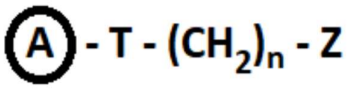
Claims:

1. An herbicidal composition comprising a compound or a salt thereof 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: $-CX_3$, $-CX_2R$, -F, -Cl, -Br, and -I, and wherein X is selected from F, Cl, Br and I;

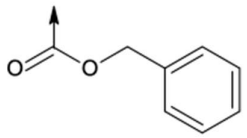
n = 0 to 5;

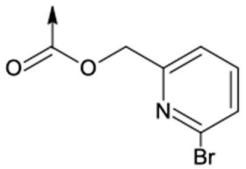
T is unsubstituted or substituted methylene group with one or two halides, $-CX_3$, $-CX_2R$ -F, -N=O, $-N\equiv N^+$, -N=NR, -CR=NR, $-N=CR_2$, and wherein X is selected from -F, -Cl, -Br and -I; and,

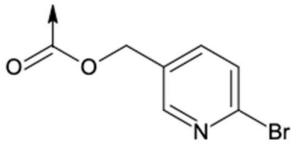
Z is -COOH, -COO-, -O-R, -COOR with saturated or non-saturated alcohol residues with straight, branched, cyclic, aromatic or heteroaromatic chain; $-O-(CH_2CH_2O)_nR$ ($n\geq 1$); $-O-(CHMeCH_2O)_nR$ ($n\geq 1$)); primary amine, secondary amine, tertiary amine, or a salt thereof;

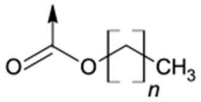
wherein R is selected from H, substituted or non-substituted alkyl, and substituted or non-substituted aryl group; and wherein Z is substituted by -O-R, R is a substituted or non-substituted aryl group; wherein the composition comprises at least one agriculturally acceptable carrier.

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

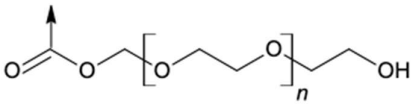




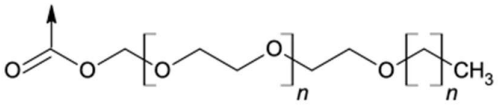




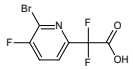
n = 0 - 7



n = 0 - 7

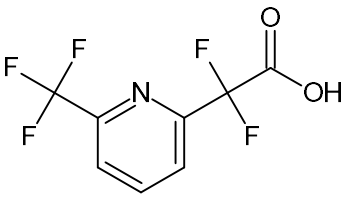


n = 0 - 7

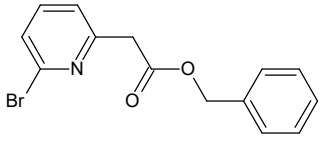


3. The composition of claim 1 or 2, comprising the compound having the structure

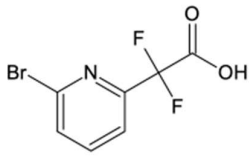
4. The composition of claim 1 or 2, comprising the compound having the structure



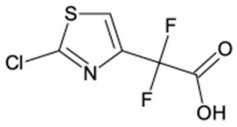
5. The composition of claim 1 or 2, comprising the compound having the structure



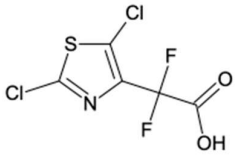
6. The composition of claim 1 or 2, comprising the compound having the structure



