



(51) International Patent Classification:

C07D 401/12 (2006.01) A01N 43/54 (2006.01)
A01N 43/40 (2006.01) C07D 403/12 (2006.01)

(21) International Application Number:

PCT/EP2022/057891

(22) International Filing Date:

25 March 2022 (25.03.2022)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

2104745.1 01 April 2021 (01.04.2021) GB

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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, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN,

HR, HU, ID, IL, IN, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, 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, 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, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, 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).

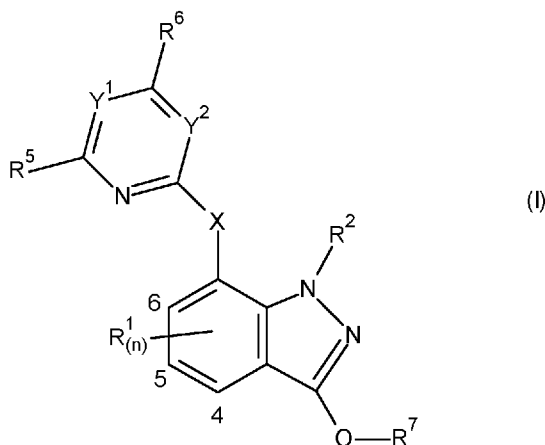
Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- of inventorship (Rule 4.17(iv))

Published:

- with international search report (Art. 21(3))
- in black and white; the international application as filed contained color or greyscale and is available for download from PATENTSCOPE

(54) Title: HERBICIDAL COMPOUNDS

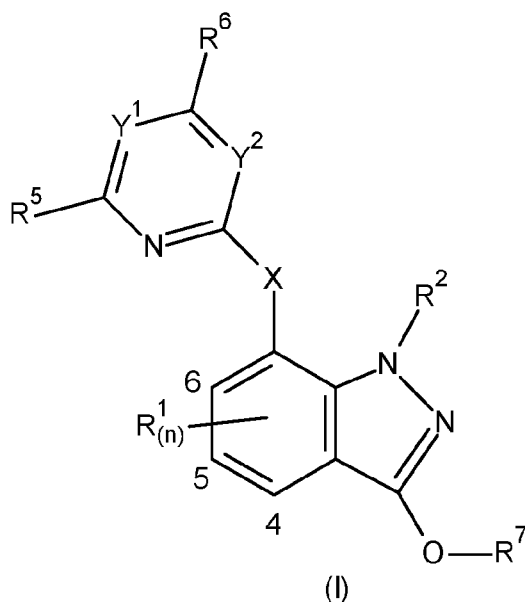


(57) Abstract: The present invention relates to compounds of Formula (I), or an agronomically acceptable salt of said compounds wherein X, Y¹, Y², R¹, R², R⁷, and n are as defined herein. The invention further relates to herbicidal compositions which comprise a compound of Formula (I) and to the use of compounds of Formula (I) for controlling weeds, in particular in crops of useful plants.

HERBICIDAL COMPOUNDS

The present invention relates to novel herbicidal compounds, to processes for their preparation, to herbicidal compositions which comprise the novel compounds, and to their use for controlling weeds, in particular in crops of useful plants, or for inhibiting plant growth.

EP0448206A2 discloses various substituted benzimidazole and indazole derivatives and their use as herbicides. EP0367242A2 discloses various aryloxybenzotriazoles and their use as herbicides. The present invention relates to the provision of further herbicidal compounds. Thus, according to the present invention there is provided a compound of Formula (I):



or an agronomically acceptable salt thereof,

wherein

X is O or S(O)_p;

Y¹ is N or CR³;

Y² is N or CR⁴;

with the proviso that Y¹ and Y² are not both N;

5 each R¹ is independently selected from the group consisting of halogen, -CN, nitro, C₁-C₄alkyl, C₂-C₄alkenyl, C₂-C₄alkynyl, C₁-C₄haloalkyl, C₁-C₄alkoxy-, C₁-C₄haloalkoxy-, -S(O)_pC₁-C₄alkyl and -S(O)_pC₁-C₄haloalkyl;

R² is C₃-C₈ fluoroalkyl;

10 R³ is selected from the group consisting of hydrogen, halogen, -CN, nitro, C₁-C₄alkyl, C₂-C₄alkenyl-, C₂-C₄alkynyl-, C₁-C₄haloalkyl-, C₁-C₄alkoxy-, C₁-C₄haloalkoxy- and -S(O)_pC₁-C₄alkyl;

15 R⁴ is selected from the group consisting of hydrogen, halogen, -CN, nitro, C₁-C₄alkyl, C₂-C₄alkenyl-, C₂-C₄alkynyl-, C₁-C₄haloalkyl-, C₁-C₄alkoxy-, C₁-C₄haloalkoxy- and -S(O)_pC₁-C₄alkyl;

R⁵ is selected from the group consisting of hydrogen, halogen, C₁-C₃alkyl and C₁-C₃haloalkyl;

20 R⁶ is selected from the group consisting of hydrogen, halogen, C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkyl and C₁-C₃haloalkoxy;

25 R⁷ is selected from the group consisting of C₃-C₈ alkenyl, C₃-C₈ alkynyl, C₃-C₈ haloalkyl, C₃-C₈ haloalkenyl, C₃-C₈ haloalkynyl, C₁-C₄alkoxy-C₁-C₃alkyl-, C₁-C₄haloalkoxy-C₁-C₃alkyl-, C₁-C₄alkoxy-C₁-C₃haloalkyl-, C₁-C₄alkyl-S(O)_p-C₁-C₃alkyl-, C₁-C₄haloalkyl-S(O)_p-C₁-C₃alkyl-, C₁-C₄alkoxy-C₁-C₃alkoxy-C₁-C₃alkyl-, C₁-C₄alkoxy-C(O)-C₁-C₃alkyl- and -(CH₂)_mR⁸

30 R⁸ is selected from the group consisting of C₃-C₆ cycloalkyl, phenyl and a 5- or 6- membered heterocyclyl which may be aromatic, saturated or partially saturated and can contain from 1 to 4 heteroatoms each independently selected from the group consisting of oxygen, nitrogen and sulphur, and wherein said C₃-C₆ cycloalkyl, phenyl or heterocyclyl groups are optionally substituted by one, two or three substituents independently selected from the group consisting of C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkoxy, C₂-C₃alkenyl, C₂-C₃alkynyl, halogen, cyano, hydroxy-, oxo and nitro;

35

m is 0, 1, 2, 3 or 4;

n is 0, 1 or 2; and

5 p is 0, 1 or 2.

C₁-C₄alkyl- includes, for example, methyl (Me, CH₃), ethyl (Et, C₂H₅), *n*-propyl (*n*-Pr), isopropyl (*i*-Pr), *n*-butyl (*n*-Bu), isobutyl (*i*-Bu), *sec*-butyl and *tert*-butyl (*t*-Bu).

C₁-C₂alkyl is methyl (Me, CH₃) or ethyl (Et, C₂H₅).

10

Halogen (or halo) includes, for example, fluorine, chlorine, bromine or iodine. The same correspondingly applies to halogen in the context of other definitions, such as haloalkyl.

15 C₁-C₄haloalkyl- and C₁-C₂haloalkyl include, for example, fluoromethyl, difluoromethyl, trifluoromethyl, chloromethyl, dichloromethyl, trichloromethyl, 2,2,2-trifluoroethyl, 2-fluoroethyl, 2-chloroethyl, pentafluoroethyl, or 1,1-difluoro-2,2,2-trichloroethyl.

20 C₁-C₄alkoxy and C₁-C₂alkoxy includes, for example, methoxy and ethoxy.

C₁-C₆haloalkoxy- and C₁-C₄haloalkoxy- include, for example, fluoromethoxy, difluoromethoxy, trifluoromethoxy, 2,2,2-trifluoroethoxy, 1,1,2,2-tetrafluoroethoxy, 2-fluoroethoxy, 2-chloroethoxy, 2,2-difluoroethoxy or 2,2,2-trichloroethoxy, preferably
25 difluoromethoxy, 2-chloroethoxy or trifluoromethoxy.

