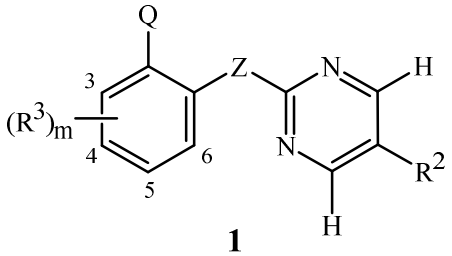
CLAIMS

1. A compound selected from Formula **1**, *N*-oxides and salts thereof,



**1**

Q is a 5- or 6-membered aromatic heterocylic ring, bound to the remainder of Formula **1** through a carbon atom, and optionally substituted with 1 to 4 $R^1$;

Z is O or S;

each $R^1$ is independently halogen, cyano, nitro, $SF_5$, CHO, $C(=O)NH_2$, $C(=S)NH_2$, $SO_2NH_2$, $C_1$-$C_4$ alkyl, $C_2$-$C_4$ alkenyl, $C_2$-$C_4$ alkynyl, $C_1$-$C_4$ haloalkyl, $C_2$-$C_4$ haloalkenyl, $C_2$-$C_4$ haloalkynyl, $C_3$-$C_6$ cycloalkyl, $C_3$-$C_6$ halocycloalkyl, $C_4$–$C_8$ alkylcycloalkyl, $C_4$–$C_8$ cycloalkylalkyl, $C_2$–$C_6$ alkylcarbonyl, $C_2$–$C_6$ haloalkylcarbonyl, $C_2$–$C_6$ alkoxycarbonyl, $C_3$-$C_7$ cycloalkylcarbonyl, $C_2$–$C_8$ alkylaminocarbonyl, $C_3$–$C_{10}$ dialkylaminocarbonyl, $C_1$-$C_4$ alkoxy, $C_3$-$C_4$ alkenyloxy, $C_3$-$C_4$ alkynyloxy, $C_1$-$C_4$ haloalkoxy, $C_3$-$C_4$ haloalkenyloxy, $C_3$-$C_4$ haloalkynyloxy, $C_3$–$C_6$ cycloalkoxy, $C_3$–$C_6$ halocycloalkoxy, $C_4$–$C_8$ cycloalkylalkoxy, $C_2$-$C_6$ alkoxyalkyl, $C_2$-$C_6$ haloalkoxyalkyl, $C_2$-$C_6$ alkoxyhaloalkyl, $C_2$–$C_6$ alkoxyalkoxy, $C_2$-$C_4$ alkylcarbonyloxy, $C_2$-$C_6$ cyanoalkyl, $C_2$-$C_6$ cyanoalkoxy, $C_1$-$C_4$ hydroxyalkyl, $C_2$-$C_4$ alkylthioalkyl, $SO_nR^{1A}$, $Si(CH_3)_3$ or $B(-OC(R^{1B})_2C(R^{1B})_2O-)$; or a phenyl ring optionally substituted with up to 5 substituents independently selected from $R^{1C}$; or a 5- or 6-membered heteroaromatic ring containing ring members selected from carbon atoms and up to 4 heteroatoms independently selected from up to 2 O, up to 2 S and up to 4 N atoms, each ring optionally substituted with up to 3 substituents independently selected from $R^{1C}$ on carbon atom ring members and $R^{1D}$ on nitrogen atom ring members;

$R^2$ is halogen, cyano, nitro, $C_1$-$C_4$ alkoxy, $C_1$-$C_4$ alkyl, $C_2$-$C_6$ alkenyl, $C_2$-$C_6$ alkynyl, $SO_nR^{2A}$, $C_1$-$C_4$ haloalkyl or $C_3$-$C_6$ cycloalkyl;

each $R^3$ is independently halogen, cyano, hydroxy, nitro, amino, CHO, $C(=O)NH_2$, $C(=S)NH_2$, $SO_2NH_2$, $C_1$-$C_4$ alkyl, $C_2$-$C_4$ alkenyl, $C_2$-$C_4$ alkynyl, $C_1$-$C_4$ haloalkyl, $C_2$-$C_4$ haloalkenyl, $C_2$-$C_4$ haloalkynyl, $C_3$-$C_6$ cycloalkyl, $C_3$-$C_6$ halocycloalkyl, $C_4$–$C_8$ alkylcycloalkyl, $C_4$–$C_8$ cycloalkylalkyl, $C_2$–$C_6$ alkylcarbonyl, $C_2$–$C_6$ haloalkylcarbonyl, $C_2$–$C_6$ alkoxycarbonyl, $C_3$-$C_7$