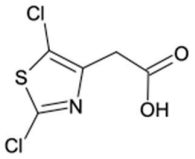

7. The composition of claim 1 or 2, comprising the compound having the structure



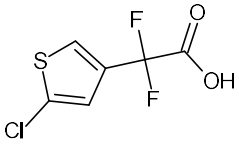

8. The composition of claim 1 or 2, comprising the compound having the structure



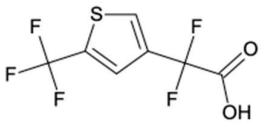

9. The composition of claim 1 or 2, comprising the compound having the structure



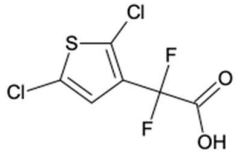

10. The composition of claim 1 or 2, comprising the compound having the structure



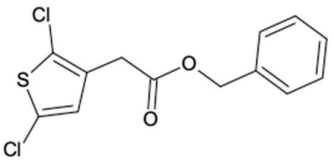

11. The composition of claim 1 or 2, comprising the compound having the structure




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




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

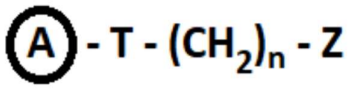



14. The composition of any one of claims 1 to 13, further comprising at least one crop protection agent.
15. The composition of claim 14, wherein the at least one crop protection agent is selected from the group consisting of fungicide, insecticide, herbicide, and plant growth regulator.
16. The herbicidal composition of claim 15, wherein the crop protection agent is a herbicide.
17. The herbicidal composition of claim 15, wherein the crop protection agent is a plant growth regulator.
18. The herbicidal composition of claim 15, wherein the at least one crop protection agent is selected from the group consisting of 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 (MCPP), 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, pyrithiobac-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, ethametsulfuron-methyl, or a combination thereof.

19. 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 18.

20. 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: $-CX_3$, $-CX_2R$, -F, -Cl, -Br, and -I; and wherein X is selected from F, Cl, Br and I;

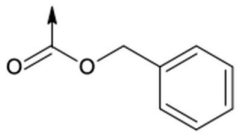
n is 0 to 5;

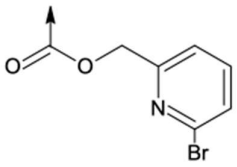
T is unsubstituted or substituted methylene group with one or two halides, $-CX_3$, $CX_2R$, -F, and wherein X is selected from F, Cl, Br and I; and,

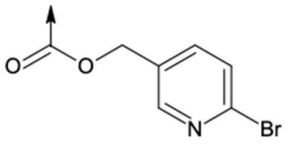
Z is -COOH, -COO-, -O-R, -COOR with saturated or non-saturated alcohol residues with straight, branched, cyclic, aromatic or heteroaromatic chain; $-O-(CH_2CH_2O)_nR$ ($n \geq 1$); $-O-(CHMeCH_2O)_nR$ ($n \geq 1$)); primary amine, secondary amine, tertiary amine, or a salt thereof;

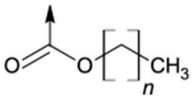
wherein R is selected from H, substituted or non-substituted alkyl, and substituted or non-substituted aryl group and wherein Z is substituted by -O-R, R is a substituted or non-substituted aryl group.

21. The method of claim 20, wherein Z is selected from

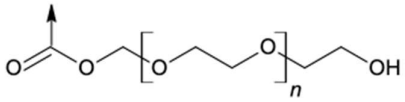




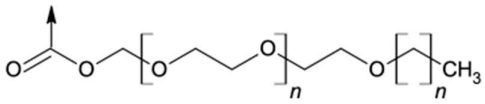




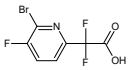
n = 0 - 7



n = 0 - 7

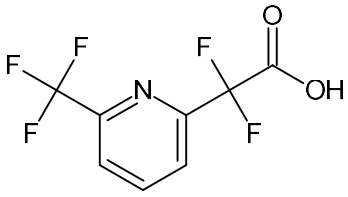


n = 0 - 7

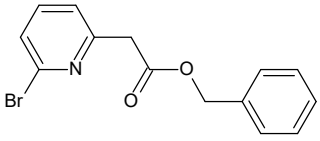


22. The method of claim 20 or 21, comprising applying to the locus of the undesired plant growth a herbicidally effective amount of a compound, having the structure

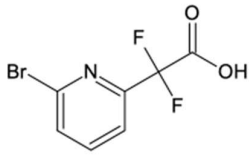
23. The method of claim 20 or 21, comprising applying to the locus of the undesired plant growth a herbicidally effective amount of a compound, having the structure



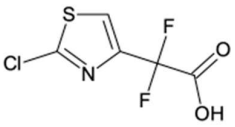
24. The method of claim 20 or 21, comprising applying to the locus of the undesired plant growth a herbicidally effective amount of a compound, having the structure



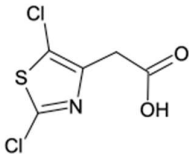
25. The method of claim 20 or 21, comprising applying to the locus of the undesired plant growth a herbicidally effective amount of a compound, having the structure