C₂-C₄alkenyl- includes, for example, -CH=CH₂ (vinyl) and -CH₂-CH=CH₂ (allyl).

C₂-C₄alkynyl- refers to a straight or branched hydrocarbon chain radical group
30 consisting solely of carbon and hydrogen atoms, containing at least one triple bond, having from two to four carbon atoms, and which is attached to the rest of the molecule by a single bond. Examples of C₂-C₄alkynyl include, but are not limited to, prop-1-ynyl, propargyl (prop-2-ynyl), and but-1-ynyl.

C₁-C₄alkyl-S- (alkylthio) includes, for example, methylthio, ethylthio, propylthio, isopropylthio, n-butylthio, isobutylthio, sec-butylthio or tert-butylthio, preferably methylthio or ethylthio.

5 C₁-C₄alkyl-S(O)- (alkylsulfinyl) includes, for example, methylsulfinyl, ethylsulfinyl, propylsulfinyl, isopropylsulfinyl, n-butylsulfinyl, isobutylsulfinyl, sec-butylsulfinyl or tert-butylsulfinyl, preferably methylsulfinyl or ethylsulfinyl.

10 C₁-C₄alkyl-S(O)₂- (alkylsulfonyl) includes, for example, methylsulfonyl, ethylsulfonyl, propylsulfonyl, isopropylsulfonyl, n-butylsulfonyl, isobutylsulfonyl, sec-butylsulfonyl or tert-butylsulfonyl, preferably methylsulfonyl or ethylsulfonyl.

In one embodiment of the present invention there is provided a compound of Formula (I) wherein X is O. In another embodiment of the present invention there is provided a compound of Formula (I) wherein X is S(O)_p (e.g S, S(O) or S(O)₂).

20 In one embodiment of the present invention there is provided a compound of Formula (I) wherein Y¹ is CR³ and Y² is N (in this embodiment R⁵ and R⁶ are preferably hydrogen) or Y¹ is CR³ and Y² is CR⁴ (in this embodiment R⁵ and R⁶ are preferably hydrogen or halogen) or Y¹ is N and Y² is CR⁴ (in this embodiment R⁵ is preferably hydrogen and R⁶ is C₁-C₃alkyl or C₁-C₃alkoxy, more preferably methyl or methoxy).

25 In another embodiment of the present invention there is provided a compound of Formula (I) wherein n=0. In another embodiment of the present invention there is provided a compound of Formula (I) wherein n=1.

30 In another embodiment of the present invention there is provided a compound of Formula (I) wherein R² is C₃-C₄ fluoroalkyl.

In another embodiment of the present invention there is provided a compound of Formula (I) wherein R³ is halogen (preferably chloro) or C₁-C₄haloalkoxy- (e.g -OCHF₂, -OCF₃).

35 In another embodiment of the present invention there is provided a compound of Formula (I) wherein R⁴ is selected from the group consisting of hydrogen, halogen

(e.g. fluorine) and $-\text{CN}$. In another embodiment of the present invention there is provided a compound of Formula (I) wherein R^4 is hydrogen.

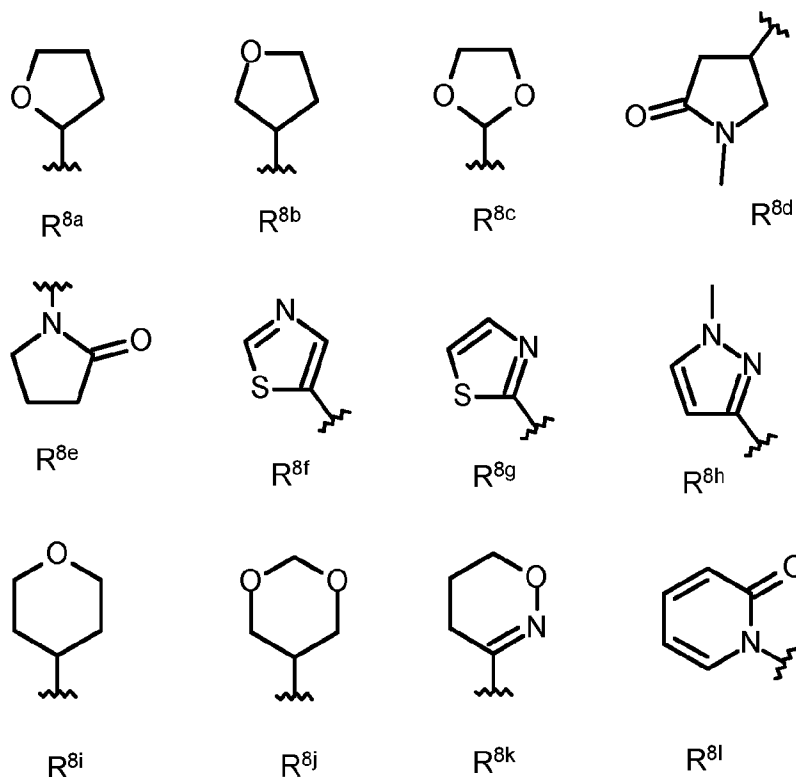
In another embodiment of the present invention there is provided a compound
5 of Formula (I) wherein R^5 is hydrogen.

In another embodiment of the present invention there is provided a compound
of Formula (I), wherein R^6 is selected from the group consisting of hydrogen, C_1 -
 C_4 alkyl (preferably methyl) and C_1 - C_3 alkoxy (preferably methoxy).
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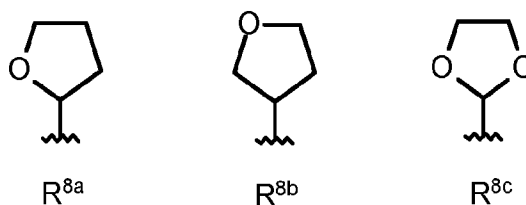
In another embodiment of the present invention there is provided a compound
of Formula (I), wherein R^5 and R^6 are hydrogen.

In another embodiment of the present invention there is provided a compound
15 of Formula (I), wherein R^7 is C_1 - C_4 alkoxy- C_1 - C_3 alkyl- (e.g. $-\text{CH}_2\text{CH}_2\text{OCH}_3$, $-\text{CH}_2\text{CH}_2\text{OCH}_2\text{CH}_3$, $-\text{CH}_2\text{CH}_2\text{OCH}_2\text{CH}_2\text{CH}_3$ or $-\text{CH}(\text{CH}_3)\text{CH}_2\text{OCH}_3$) or C_1 - C_4 alkoxy- C_1 -
 C_3 alkoxy- C_1 - C_3 alkyl- (e.g. $-\text{CH}_2\text{CH}(\text{OCH}_3)_2$ or $-\text{CH}_2\text{CH}_2\text{OCH}_2\text{CH}_2\text{OCH}_3$).

In another embodiment of the present invention there is provided a compound
20 of Formula (I), wherein R^7 is $-(\text{CH}_2)_m\text{R}^8$ wherein R^8 is selected from the group
consisting of C_3 - C_6 cycloalkyl, phenyl and a 5- or 6- membered heterocyclyl which
may be aromatic, saturated or partially saturated and can contain from 1 to 4
heteroatoms each independently selected from the group consisting of oxygen,
nitrogen and sulphur, and wherein said C_3 - C_6 cycloalkyl, phenyl or heterocyclyl
25 groups are optionally substituted by one, two or three substituents independently
selected from the group consisting of C_1 - C_3 alkyl, C_1 - C_3 haloalkyl, C_1 - C_3 alkoxy, C_2 -
 C_3 alkenyl, C_2 - C_3 alkynyl, halogen, cyano, hydroxy-, oxo and nitro. m is 0, 1, 2, 3 or 4,
typically 0 or 1. In one embodiment R^8 is C_3 - C_6 cycloalkyl (e.g. cyclopropyl) optionally
substituted as described above. In another embodiment R^8 is phenyl optionally
30 substituted as described above. In another embodiment R^8 is a 5- or 6- membered
heterocyclyl which may be aromatic, saturated or partially saturated and can contain
from 1 to 4 heteroatoms each independently selected from the group consisting of
oxygen, nitrogen and sulphur which is optionally substituted as described above. In a
preferred embodiment, the 5- or 6- membered heterocyclyl is selected from the group
35 consisting of R^{8a} , R^{8b} , R^{8c} , R^{8d} , R^{8e} , R^{8f} , R^{8g} , R^{8h} , R^{8i} , R^{8j} , R^{8k} and R^{8l} .