cycloalkylcarbonyl, $C_1$-$C_4$ alkoxy, $C_3$-$C_4$ alkenyloxy, $C_3$-$C_4$ alkynyloxy, $C_1$-$C_4$ haloalkoxy, $C_3$-$C_4$ haloalkenyloxy, $C_3$-$C_4$ haloalkynyloxy, $C_3$–$C_6$ cycloalkoxy, $C_3$–$C_6$ halocycloalkoxy, $C_4$–$C_8$ cycloalkylalkoxy, $C_2$-$C_6$ alkoxyalkyl, $C_2$-$C_6$ haloalkoxyalkyl, $C_2$-$C_6$ alkoxyhaloalkyl, $C_2$–$C_6$ alkoxyalkoxy, $C_2$-$C_4$ alkylcarbonyloxy, $C_2$-$C_6$ cyanoalkyl, $C_2$-$C_6$ cyanoalkoxy, $C_2$-$C_4$ alkylthioalkyl, $Si(CH_3)_3$, $C{\equiv}CSi(CH_3)_3$, $C(=O)N(R^{3A})(R^{3B})$, $C(=NOR^{3C})H$, $C(=NR^{3D})H$, $SO_nR^{3E}$; or a phenyl ring optionally substituted with up to 5 substituents independently selected from $R^{3F}$; or a 5- or 6-membered heteroaromatic ring containing ring members selected from carbon atoms and up to 4 heteroatoms independently selected from up to 2 O, up to 2 S and up to 4 N atoms, each ring optionally substituted with up to 3 substituents independently selected from $R^{3F}$ on carbon atom ring members and $R^{3G}$ on nitrogen atom ring members; or pyrimidinyloxy;

m is 0, 1, 2 or 3;

each n is independently 0, 1 or 2;

each $R^{1A}$, $R^{2A}$ and $R^{3E}$ is independently $C_1$-$C_4$ alkyl, $C_1$-$C_4$ haloalkyl, $C_1$-$C_4$ alkylamino or $C_2$-$C_6$ dialkylamino;

each $R^{1B}$ is independently H or $C_1$-$C_4$ alkyl;

each $R^{1C}$ is independently hydroxy, halogen, cyano, nitro, $C_1$–$C_6$ alkyl, $C_1$–$C_6$ haloalkyl, $C_1$–$C_6$ alkoxy or $C_1$–$C_6$ haloalkoxy;

each $R^{1D}$ is independently cyano, $C_1$–$C_6$ alkyl, $C_1$–$C_6$ haloalkyl, $C_1$–$C_6$ alkoxy or $C_2$–$C_6$ alkylcarbonyl;

each $R^{3A}$ is independently $C_1$-$C_4$ alkyl or $C_1$-$C_4$ haloalkyl;

each $R^{3B}$ is independently H, $C_1$-$C_4$ alkyl or $C_1$-$C_4$ haloalkyl;

each $R^{3C}$ is independently H or $C_1$-$C_4$ alkyl;

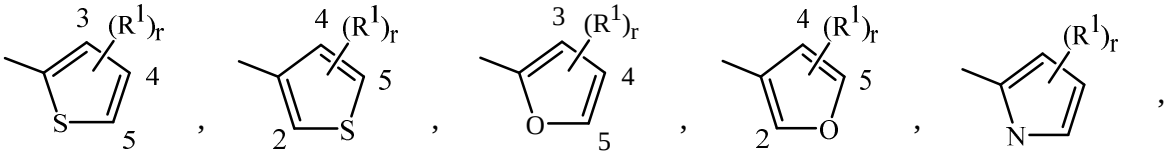
each $R^{3D}$ is independently H, amino, $C_1$-$C_4$ alkyl or $C_1$-$C_4$ alkylamino;

each $R^{3F}$ is independently hydroxy, halogen, cyano, nitro, $C_1$–$C_6$ alkyl, $C_1$–$C_6$ haloalkyl, $C_1$–$C_6$ alkoxy or $C_1$–$C_6$ haloalkoxy; and

each $R^{3G}$ is independently cyano, $C_1$–$C_6$ alkyl, $C_1$–$C_6$ haloalkyl, $C_1$–$C_6$ alkoxy or $C_2$–$C_6$ alkylcarbonyl;