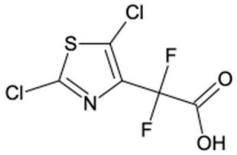

26. The method of claim 20 or 21, comprising applying to the locus of the undesired plant growth a herbicidally effective amount of a compound, having the structure



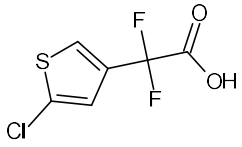

27. The method of claim 20 or 21, comprising applying to the locus of the undesired plant growth a herbicidally effective amount of a compound, having the structure



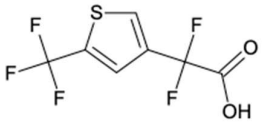

28. The method of claim 20 or 21, comprising applying to the locus of the undesired plant growth a herbicidally effective amount of a compound, having the structure



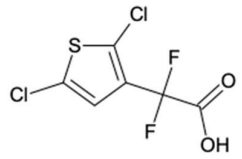

29. The method of claim 22 or 23, comprising applying to the locus of the undesired plant growth a herbicidally effective amount of a compound, having the structure



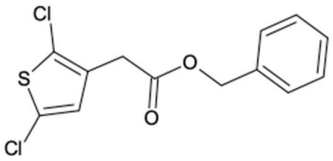

30. The method of claim 20 or 21, comprising applying to the locus of the undesired plant growth a herbicidally effective amount of a compound, having the structure



31. The method of claim 20 or 21, comprising applying to the locus of the undesired plant growth a herbicidally effective amount of a compound, having the structure




32. The method of claim 20 or 21, comprising applying to the locus of the undesired plant growth a herbicidally effective amount of a compound, having the structure

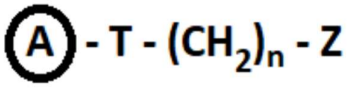



33. The method of any one of claims 20 to 32, further comprising applying to the locus of the undesired plant growth at least one crop protection agent.
34. The method of claim 33, wherein the crop protection agent is selected from the group consisting of herbicides, fungicides, insecticides and plant growth regulators.
35. The method of claim 34, wherein the crop protection agent is herbicide.
36. The method of claim 35, wherein the crop protection agent is amino acid synthesis inhibitor herbicide.
37. The method of claim 36, 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.
38. The method of claim 36, 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.
39. The method of claim 36, 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.
40. The method of claim 36, wherein the amino acid synthesis inhibitor herbicide is glyphosate.
41. The method of claim 33, wherein the crop protection agent is a plant growth regulator.

42. The method of claim 41, wherein the plant growth regulator is selected from the group consisting of dicamba, 2,4-D, clopyralid and fluroxypyr.

43. 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: $-CX_3$, $-CX_2R$, -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 $-CX_3$, $CX_2R$, -F, and wherein X is selected from F, Cl, Br and I; and,

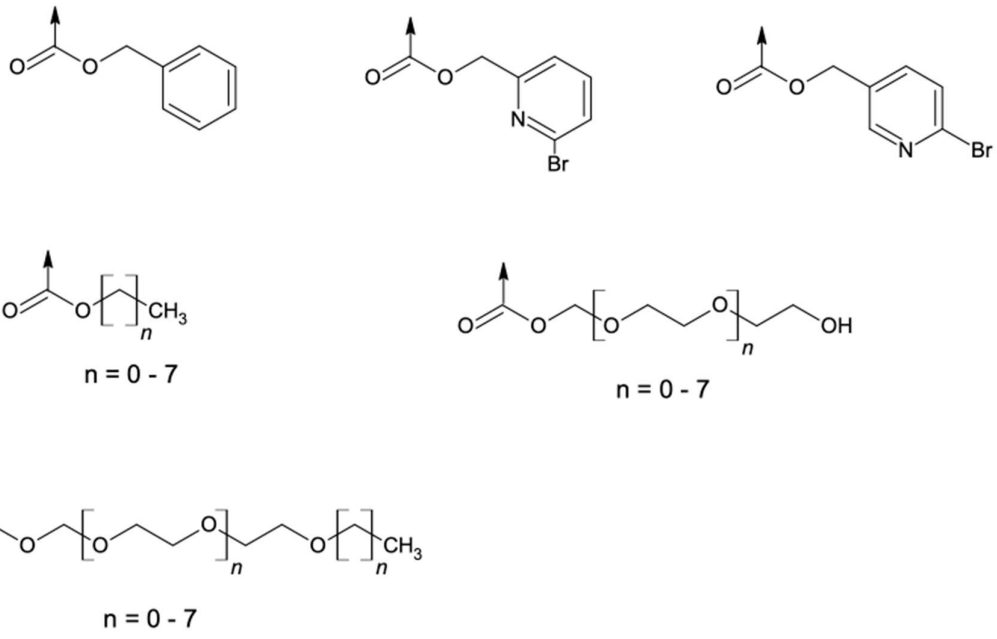
Z is -COOH, -COO-, -O-R, -COOR with saturated or non-saturated alcohol residues with straight, branched, cyclic, aromatic or heteroaromatic chain; $-O-(CH_2CH_2O)_nR$ ($n\geq1$); $-O-(CHMeCH_2O)_nR$ ($n\geq1$)); primary amine, secondary amine, tertiary amine, or a salt thereof;