In a more preferred embodiment, R^8 is selected from the group consisting of R^{8a} , R^{8b} and R^{8c} .



5

In a particularly preferred embodiment of the present invention there is provided a compound of Formula (I) wherein X is O, Y^1 is CR^3 (wherein R^3 is preferably chlorine or methyl), and Y^2 is N, R^5 and R^6 are hydrogen. In this
 10 embodiment it is preferred that n is 0 or 1 (wherein R^1 = 6-F, 6-Cl or 6-CN) and R^2 is C_3 - C_8 fluoroalkyl e.g. $CF_3CH_2CH_2CH_2$ -.

Compounds of Formula (I) may contain asymmetric centres and may be present as a single enantiomer, pairs of enantiomers in any proportion or, where
 15 more than one asymmetric centre are present, contain diastereoisomers in all possible ratios. Typically one of the enantiomers has enhanced biological activity compared to the other possibilities.

The present invention also provides agronomically acceptable salts of compounds of Formula (I). Salts that the compounds of Formula (I) may form with amines, including primary, secondary and tertiary amines (for example ammonia, dimethylamine and triethylamine), alkali metal and alkaline earth metal bases, transition metals or quaternary ammonium bases are preferred.

The compounds of Formula (I) according to the invention can be used as herbicides by themselves, but they are generally formulated into herbicidal compositions using formulation adjuvants, such as carriers, solvents and surface-active agents (SAA). Thus, the present invention further provides a herbicidal composition comprising a herbicidal compound according to any one of the previous claims and an agriculturally acceptable formulation adjuvant. The composition can be in the form of concentrates which are diluted prior to use, although ready-to-use compositions can also be made. The final dilution is usually made with water, but can be made instead of, or in addition to, water, with, for example, liquid fertilisers, micronutrients, biological organisms, oil or solvents.

The herbicidal compositions generally comprise from 0.1 to 99 % by weight, especially from 0.1 to 95 % by weight, compounds of Formula I and from 1 to 99.9 % by weight of a formulation adjuvant which preferably includes from 0 to 25 % by weight of a surface-active substance.

The compositions can be chosen from a number of formulation types. These include an emulsion concentrate (EC), a suspension concentrate (SC), a suspo-emulsion (SE), a capsule suspension (CS), a water dispersible granule (WG), an emulsifiable granule (EG), an emulsion, water in oil (EO), an emulsion, oil in water (EW), a micro-emulsion (ME), an oil dispersion (OD), an oil miscible flowable (OF), an oil miscible liquid (OL), a soluble concentrate (SL), an ultra-low volume suspension (SU), an ultra-low volume liquid (UL), a technical concentrate (TK), a dispersible concentrate (DC), a soluble powder (SP), a wettable powder (WP) and a soluble granule (SG). The formulation type chosen in any instance will depend upon the particular purpose envisaged and the physical, chemical and biological properties of the compound of Formula (I).

Soluble powders (SP) may be prepared by mixing a compound of Formula (I) with one or more water-soluble inorganic salts (such as sodium bicarbonate, sodium

carbonate or magnesium sulphate) or one or more water-soluble organic solids (such as a polysaccharide) and, optionally, one or more wetting agents, one or more dispersing agents or a mixture of said agents to improve water dispersibility/solubility. The mixture is then ground to a fine powder. Similar compositions may also be
5 granulated to form water soluble granules (SG).

Wettable powders (WP) may be prepared by mixing a compound of Formula (I) with one or more solid diluents or carriers, one or more wetting agents and, preferably, one or more dispersing agents and, optionally, one or more suspending agents to facilitate the dispersion in liquids. The mixture is then ground to a fine
10 powder. Similar compositions may also be granulated to form water dispersible granules (WG).

Granules (GR) may be formed either by granulating a mixture of a compound of Formula (I) and one or more powdered solid diluents or carriers, or from pre-formed blank granules by absorbing a compound of Formula (I) (or a solution thereof, in a suitable agent) in a porous granular material (such as pumice, attapulgite clays, fuller's earth, kieselguhr, diatomaceous earths or ground corn cobs) or by adsorbing a compound of Formula (I) (or a solution thereof, in a suitable agent) on to a hard core material (such as sands, silicates, mineral carbonates, sulphates or phosphates) and drying if necessary. Agents which are commonly used to aid absorption or
15 adsorption include solvents (such as aliphatic and aromatic petroleum solvents, alcohols, ethers, ketones and esters) and sticking agents (such as polyvinyl acetates, polyvinyl alcohols, dextrans, sugars and vegetable oils). One or more other additives may also be included in granules (for example an emulsifying agent, wetting agent or dispersing agent).

25 Dispersible Concentrates (DC) may be prepared by dissolving a compound of Formula (I) in water or an organic solvent, such as a ketone, alcohol or glycol ether. These solutions may contain a surface active agent (for example to improve water dilution or prevent crystallisation in a spray tank).

Emulsifiable concentrates (EC) or oil-in-water emulsions (EW) may be
30 prepared by dissolving a compound of Formula (I) in an organic solvent (optionally containing one or more wetting agents, one or more emulsifying agents or a mixture of said agents). Suitable organic solvents for use in ECs include aromatic hydrocarbons (such as alkylbenzenes or alkylnaphthalenes, exemplified by SOLVESSO 100, SOLVESSO 150 and SOLVESSO 200; SOLVESSO is a
35 Registered Trade Mark), ketones (such as cyclohexanone or methylcyclohexanone)

and alcohols (such as benzyl alcohol, furfuryl alcohol or butanol), N-alkylpyrrolidones (such as N-methylpyrrolidone or N-octylpyrrolidone), dimethyl amides of fatty acids (such as C₈-C₁₀ fatty acid dimethylamide) and chlorinated hydrocarbons. An EC product may spontaneously emulsify on addition to water, to produce an emulsion
5 with sufficient stability to allow spray application through appropriate equipment.

Preparation of an EW involves obtaining a compound of Formula (I) either as a liquid (if it is not a liquid at room temperature, it may be melted at a reasonable temperature, typically below 70°C) or in solution (by dissolving it in an appropriate solvent) and then emulsifying the resultant liquid or solution into water containing one
10 or more SAAs, under high shear, to produce an emulsion. Suitable solvents for use in EWs include vegetable oils, chlorinated hydrocarbons (such as chlorobenzenes), aromatic solvents (such as alkylbenzenes or alkylnaphthalenes) and other appropriate organic solvents which have a low solubility in water.

Microemulsions (ME) may be prepared by mixing water with a blend of one or
15 more solvents with one or more SAAs, to produce spontaneously a thermodynamically stable isotropic liquid formulation. A compound of Formula (I) is present initially in either the water or the solvent/SAA blend. Suitable solvents for use in MEs include those hereinbefore described for use in ECs or in EWs. An ME may be either an oil-in-water or a water-in-oil system (which system is present may
20 be determined by conductivity measurements) and may be suitable for mixing water-soluble and oil-soluble pesticides in the same formulation. An ME is suitable for dilution into water, either remaining as a microemulsion or forming a conventional oil-in-water emulsion.