2. A compound of Claim 1 wherein

Q is selected from

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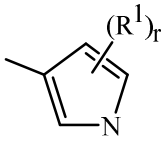
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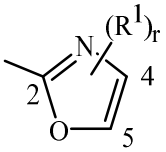
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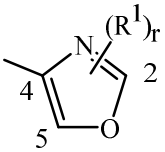
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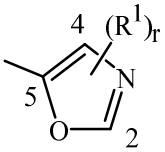
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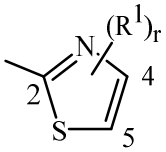
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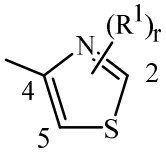
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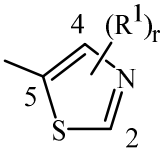
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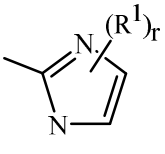
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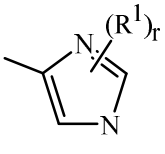
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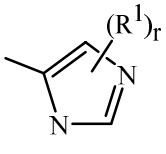
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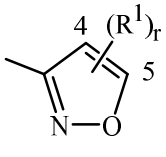
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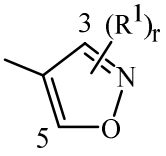
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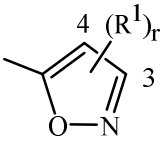
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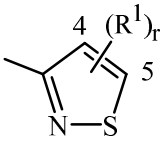
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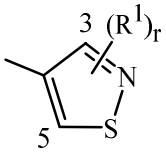
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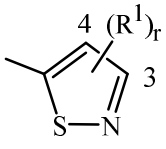
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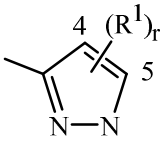
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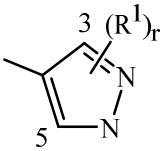
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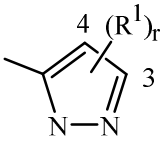
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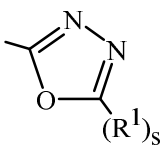
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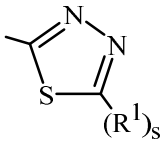
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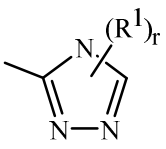
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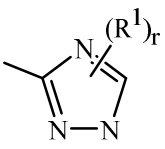
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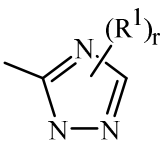
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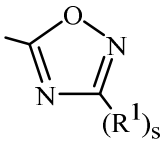
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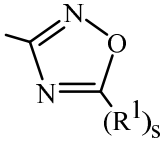
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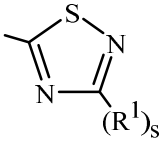
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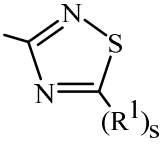
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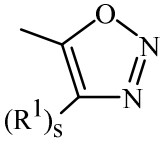
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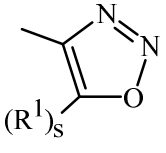
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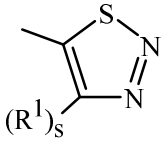
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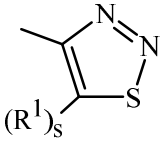
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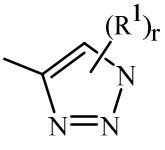
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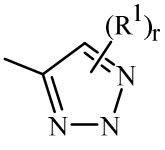
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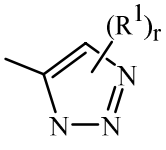
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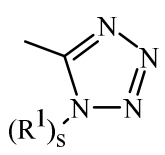
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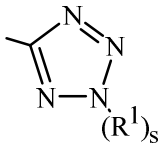
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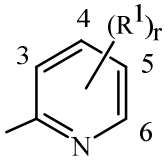
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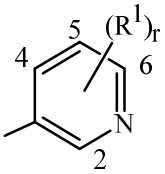
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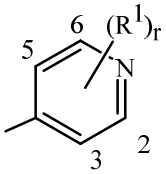
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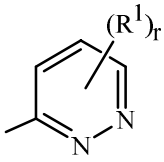
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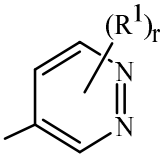
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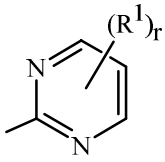
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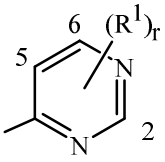
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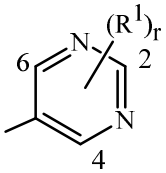
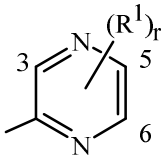

