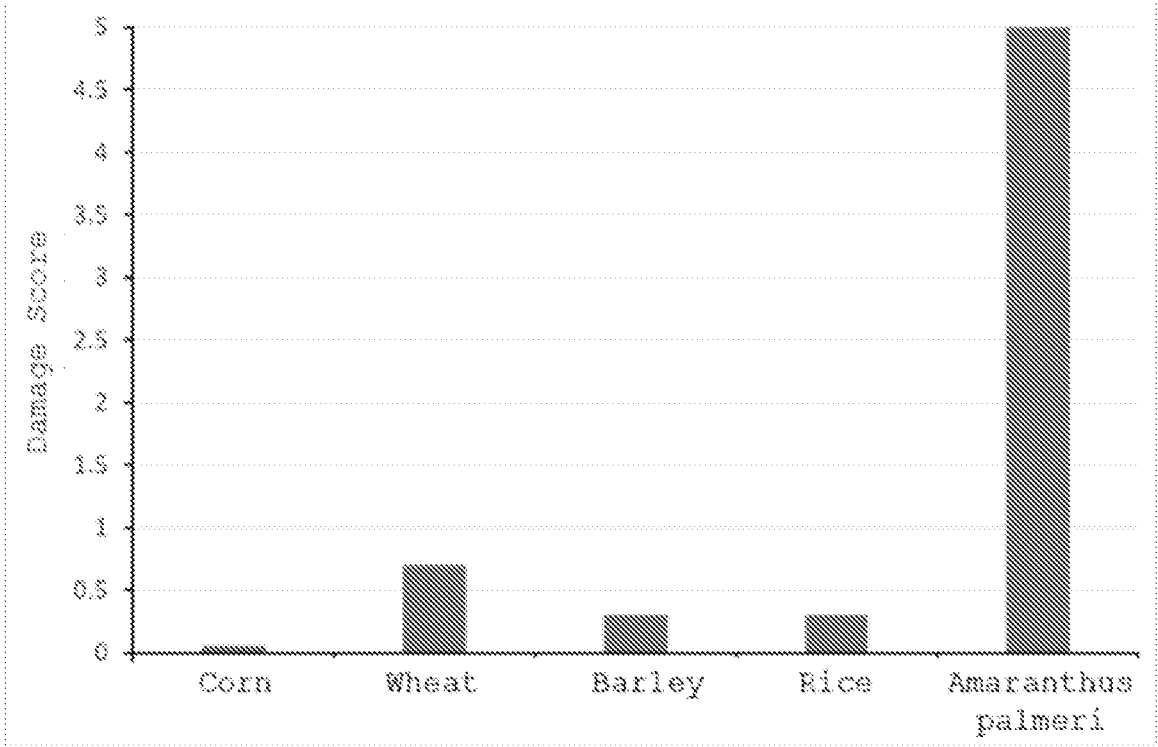


Figure 4

5/8

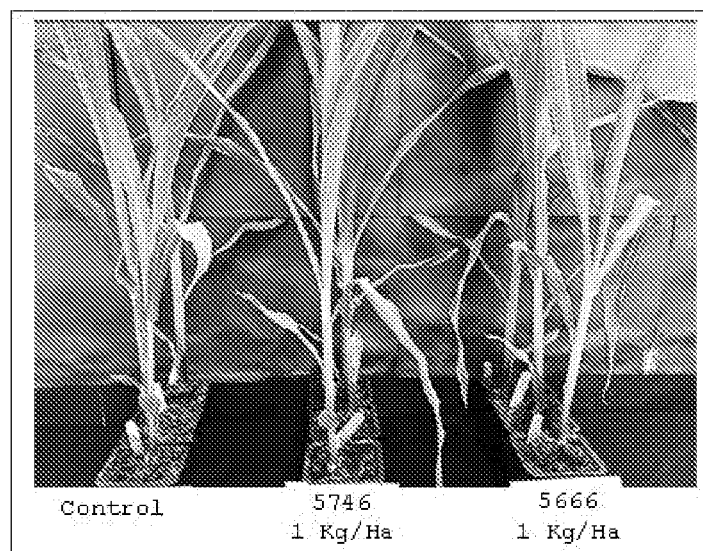


Figure 5