Suspension concentrates (SC) may comprise aqueous or non-aqueous
25 suspensions of finely divided insoluble solid particles of a compound of Formula (I). SCs may be prepared by ball or bead milling the solid compound of Formula (I) in a suitable medium, optionally with one or more dispersing agents, to produce a fine particle suspension of the compound. One or more wetting agents may be included in the composition and a suspending agent may be included to reduce the rate at
30 which the particles settle. Alternatively, a compound of Formula (I) may be dry milled and added to water, containing agents hereinbefore described, to produce the desired end product.

Aerosol formulations comprise a compound of Formula (I) and a suitable propellant (for example *n*-butane). A compound of Formula (I) may also be dissolved
35 or dispersed in a suitable medium (for example water or a water miscible liquid, such

as *n*-propanol) to provide compositions for use in non-pressurised, hand-actuated spray pumps.

Capsule suspensions (CS) may be prepared in a manner similar to the preparation of EW formulations but with an additional polymerisation stage such that an aqueous dispersion of oil droplets is obtained, in which each oil droplet is encapsulated by a polymeric shell and contains a compound of Formula (I) and, optionally, a carrier or diluent therefor. The polymeric shell may be produced by either an interfacial polycondensation reaction or by a coacervation procedure. The compositions may provide for controlled release of the compound of Formula (I) and they may be used for seed treatment. A compound of Formula (I) may also be formulated in a biodegradable polymeric matrix to provide a slow, controlled release of the compound.

The composition may include one or more additives to improve the biological performance of the composition, for example by improving wetting, retention or distribution on surfaces; resistance to rain on treated surfaces; or uptake or mobility of a compound of Formula (I). Such additives include surface active agents (SAAs), spray additives based on oils, for example certain mineral oils or natural plant oils (such as soy bean and rape seed oil), modified plant oils such as methylated rape seed oil (MRSO), and blends of these with other bio-enhancing adjuvants (ingredients which may aid or modify the action of a compound of Formula (I)).

Wetting agents, dispersing agents and emulsifying agents may be SAAs of the cationic, anionic, amphoteric or non-ionic type.

Suitable SAAs of the cationic type include quaternary ammonium compounds (for example cetyltrimethyl ammonium bromide), imidazolines and amine salts.

Suitable anionic SAAs include alkali metals salts of fatty acids, salts of aliphatic monoesters of sulphuric acid (for example sodium lauryl sulphate), salts of sulphonated aromatic compounds (for example sodium dodecylbenzenesulphonate, calcium dodecylbenzenesulphonate, butyl naphthalene sulphonate and mixtures of sodium di-*isopropyl*- and tri-*isopropyl*-naphthalene sulphonates), ether sulphates, alcohol ether sulphates (for example sodium laureth-3-sulphate), ether carboxylates (for example sodium laureth-3-carboxylate), phosphate esters (products from the reaction between one or more fatty alcohols and phosphoric acid (predominately mono-esters) or phosphorus pentoxide (predominately di-esters), for example the reaction between lauryl alcohol and tetraphosphoric acid; additionally these products

may be ethoxylated), sulphosuccinamates, paraffin or olefine sulphonates, taurates, lignosulphonates and phosphates / sulphates of tristyrylphenols.

Suitable SAAs of the amphoteric type include betaines, propionates and glycines.

- 5 Suitable SAAs of the non-ionic type include condensation products of alkylene oxides, such as ethylene oxide, propylene oxide, butylene oxide or mixtures thereof, with fatty alcohols (such as oleyl alcohol or cetyl alcohol) or with alkylphenols (such as octylphenol, nonylphenol or octylcresol); partial esters derived from long chain fatty acids or hexitol anhydrides; condensation products of said partial esters with
10 ethylene oxide; block polymers (comprising ethylene oxide and propylene oxide); alkanolamides; simple esters (for example fatty acid polyethylene glycol esters); amine oxides (for example lauryl dimethyl amine oxide); lecithins and sorbitans and esters thereof, alkyl polyglycosides and tristyrylphenols.

- Suitable suspending agents include hydrophilic colloids (such as
15 polysaccharides, polyvinylpyrrolidone or sodium carboxymethylcellulose) and swelling clays (such as bentonite or attapulgite).

- The compounds of present invention can also be used in mixture with one or more additional herbicides and/or plant growth regulators. Examples of such additional herbicides or plant growth regulators include acetochlor, acifluorfen
20 (including acifluorfen-sodium), aclonifen, ametryn, amicarbazone, aminopyralid, aminotriazole, atrazine, beflubutamid-M, benquitrone, bensulfuron (including bensulfuron-methyl), bentazone, bicyclopyrone, bilanafos, bipyrazone, bispyribac-sodium, bixlozone, bromacil, bromoxynil, butachlor, butafenacil, carfentrazone (including carfentrazone-ethyl), cloransulam (including cloransulam-methyl),
25 chlorimuron (including chlorimuron-ethyl), chlorotoluron, chlorsulfuron, cinmethylin, clacyfos, clethodim, clodinafop (including clodinafop-propargyl), clomazone, clopyralid, cyclopyranil, cyclopyrimorate, cyclosulfamuron, cyhalofop (including cyhalofop-butyl), 2,4-D (including the choline salt and 2-ethylhexyl ester thereof), 2,4-DB, desmedipham, dicamba (including the aluminium, aminopropyl, bis-
30 aminopropylmethyl, choline, dichloroprop, diglycolamine, dimethylamine, dimethylammonium, potassium and sodium salts thereof) diclosulam, diflufenican, diflufenzopyr, dimethachlor, dimethenamid-P, dioxopyritrione, diquat dibromide, diuron, epyrifencil, ethalfluralin, ethofumesate, fenoxaprop (including fenoxaprop-P-ethyl), fenoxasulfone, fenpyrazone, fenquitrone, fentrazamide, flazasulfuron,
35 florasulam, florypyrauxifen (including florypyrauxifen-benzyl), fluazifop (including fluazifop-P-butyl), flucarbazone (including flucarbazone-sodium), flufenacet,

flumetsulam, flumioxazin, fluometuron, flupyr-sulfuron (including flupyr-sulfuron-methyl-sodium), fluroxypyr (including fluroxypyr-meptyl), fomesafen, foramsulfuron, glufosinate (including L-glufosinate and the ammonium salts of both), glyphosate (including the diammonium, isopropylammonium and potassium salts thereof),

5 halauxifen (including halauxifen-methyl), haloxyfop (including haloxyfop-methyl), hexazinone, hydantocidin, imazamox (including R-imazamox), imazapic, imazapyr, imazethapyr, indaziflam, iodosulfuron (including iodosulfuron-methyl-sodium), iofensulfuron (including iofensulfuron-sodium), ioxynil, isoproturon, isoxaflutole, lancotrione, MCPA, MCPB, mecoprop-P, mesosulfuron (including mesosulfuron-

10 methyl), mesotrione, metamitron, metazachlor, methiozolin, metolachlor, metosulam, metribuzin, metsulfuron, napropamide, nicosulfuron, norflurazon, oxadiazon, oxasulfuron, oxyfluorfen, paraquat dichloride, pendimethalin, penoxsulam, phenmedipham, picloram, pinoxaden, pretilachlor, primisulfuron-methyl, prometryne, propanil, propaquizafop, propyrisulfuron, propyzamide, prosulfocarb, prosulfuron,

15 pyraclonil, pyraflufen (including pyraflufen-ethyl), pyrasulfotole, pyridate, pyriftalid, pyrimisulfan, pyroxasulfone, pyroxsulam, quinclorac, quinmerac, quizalofop (including quizalofop-P-ethyl and quizalofop-P-tefuryl), rimisoxafen, rimsulfuron, saflufenacil, sethoxydim, simazine, S-metalochlor, sulfentrazone, sulfosulfuron, tebuthiuron, tefuryltrione, tembotrione, terbuthylazine, terbutryn, tetflupyrolimet,