Q-50 ,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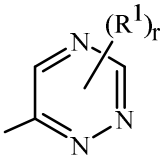
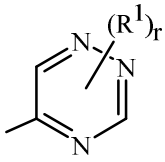
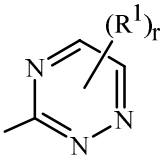
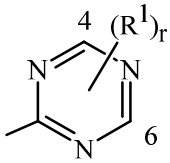

Q-52 ,

Q-53 ,

Q-54 and

Q-55 ;

wherein r is 0, 1, 2 or 3; and s is 0 or 1;

each $R^1$ is independently halogen, cyano, $SF_5$, CHO, $C_1$-$C_4$ alkyl, $C_2$-$C_4$ alkenyl, $C_2$-$C_4$ alkynyl, $C_1$-$C_4$ haloalkyl, $C_2$-$C_4$ haloalkenyl, $C_2$-$C_4$ haloalkynyl, $C_2$–$C_6$ alkylcarbonyl, $C_2$–$C_6$ haloalkylcarbonyl, $C_2$–$C_6$ alkoxycarbonyl, $C_1$-$C_4$ alkoxy, $C_3$-$C_4$ alkenyloxy, $C_3$-$C_4$ alkynyloxy, $C_1$-$C_4$ haloalkoxy, $C_3$-$C_4$ haloalkenyloxy, $C_3$-$C_4$ haloalkynyloxy, $C_2$-$C_6$ alkoxyalkyl, $C_2$-$C_6$ haloalkoxyalkyl, $C_2$-$C_6$ cyanoalkyl, $C_1$-$C_4$ hydroxyalkyl, $C_2$-$C_4$ alkylthioalkyl or $SO_nR^{1A}$;

$R^3$ is independently halogen, cyano, CHO, $C_1$-$C_4$ alkyl, $C_2$-$C_4$ alkenyl, $C_2$-$C_4$ alkynyl, $C_1$-$C_4$ haloalkyl, $C_2$-$C_4$ haloalkenyl, $C_2$-$C_4$ haloalkynyl, $C_3$-$C_6$ cycloalkyl, $C_3$-$C_6$ halocycloalkyl, $C_4$–$C_8$ alkylcycloalkyl, $C_2$–$C_6$ alkylcarbonyl, $C_2$–$C_6$ haloalkylcarbonyl, $C_2$–$C_6$ alkoxycarbonyl, $C_1$-$C_4$ alkoxy, $C_3$-$C_4$ alkenyloxy, $C_3$-$C_4$ alkynyloxy, $C_1$-$C_4$ haloalkoxy, $C_3$-$C_4$ haloalkenyloxy, $C_3$-$C_4$ haloalkynyloxy, $C_3$–$C_6$ cycloalkoxy, $C_3$–$C_6$ halocycloalkoxy, $C_2$-$C_6$ alkoxyalkyl, $C_2$-$C_6$ haloalkoxyalkyl, $C_2$-$C_4$ alkylcarbonyloxy, $C_2$-$C_6$ cyanoalkyl, $C(=O)N(R^{3A})(R^{3B})$, $C(=NOR^{3C})H$, $SO_nR^{3E}$; or a phenyl ring optionally substituted with up to 5 substituents independently selected from $R^{3F}$; or a 5- or 6-membered heteroaromatic ring containing ring members selected from carbon atoms and up to 4 heteroatoms independently selected from up to 2 O, up to 2 S and up to 4 N atoms, each ring optionally substituted with up to 3 substituents independently selected from $R^{3F}$ on carbon atom ring members and $R^{3G}$ on nitrogen atom ring members;

Z is O; and

m is 0, 1 or 2.