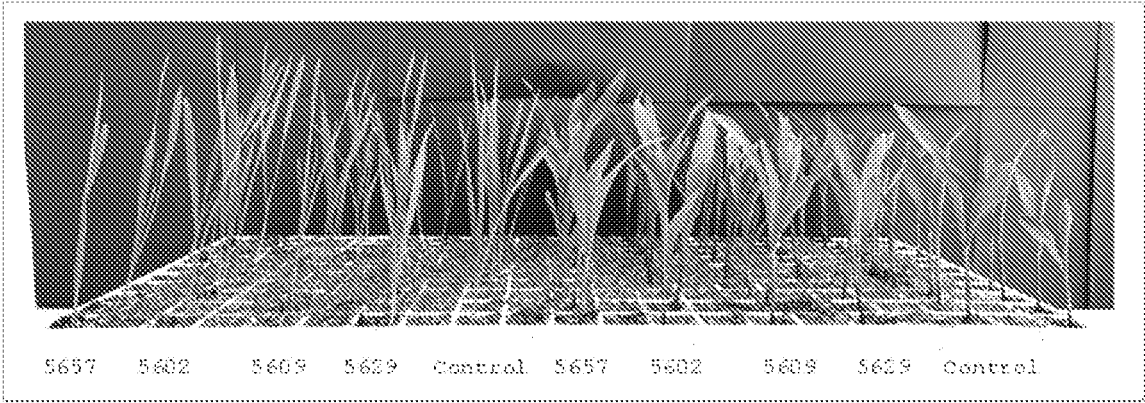
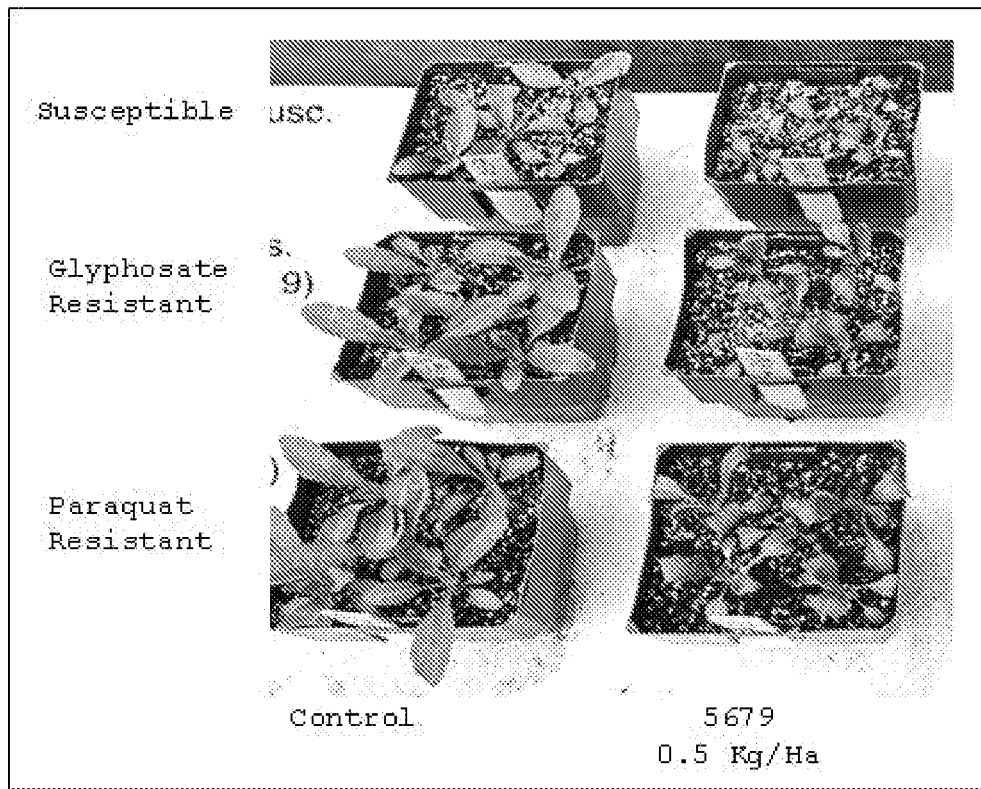
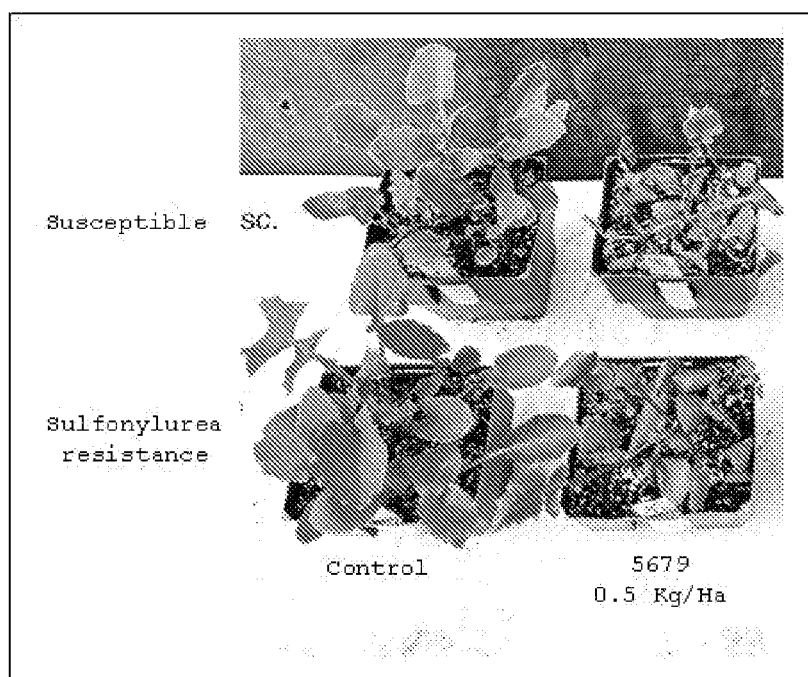