20 thiencarbazone, thifensulfuron, tiafenacil, tolpyralate, topramezone, tralkoxydim, triafamone, triallate, triasulfuron, tribenuron (including tribenuron-methyl), triclopyr, trifloxysulfuron (including trifloxysulfuron-sodium), trifludimoxazin, trifluralin, triflusulfuron, tripyrasulfone, 3-(2-chloro-4-fluoro-5-(3-methyl-2,6-dioxo-4-trifluoromethyl-3,6-dihydropyrimidin-1(2H)-yl)phenyl)-5-methyl-4,5-dihydroisoxazole-

25 5-carboxylic acid ethyl ester, 4-hydroxy-1-methoxy-5-methyl-3-[4-(trifluoromethyl)-2-pyridyl]imidazolidin-2-one, 4-hydroxy-1,5-dimethyl-3-[4-(trifluoromethyl)-2-pyridyl]imidazolidin-2-one, 5-ethoxy-4-hydroxy-1-methyl-3-[4-(trifluoromethyl)-2-pyridyl]imidazolidin-2-one, 4-hydroxy-1-methyl-3-[4-(trifluoromethyl)-2-pyridyl]imidazolidin-2-one, 4-hydroxy-1,5-dimethyl-3-[1-methyl-5-(trifluoromethyl) pyrazol-3-

30 yl]imidazolidin-2-one, (4R)-1-(5-tert-butylisoxazol-3-yl)-4-ethoxy-5-hydroxy-3-methylimidazolidin-2-one, 4-amino-3-chloro-5-fluoro-6-(7-fluoro-1H-indol-6-yl)pyridine-2-carboxylic acid (including agrochemically acceptable esters thereof, for example, methyl 4-amino-3-chloro-5-fluoro-6-(7-fluoro-1H-indol-6-yl)pyridine-2-carboxylate, prop-2-ynyl 4-amino-3-chloro-5-fluoro-6-(7-fluoro-1H-indol-6-yl)pyridine-2-carboxylate

35 and cyanomethyl 4-amino-3-chloro-5-fluoro-6-(7-fluoro-1H-indol-6-yl)pyridine-2-carboxylate), 3-ethylsulfanyl-N-(1,3,4-oxadiazol-2-yl)-5-(trifluoromethyl)-[1,2,4]triazolo [4,3-a]pyridine-8-carboxamide, 3-(isopropylsulfanylmethyl)-N-(5-methyl-1,3,4-

oxadiazol-2-yl)-5-(trifluoromethyl)-[1,2,4]triazolo[4,3-a]pyridine-8-carboxamide, 3-(isopropylsulfonylmethyl)-N-(5-methyl-1,3,4-oxadiazol-2-yl)-5-(trifluoromethyl)-[1,2,4]triazolo[4,3-a]pyridine-8-carboxamide, 3-(ethylsulfonylmethyl)-N-(5-methyl-1,3,4-oxadiazol-2-yl)-5-(trifluoromethyl)-[1,2,4]triazolo[4,3-a]pyridine-8-carboxamide, ethyl 2-[[3-[[3-chloro-5-fluoro-6-[3-methyl-2,6-dioxo-4-(trifluoromethyl)pyrimidin-1-yl]-2-pyridyl]oxy]acetate and 6-chloro-4-(2,7-dimethyl-1-naphthyl)-5-hydroxy-2-methylpyridazin-3-one .

The mixing partners of the compound of Formula (I) may also be in the form of esters or salts, as mentioned e.g. in The Pesticide Manual, Sixteenth Edition, British Crop Protection Council, 2012.

The compound of Formula (I) can also be used in mixtures with other agrochemicals such as fungicides, nematicides or insecticides, examples of which are given in The Pesticide Manual.

The mixing ratio of the compound of Formula (I) to the mixing partner is preferably from 1: 100 to 1000:1.

The mixtures can advantageously be used in the above-mentioned formulations (in which case "active ingredient" relates to the respective mixture of compound of Formula (I) with the mixing partner).

The compounds or mixtures of the present invention can also be used in combination with one or more herbicide safeners. Examples of such safeners include benoxacor, cloquintocet (including cloquintocet-mexyl), cyprosulfamide, dichlormid, fenchlorazole (including fenchlorazole-ethyl), fencloirim, fluxofenim, furilazole, isoxadifen (including isoxadifen-ethyl), mefenpyr (including mefenpyr-diethyl), metcamifen and oxabetrinil.

Particularly preferred are mixtures of a compound of Formula (I) with cyprosulfamide, isoxadifen-ethyl, cloquintocet-mexyl and/or metcamifen.

The safeners of the compound of Formula (I) may also be in the form of esters or salts, as mentioned e.g. in The Pesticide Manual, 16th Edition (BCPC), 2012. The reference to cloquintocet-mexyl also applies to a lithium, sodium, potassium, calcium, magnesium, aluminium, iron, ammonium, quaternary ammonium, sulfonium or phosphonium salt thereof as disclosed in WO 02/34048.

Preferably the mixing ratio of compound of Formula (I) to safener is from 100:1 to 1:10, especially from 20:1 to 1:1.

The present invention still further provides a method of controlling weeds at a locus said method comprising application to the locus of a weed controlling amount of a composition comprising a compound of Formula (I). Moreover, the present

invention may further provide a method of selectively controlling weeds at a locus comprising crop plants and weeds, wherein the method comprises application to the locus of a weed controlling amount of a composition according to the present invention. 'Controlling' means killing, reducing or retarding growth or preventing or
5 reducing germination. It is noted that the compounds of the present invention show a much improved selectivity compared to known, structurally similar compounds. Generally the plants to be controlled are unwanted plants (weeds). 'Locus' means the area in which the plants are growing or will grow. The application may be applied to the locus pre-emergence and/or postemergence of the crop plant. Some crop plants
10 may be inherently tolerant to herbicidal effects of compounds of Formula (I). Preferred crop plants include maize, wheat, barley and rice.

The rates of application of compounds of Formula I may vary within wide limits and depend on the nature of the soil, the method of application (pre- or post-emergence; seed dressing; application to the seed furrow; no tillage application etc.),
15 the crop plant, the weed(s) to be controlled, the prevailing climatic conditions, and other factors governed by the method of application, the time of application and the target crop. The compounds of Formula I according to the invention are generally applied at a rate of from 10 to 2500 g/ha, especially from 25 to 1000 g/ha, more especially from 25 to 250 g/ha.

20 The application is generally made by spraying the composition, typically by tractor mounted sprayer for large areas, but other methods such as dusting (for powders), drip or drench can also be used.

Crop plants are to be understood as also including those crop plants which have been rendered tolerant to other herbicides or classes of herbicides (e.g. ALS-,
25 GS-, EPSPS-, PPO-, HPPD-, -PDS and ACCase-inhibitors) by conventional methods of breeding or by genetic engineering. An example of a crop that has been rendered tolerant to imidazolinones, e.g. imazamox, by conventional methods of breeding is Clearfield® summer rape (canola). Examples of crops that have been rendered tolerant to herbicides by genetic engineering methods include e.g. glyphosate- and
30 glufosinate-resistant maize varieties commercially available under the trade names RoundupReady® and LibertyLink®.

Crop plants are also to be understood as being those which have been rendered resistant to harmful insects by genetic engineering methods, for example Bt maize (resistant to European corn borer), Bt cotton (resistant to cotton boll weevil)
35 and also Bt potatoes (resistant to Colorado beetle). Examples of Bt maize are the Bt 176 maize hybrids of NK® (Syngenta Seeds). The Bt toxin is a protein that is formed naturally by *Bacillus thuringiensis* soil bacteria. Examples of toxins, or transgenic

plants able to synthesise such toxins, are described in EP-A-451 878, EP-A-374 753, WO 93/07278, WO 95/34656, WO 03/052073 and EP-A-427 529. Examples of transgenic plants comprising one or more genes that code for an insecticidal resistance and express one or more toxins are KnockOut® (maize), Yield Gard® (maize), NuCOTIN33B® (cotton), Bollgard® (cotton), NewLeaf® (potatoes), NatureGard® and Protexcta®. Plant crops or seed material thereof can be both resistant to herbicides and, at the same time, resistant to insect feeding ("stacked" transgenic events). For example, seed can have the ability to express an insecticidal Cry3 protein while at the same time being tolerant to glyphosate.