3. A compound of Claim 2 wherein

each $R^1$ is independently halogen, cyano, CHO, $C_1$-$C_4$ alkyl, $C_2$-$C_4$ alkenyl, $C_2$-$C_4$ alkynyl, $C_1$-$C_4$ haloalkyl, $C_2$-$C_4$ haloalkenyl, $C_2$-$C_4$ haloalkynyl, $C_1$-$C_4$ alkoxy, $C_3$-$C_4$ alkenyloxy, $C_3$-$C_4$ alkynyloxy, $C_1$-$C_4$ haloalkoxy, $C_3$-$C_4$ haloalkenyloxy, $C_3$-$C_4$ haloalkynyloxy, $C_2$-$C_6$ alkoxyalkyl, $C_2$-$C_6$ haloalkoxyalkyl, $C_1$-$C_4$ hydroxyalkyl, $C_2$-$C_4$ alkylthioalkyl or $SO_nR^{1A}$;

$R^2$ is halogen, $C_1$-$C_4$ alkyl or $C_1$-$C_4$ haloalkyl;

each $R^3$ is independently halogen, cyano, CHO, $C_1$-$C_4$ alkyl, $C_2$-$C_4$ alkenyl, $C_2$-$C_4$ alkynyl, $C_1$-$C_4$ haloalkyl, $C_2$-$C_4$ haloalkenyl, $C_2$-$C_4$ haloalkynyl, $C_3$-$C_6$ cycloalkyl, $C_3$-$C_6$ halocycloalkyl, $C_2$–$C_6$ alkylcarbonyl, $C_2$–$C_6$ haloalkylcarbonyl, $C_2$–$C_6$ alkoxycarbonyl, $C_1$-$C_4$ alkoxy, $C_1$-$C_4$ haloalkoxy, $C_2$-$C_6$ alkoxyalkyl, $C_2$-$C_6$ haloalkoxyalkyl, $C_2$-$C_6$ cyanoalkyl, $SO_nR^{3E}$; or a 5- or 6-membered heteroaromatic ring containing ring members selected from carbon atoms and up to 4 heteroatoms independently selected from up to 2 O, up to 2 S and up to 4 N atoms, each ring optionally substituted with up to 3 substituents independently selected from $R^{3F}$ on carbon atom ring members and $R^{3G}$ on nitrogen atom ring members; and

m is 0 or 1.

4. A compound of Claim 3 wherein

Q is selected from Q-7 through Q-24;

each $R^1$ is independently halogen, cyano, $C_1$-$C_4$ alkyl, $C_1$-$C_4$ haloalkyl, $C_1$-$C_4$ alkoxy, $C_1$-$C_4$ haloalkoxy or $SO_nR^{1A}$;

$R^2$ is halogen or $C_1$-$C_4$ alkyl;

each $R^3$ is independently halogen, cyano, $C_1$-$C_4$ alkyl, $C_2$-$C_4$ alkenyl, $C_2$-$C_4$ alkynyl, $C_1$-$C_4$ haloalkyl, $C_2$–$C_6$ alkylcarbonyl, $C_2$–$C_6$ haloalkylcarbonyl, $C_2$–$C_6$ alkoxycarbonyl, $C_1$-$C_4$ alkoxy, $C_1$-$C_4$ haloalkoxy, $C_2$-$C_6$ alkoxyalkyl or $C_2$-$C_6$ haloalkoxyalkyl; and

each $R^{1A}$ is independently $C_1$-$C_4$ alkyl or $C_1$-$C_4$ haloalkyl.

5. A compound of Claim 4 wherein

Q is selected from Q-16 and Q-18;

each $R^1$ is independently halogen, $C_1$-$C_4$ alkyl, $C_1$-$C_4$ haloalkyl or $C_1$-$C_4$ haloalkoxy;

$R^2$ is halogen or $CH_3$; and

each $R^3$ is independently halogen, cyano, $C_1$-$C_4$ alkyl or $C_1$-$C_4$ haloalkyl.