wherein R is selected from H, substituted or non-substituted alkyl, and substituted or non-substituted aryl group, and wherein Z is substituted by -O-R, R is a substituted or non-substituted aryl group: and,

b. A second herbicide,

to thereby effectively control the undesired plant growth.

44. The method of claim 43, wherein Z is selected from



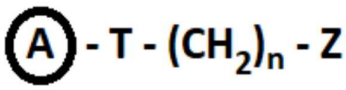

45. The method of claim 43 or 44, wherein the second herbicide is amino acid synthesis inhibitor herbicide.
46. The method of claim 45, wherein the second herbicide is selected from the group consisting of sulfonylurea herbicide, imidazolinone herbicide, sulfonamide herbicide and amino acid derivative.
47. The method of claim 45, 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 and Glyphosate.
48. The method of claim 45, wherein the second herbicide is selected from the group consisting of 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 (MCPP), 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, pyrithiobac-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.

49. The method of any one of claims 43 to 48 further comprising applying a third herbicide or a plant growth regulator.

50. A composition for controlling undesired plant growth comprising a mixture of:

a. a compound or a salt thereof having the structure



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: $-CX_3$, $-CX_2R$, -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, -$CX_3$, $CX_2R$, -F, and wherein X is selected from F, Cl, Br and I; and,

Z is -COOH, -COO-, -O-R, -COOR with saturated or non-saturated alcohol residues with straight, branched, cyclic, aromatic or heteroaromatic chain; -O-$(CH_2CH_2O)_nR$ ($n \geq 1$); -O-$(CHMeCH_2O)_nR$ ($n \geq 1$)); primary amine, secondary amine, tertiary amine, or a salt thereof;

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

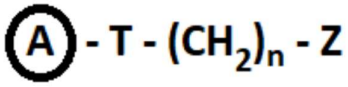
b. at least one herbicide selected from the group consisting of atrazine, terbuthylazine, (S)-metolachlor, metolachlor, terbutryn, simazine, dimethenamid, (S)-dimethenamid, flufenacet, acetochlor, alachlor, isoxaflutole, isoxachlortole, mesotrione, sulcotrione, metosulam, flumetsulam, pendimethalin, 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 (MCPP), 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, pyrithiobac-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, ethametsulfuron-methyl, or a combination thereof; and,

c. at least one agriculturally acceptable carrier.

51. A composition for controlling undesired plant growth comprising a mixture of:

a. 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: $-CX_3$, $-CX_2R$, -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 halide atoms, $-CX_3$, -F, and wherein X is selected from F, Cl, Br and I; and,

Z is -COOH, -COO-, -O-R, -COOR with saturated or non-saturated alcohol residues with straight, branched, cyclic, aromatic or heteroaromatic chain; $-O-(CH_2CH_2O)_nR$ ($n\geq1$); $-O-(CHMeCH_2O)_nR$ ($n\geq1$)); primary amine, secondary amine, tertiary amine, or a salt thereof;

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

b. at least one plant growth regulator; and,

c. at least one agriculturally acceptable carrier.

52. A method of controlling amino acid content in a plant or a plant part thereof, comprising applying an effective amount of the herbicidal composition of any one of claims 1 to 18.

53. A method of controlling plant growth comprising applying to the plant or a plant part thereof, an effective amount of the herbicidal composition of any one of claims 1 to 18.