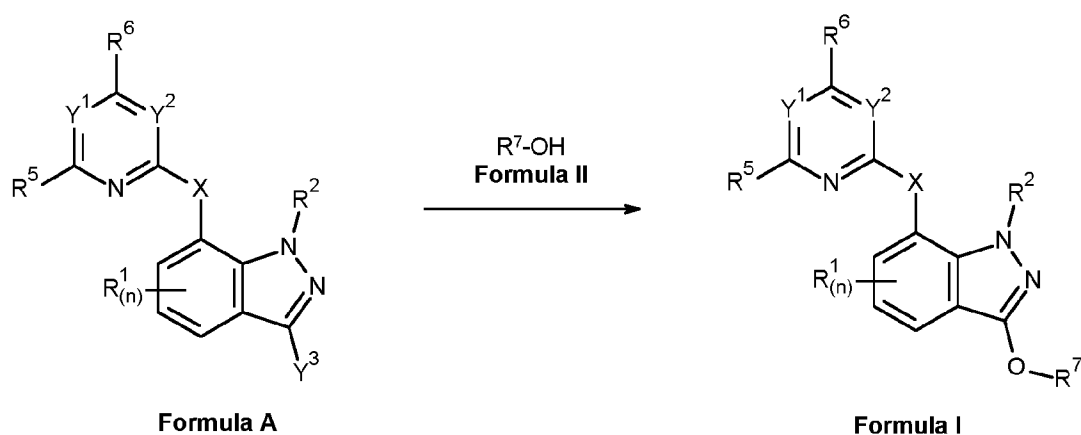
10 Crop plants are also to be understood to include those which are obtained by conventional methods of breeding or genetic engineering and contain so-called output traits (e.g. improved storage stability, higher nutritional value and improved flavour).

The compositions can be used to control unwanted plants (collectively, 'weeds'). The weeds to be controlled may be both monocotyledonous species, for example *Agrostis*, *Alopecurus*, *Avena*, *Brachiaria*, *Bromus*, *Cenchrus*, *Cyperus*, *Digitaria*, *Echinochloa*, *Eleusine*, *Lolium*, *Monochoria*, *Rottboellia*, *Sagittaria*, *Scirpus*, *Setaria* and *Sorghum*, and dicotyledonous species, for example *Abutilon*, *Amaranthus*, *Ambrosia*, *Chenopodium*, *Chrysanthemum*, *Conyza*, *Galium*, *Ipomoea*, *Nasturtium*, *Sida*, *Sinapis*, *Solanum*, *Stellaria*, *Veronica*, *Viola* and *Xanthium*.

In a further aspect of the present invention there is provided the use of a compound of Formula (I) as defined herein as a herbicide.

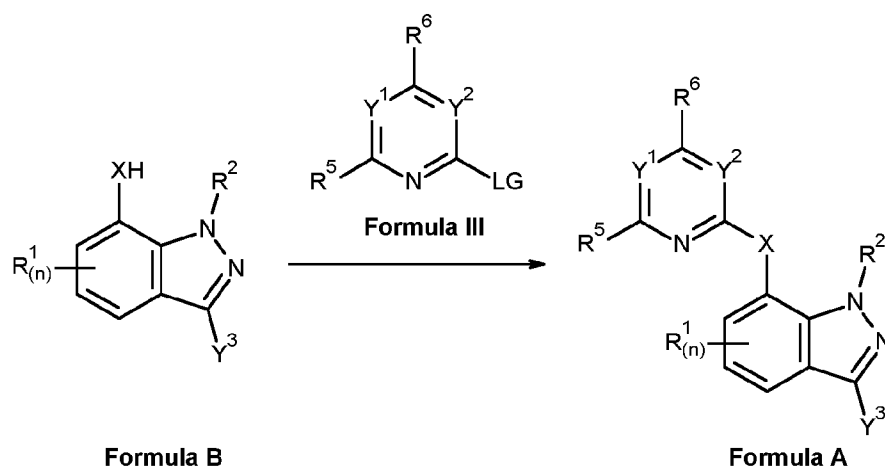
25 The compounds of the present invention can be prepared according to the following schemes.

Scheme 1



A compound Formula I may be prepared from a compound Formula A (where Y³ represents a suitable halogen by reaction with an alcohol (Formula II) in the presence of a suitable catalyst, a suitable base and in a suitable solvent. Suitable catalysts may include RockPhos Pd G3. Suitable bases may include caesium carbonate. Suitable solvents may include toluene. Compounds of Formula II are commercially available or may be prepared by methods known in the literature.

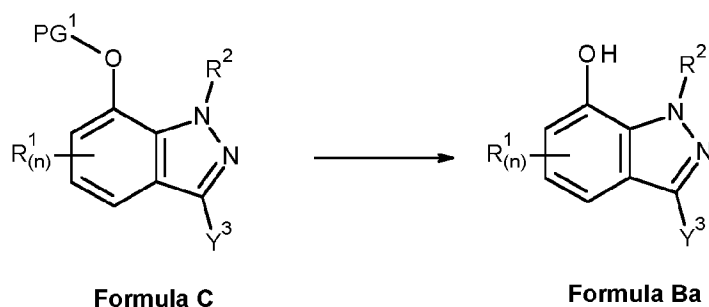
Scheme 2



A compound of Formula A may be prepared from a compound of Formula B by reaction with a compound of Formula III (where LG represents a suitable leaving group such as F, Cl, Br or SO₂Me) in the presence of a suitable base and in a suitable solvent. Suitable bases may include NaH, K₂CO₃, Cs₂CO₃. Suitable solvents

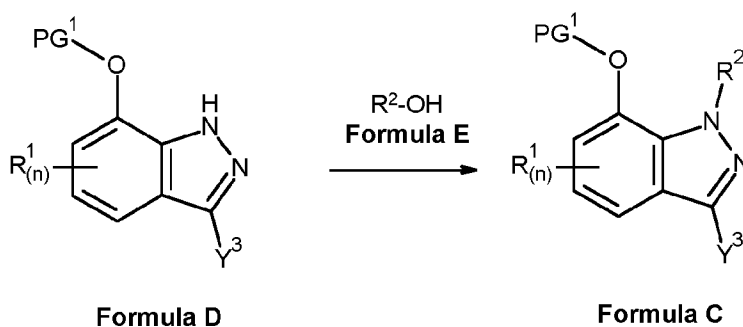
may include THF, CH₃CN or DMF. Compounds of Formula III are commercially available or may be prepared by methods known in the literature.

Scheme 3



- 5 A compound of Formula Ba (a compound of Formula B where X = O) may be prepared from a compound of Formula C (where PG¹ represents a suitable protecting group such as Me or Tf) by a deprotection reaction in a suitable solvent. Suitable deprotecting conditions may include BBr₃, dodecanethiol/LiO^tBu (for PG = Me) or
- 10 K₂CO₃ (for PG = Tf). Suitable solvents may include DCM, DCE or CH₃CN.

Scheme 4



- 15 A compound of Formula C may be prepared from a compound of Formula D *via* reaction with a compound of Formula E, optionally in the presence of a suitable base and in a suitable solvent. Compounds of Formula E are commercially available or may be prepared by methods known in the literature.