6. A compound of Claim 3 wherein

Q is selected from Q-43, Q-44, Q-45, Q-48, Q-49 and Q-50;

each $R^1$ is independently halogen, cyano, $C_1$-$C_4$ alkyl, $C_1$-$C_4$ haloalkyl, $C_1$-$C_4$ alkoxy, $C_1$-$C_4$ haloalkoxy or $SO_nR^{1A}$;

$R^2$ is halogen or $C_1$-$C_4$ alkyl;

each $R^3$ is independently halogen, cyano, $C_1$-$C_4$ alkyl, $C_2$-$C_4$ alkenyl, $C_2$-$C_4$ alkynyl, $C_1$-$C_4$ haloalkyl, $C_2$–$C_6$ alkylcarbonyl, $C_2$–$C_6$ haloalkylcarbonyl, $C_2$–$C_6$ alkoxycarbonyl, $C_1$-$C_4$ alkoxy, $C_1$-$C_4$ haloalkoxy, $C_2$-$C_6$ alkoxyalkyl or $C_2$-$C_6$ haloalkoxyalkyl; and

each $R^{1A}$ is independently $C_1$-$C_4$ alkyl or $C_1$-$C_4$ haloalkyl.

7. A compound of Claim 6 wherein

Q is selected from Q-43, Q-44 and Q-45;

each $R^1$ is independently halogen, $C_1$-$C_4$ alkyl, $C_1$-$C_4$ haloalkyl or $C_1$-$C_4$ haloalkoxy;

$R^2$ is halogen or $CH_3$; and

each $R^3$ is independently halogen, cyano, $C_1$-$C_4$ alkyl or $C_1$-$C_4$ haloalkyl.

8. A compound of Claim 1 selected from the group consisting of

5-chloro-2-[2-(5-chloro-2-pyridinyl)phenoxy]pyrimidine,

5-chloro-2-[2-[5-(fluoromethyl)-3-isoxazolyl]phenoxy]pyrimidine,

2-[2-(3-bromo-5-isoxazolyl)phenoxy]-5-chloropyrimidine,

5-chloro-2-[2-[5-(trifluoromethyl)-2-pyridinyl]phenoxy]pyrimidine,

5-chloro-2-[3-chloro-2-(5-chloro-2-pyridinyl)phenoxy]pyrimidine,

4-[2-[(5-bromo-2-pyrimidinyl)oxy]phenyl]-2-(trifluoromethyl)pyrimidine,

2-[2-(2-bromo-5-thiazolyl)phenoxy]-5-(trifluoromethyl)pyrimidine,

5-chloro-2-[4-methyl-2-[2-(trifluoromethyl)-4-pyridinyl]phenoxy]pyrimidine,

5-chloro-2-[2-[5-(difluoromethyl)-3-isoxazolyl]phenoxy]pyrimidine,

5-chloro-2-[2-[3-(difluoromethyl)-5-isoxazolyl]phenoxy]pyrimidine,

5-chloro-2-[2-[5-(difluoromethyl)-3-isoxazolyl]-3-fluorophenoxy]pyrimidine,

5-bromo-2-[2-[5-(difluoromethyl)-3-isoxazolyl]phenoxy]pyrimidine,

5-chloro-2-[2-[3-(trifluoromethyl)-5-isoxazolyl]phenoxy]pyrimidine,

5-chloro-2-[2-[3-(difluoromethyl)-5-isoxazolyl]-3-fluorophenoxy]pyrimidine,

5-bromo-2-[2-[3-(difluoromethyl)-5-isoxazolyl]-3-fluorophenoxy]pyrimidine,

5-chloro-2-[2-[5-(trifluoromethyl)-3-isoxazolyl]-3-fluorophenoxy]pyrimidine,

5-chloro-2-[2-[5-(trifluoromethyl)-3-isoxazolyl]phenoxy]pyrimidine,

5-chloro-2-[2-[5-(difluoromethyl)-3-isozazolyl]-3-difluoromethoxyphenoxy]pyrimidine,

5-chloro-2-[2-[5-(cyclopropyl)-3-isoxazolyl]-3-fluorophenoxy]pyrimidine,

5-chloro-2-[2-[5-(trifluoromethyl)-3-isoxazolyl]-3-chlorophenoxy]pyrimidine,

5-chloro-2-[2-[5-(difluoromethyl)-3-isoxazolyl]-3-chlorophenoxy]pyrimidine,

5-chloro-2-[2-[3-(trifluoromethyl)-5-isoxazolyl]-3-chlorophenoxy]pyrimidine,
5-chloro-2-[2-[3-(trifluoromethyl)-5-isoxazolyl]-3-fluorophenoxy]pyrimidine,
5-chloro-2-[2-[5-(trifluoromethyl)-3-isoxazolyl]-3-bromophenoxy]pyrimidine,
5-chloro-2-[2-[3-(difluoromethyl)-5-isoxazolyl]-3-chlorophenoxy]pyrimidine,
5-bromo-2-[2-[3-(trifluoromethyl)-5-isoxazolyl]-3-chlorophenoxy]pyrimidine,
5-bromo-2-[2-[3-(trifluoromethyl)-5-isoxazolyl]-3-chlorophenoxy]pyrimidine,
5-chloro-2-[2-[3-(difluoromethyl)-3-isoxazolyl]-3-bromophenoxy]pyrimidine,
and
5-chloro-2-[2-[5-(difluoromethyl)-3-isoxazolyl]-3-bromophenoxy]pyrimidine.