Figure 6

7/8

**Figure 7**

**Figure 8**

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IL2023/050017

A. CLASSIFICATION OF SUBJECT MATTER

A01N 43/00(2023.01)i; **A01N 43/40**(2023.01)i; **A01N 43/76**(2023.01)i; **A01N 43/78**(2023.01)i; **A01N 43/82**(2023.01)i; **A01P 13/00**(2023.01)i; **C07D 213/16**(2023.01)i; **C07D 213/44**(2023.01)i; **C07D 213/54**(2023.01)i; **C07D 213/61**(2023.01)i; **C07D 277/24**(2023.01)i; **C07D 277/30**(2023.01)i; **C07D 263/32**(2023.01)i; **C07D 285/12**(2023.01)i; **C07D 285/08**(2023.01)i; **C07D 213/40**(2023.01)i; **C07D 213/51**(2023.01)i; **C07D 277/40**(2023.01)i; **C07D 333/28**(2023.01)i; **A01N 37/44**(2023.01)i; **A01N 37/46**(2023.01)i; **A01P 13/02**(2023.01)i; **A01P 21/00**(2023.01)i

CPC:A01N 43/00; A01N 43/40; A01N 43/76; A01N 43/78; A01N 43/82; A01P 13/00; C07D 213/16; C07D 213/44; C07D 213/54; C07D 213/61; C07D 277/24; C07D 277/30; C07D 263/32; C07D 285/12; C07D 285/08; C07D 213/40; C07D 213/51; C07D 277/40; C07D 333/28; A01N 37/44; A01N 37/46; A01P 13/02; A01P 21/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A01N 43/00; A01N 43/40; A01N 43/76; A01N 43/78; A01N 43/82; A01P 13/00; C07D 213/16; C07D 213/44; C07D 213/54; C07D 213/61; C07D 277/24; C07D 277/30; C07D 263/32; C07D 285/12; C07D 285/08; C07D 213/40; C07D 213/51; C07D 277/40; C07D 333/28; A01N 37/44; A01N 37/46; A01P 13/02; A01P 21/00

CPC:A01N 43/00; A01N 43/40; A01N 43/76; A01N 43/78; A01N 43/82; A01P 13/00; C07D 213/16; C07D 213/44; C07D 213/54; C07D 213/61; C07D 277/24; C07D 277/30; C07D 263/32; C07D 285/12; C07D 285/08; C07D 213/40; C07D 213/51; C07D 277/40; C07D 333/28; A01N 37/44; A01N 37/46; A01P 13/02; A01P 21/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Databases consulted: CAPLUS, Orbit Search terms used: Structures, agriculture, plant, herbicide

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 9222203 A1 (DU PONT [US]) 23 December 1992 (1992-12-23) p. 1 lines 7-18, p. 2 lines 14-30, claims 1, 7, 8	1-25,27-29
X	N-Thiophenylethyl-2, 2-dichloro-1-cyclopropanecarboxamides: modification of the amide part of carpropamid and examination of fungicidal activity. Journal of Pesticide Science, 2009, 34.3: 161-172 KAGABU, Shinzo, et al. (2009/06/22) p. 163, Fig. 1, abstract, Table 1 comp. 17-29, p. 170 right column para 5 and the last phrase, p. 172 right column the last para	1-25,27-29

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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“&” document member of the same patent family

Date of the actual completion of the international search

19 March 2023

Date of mailing of the international search report

21 March 2023

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Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IL2023/050017

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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A	US 4195984 A (ABBOTT LAB) 01 April 1980 (1980-04-01) Claim 10	1,2,7-11,23
A	Copper-mediated reaction of 2-halopyridines with ethyl bromodifluoroacetate. Tetrahedron letters, 2002, 43.50: 9271-9273 ASHWOOD, Michael S., (2002/12/31) scheme 1	1-25,27-29
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P,X	Coupling of Heteroaryl Halides with Chlorodifluoroacetamides and Chlorodifluoroacetate by Nickel Catalysis. Chemistry—A European Journal, 2022, 28.26: e202200642 ZHANG, Dawei, et al (2022/12/31) claims 21-31, 33, 35-42, 47-68	1-75

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International application No.

PCT/IL2023/050017

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