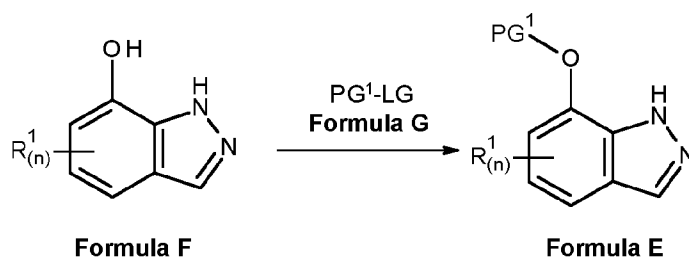
Scheme 5



A compound of Formula D (where Y^3 represents a halogen) may be prepared from a compound of Formula E via a halogenation reaction with a suitable reagent in a suitable solvent. Suitable halogenation reagents may include *N*-bromo-succinimide.

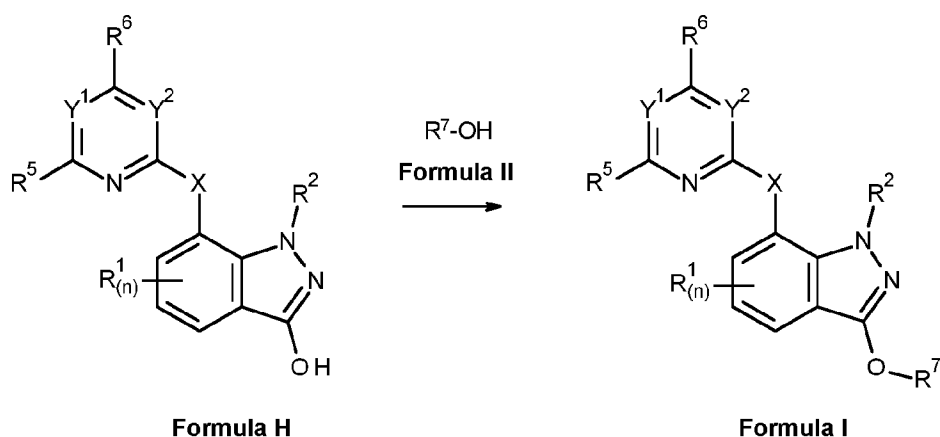
5 Suitable solvents may include CH_3CN .

Scheme 6



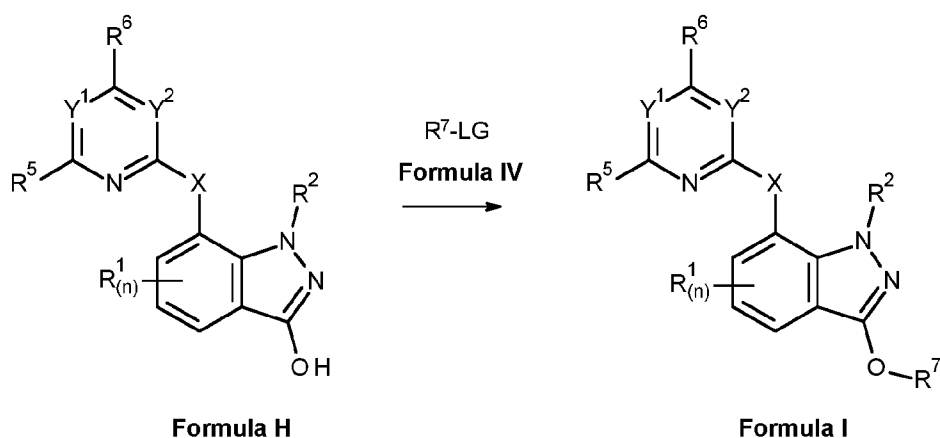
10 A compound of Formula E (where PG^1 is a suitable protecting group such as Tf) may be prepared from a compound of Formula F by reaction with a compound Formula G (where LG represents a suitable leaving group such as Cl, Br or I or a sulfonate derivative such as OMs, OTs or OTf), optionally in the presence of a suitable base and in a suitable solvent. Suitable bases may include Cs_2CO_3 ,
 15 K_2CO_3 or NaH. Suitable solvents may include DMF, THF or CH_3CN . Alternatively compounds of Formula F (such as where $\text{PG} = \text{Me}$) are commercially available or may be prepared by methods known in the literature. Compounds of Formula G are commercially available or may be prepared by methods known in the literature.

20 Scheme 7



A compound of Formula (I) may be prepared from a compound of Formula H by reaction with a compound of Formula (II) in the presence of a suitable coupling agent, in the presence of a suitable phosphine, in a suitable solvent. Suitable coupling agents may include isopropyl (E)-*N*-isopropoxycarbonyliminocarbamate. Suitable phosphines may include triphenyl phosphine. Suitable solvents may include THF. Compounds of Formula II are commercially available or may be prepared by methods known in the literature.

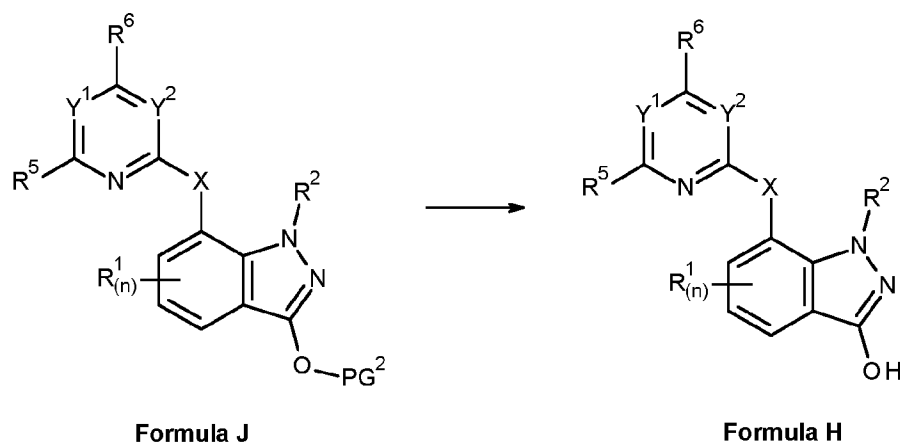
10 Scheme 8



Alternatively, a compound of Formula (I) may be prepared from a compound of Formula H by reaction with a compound of Formula (II) with a compound of Formula (IV) (where LG represents a suitable leaving group such as Cl, Br or I or a sulfonate derivative such as OMs, OTs or OTf), optionally in the presence of a suitable base and in a suitable solvent. Suitable bases may include Cs₂CO₃,

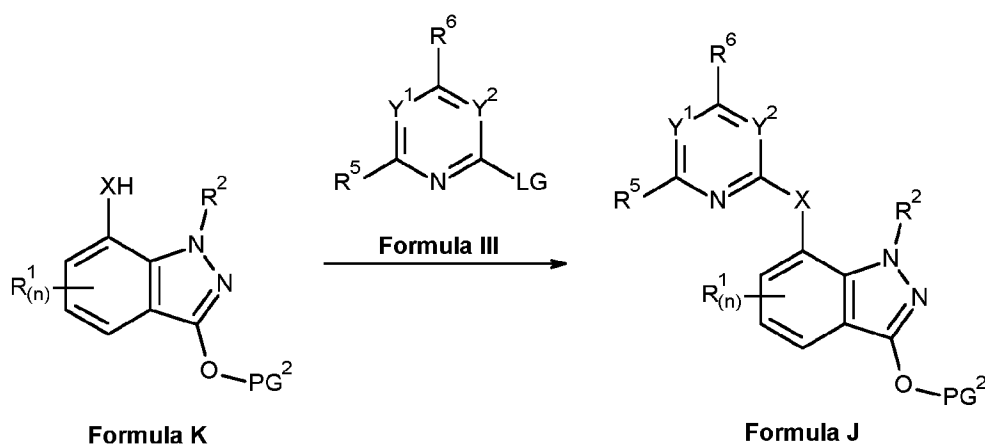
K_2CO_3 or NaH . Suitable solvents may include DMF, THF or CH_3CN . Compounds of Formula N are commercially available or may be prepared by methods known in the literature.

5 Scheme 9



- A compound of Formula H may be prepared from a compound of Formula J (where PG^2 is a suitable protecting group such as 4-methoxybenzyl) by a deprotection reaction in a suitable solvent. Suitable deprotecting conditions may include trifluoroacetic acid. Suitable solvents may include DCM.