9. A herbicidal composition comprising a compound of any of Claims 1-8 and at least one component selected from the group consisting of surfactants, solid diluents and liquid diluents.

10. A herbicidal composition comprising a compound of any of Claims 1-8, at least one additional active ingredient selected from the group consisting of other herbicides and herbicide safeners, and at least one component selected from the group consisting of surfactants, solid diluents and liquid diluents.

11. A herbicidal mixture comprising (a) a compound of any of Claims 1-8, and (b) at least one additional active ingredient selected from (b1) photosystem II inhibitors, (b2) acetohydroxy acid synthase (AHAS) inhibitors, (b3) acetyl-CoA carboxylase (ACCase) inhibitors, (b4) auxin mimics and (b5) 5-enol-pyruvylshikimate-3-phosphate (EPSP) synthase inhibitors, (b6) photosystem I electron diverters, (b7) protoporphyrinogen oxidase (PPO) inhibitors, (b8) glutamine synthetase (GS) inhibitors, (b9) very long chain fatty acid (VLCFA) elongase inhibitors, (b10) auxin transport inhibitors, (b11) phytoene desaturase (PDS) inhibitors, (b12) 4-hydroxyphenyl-pyruvate dioxygenase (HPPD) inhibitors, (b13) homogentisate solenesyltranserase (HST) inhibitors, (b14) cellulose biosynthesis inhibitors, (b15) other herbicides selected from mitotic disruptors, organic arsenicals, asulam, bromobutide, cinmethylin, cumyluron, dazomet, difenzoquat, dymron, etobenzanid, flurenol, fosamine, fosamine-ammonium, metam, methyldymron, oleic acid, oxaziclomefone, pelargonic acid and pyributicarb, and (b16) herbicide safeners and salts of compounds of (b1) through (b16).

12. A method for controlling the growth of undesired vegetation comprising contacting the vegetation or its environment with a herbicidally effective amount of a compound of any of Claims 1-8.

13. A method for controlling the growth of undesired vegetation in a genetically modified plants that exhibit traits of glyphosate tolerance, glufosinate tolerance, ALS herbicide tolerance, dicamba tolerance, imidazolinone herbicide tolerance, 2,4-D tolerance,

HPPD tolerance and mesotrione tolerance, comprising contacting the vegetation or its environment with a herbicidally effective amount of a compound of any of Claims 1-8.

14. A herbicidal mixture comprising (a) a compound of any of Claims 1-8, and (b) at least one additional active ingredient selected from (b1) photosystem II inhibitors, (b2) acetohydroxy acid synthase (AHAS) inhibitors, (b4) auxin mimics, (b5) 5-enol-pyruvylshikimate-3-phosphate (EPSP) synthase inhibitors, (b7) protoporphyrinogen oxidase (PPO) inhibitors, (b9) very long chain fatty acid (VLCFA) elongase inhibitors and (b12) 4-hydroxyphenyl-pyruvate dioxygenase (HPPD) inhibitors.

15. A herbicidal mixture comprising (a) a compound of any of Claims 1-8, and (b) at least one additional active ingredient selected from the group consisting of 2,4-D, acetochlor, alachlor, atrazine, bromoxynil, bentazon, bicyclopyrone, carfentrazone-ethyl, cloransulam-methyl, dicamba, dimethenamid-p, florasulam, flufenacet, flumioxazin, flupyrsulfuron-methyl, fluroxypyr-meptyl, glyphosate, halauxifen-methyl, isoxaflutole, MCPA, mesotrione, metolachlor, metsulfuron-methyl, nicosulfuon, pyrasulfotole, pyroxasulfone, pyroxsulam, rimsulfuron, saflufenacil, tembotrione, thifensulfuron-methyl, topramazone and tribenuron.