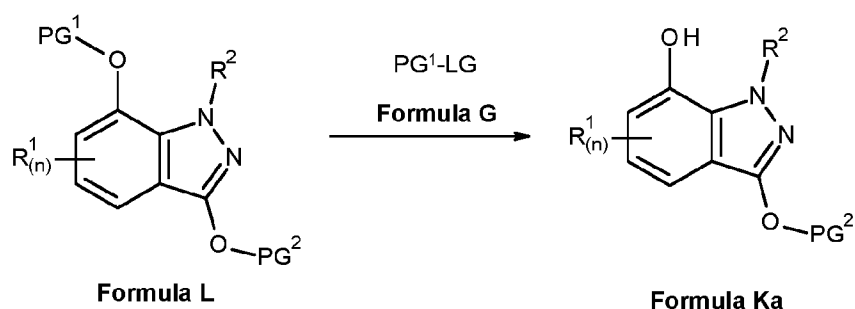
Scheme 10



A compound of Formula J may be prepared from a compound of Formula K by reaction with a compound of Formula III (where LG represents a suitable leaving group such as F, Cl, Br or SO_2Me) in the presence of a suitable base and in a

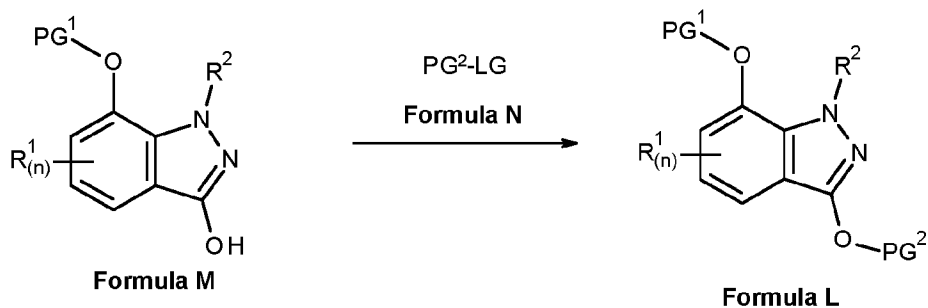
suitable solvent. Suitable bases may include NaH, K₂CO₃, Cs₂CO₃. Suitable solvents may include THF, CH₃CN or DMF. Compounds of Formula III are commercially available or may be prepared by methods known in the literature.

5 Scheme 11



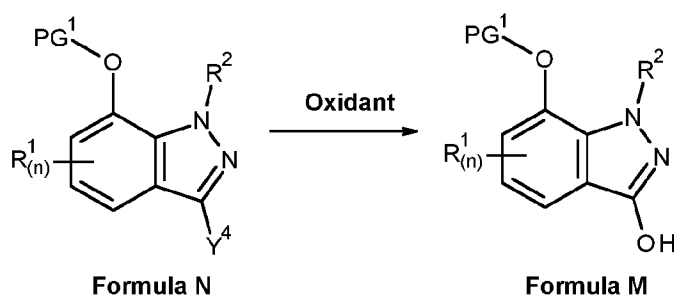
A compound of Formula Ka (a compound of Formula K where X = O) may be prepared from a compound of Formula L (where PG¹ represents a suitable protecting group such as Me) by a deprotection reaction in a suitable solvent. Suitable deprotecting conditions may include BBr₃, dodecanethiol/LiO^tBu, or sodium dodecane-1-thiolate. Suitable solvents may include DMF, DCM, DCE or CH₃CN.

Scheme 12



A compound of Formula L (where PG² is a suitable protecting group such as 4-methoxybenzyl) may be prepared from a compound of Formula M by reaction with a compound of Formula N (where LG represents a suitable leaving group such as Cl, Br or I or a sulfonate derivative such as OMs, OTs or OTf), optionally in the presence of a suitable base and in a suitable solvent. Suitable bases may include Cs₂CO₃, K₂CO₃ or NaH. Suitable solvents may include DMF, THF or CH₃CN. Compounds of Formula N are commercially available or may be prepared by methods known in the literature.

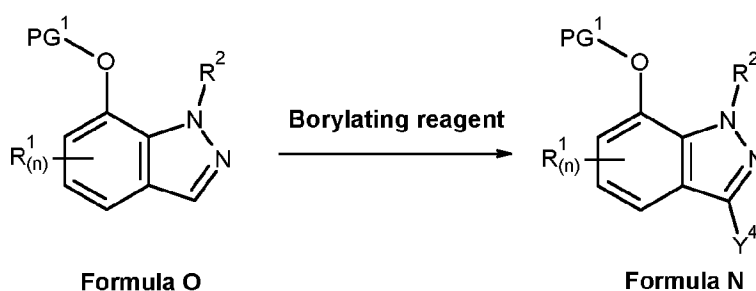
Scheme 13



- 5 A compound of Formula M may be prepared from a compound of Formula N (where Y^4 represents a boronic acid or ester such as a pinacol boronic ester) by reaction with a suitable oxidant in the presence of a suitable solvent, optionally in the presence of a suitable base. Suitable oxidants include H_2O_2 , suitable solvents include ethanol/water. Suitable bases include NaOH.

10

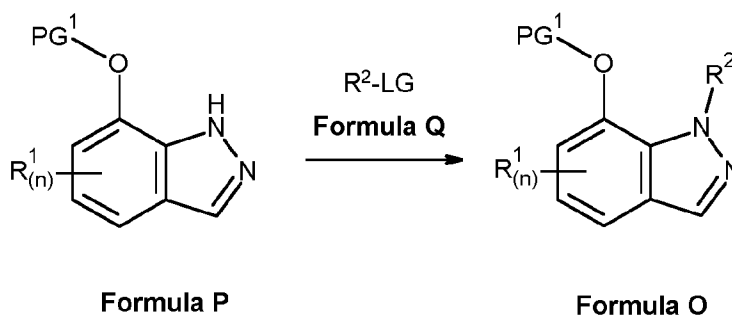
Scheme 14



- 15 A compound of Formula N (where Y^4 represents a boronic acid or ester such as a pinacol boronic ester) may be prepared from a compound of Formula O by reaction with a suitable borylating reagent in the presence of a suitable solvent, optionally in the presence of a suitable catalyst and/or a suitable base. Suitable borylating reagents may include 4,4,5,5-tetramethyl-2-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)-1,3,2-dioxaborolane. Suitable solvents may include tert-butyl methyl ether.
- 20 Suitable catalysts may include (1,5-cyclooctadiene)(methoxy)iridium(I) dimer. Suitable bases may include 4-tert-butyl-2-(4-tert-butyl-2-pyridyl)pyridine.

Scheme 15

25

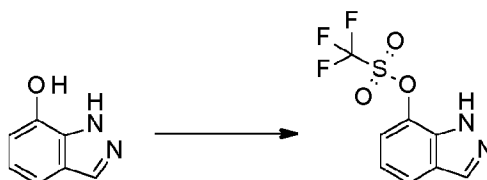


A compound of Formula O may be prepared from a compound of Formula P *via* reaction with a compound of Formula Q (where LG represents a suitable leaving group such as Cl, Br or I or a sulfonate derivative such as OMs, OTs or OTf), optionally in the presence of a suitable base and in a suitable solvent. Suitable bases may include Cs₂CO₃, K₂CO₃ or NaH. Suitable solvents may include DMF, THF or CH₃CN. Compounds of Formula Q and of Formula P are commercially available or may be prepared by methods known in the literature.

- 10 The following non-limiting examples provide specific synthesis methods for representative compounds of the present invention, as referred to in the Table below.

Example 1: Synthesis of 7-(5-fluoropyrimidin-2-yl)oxy-3-(tetrahydrofuran-3-ylmethoxy)-1-(4,4,4-trifluorobutyl)indazole (Compound 1.008)

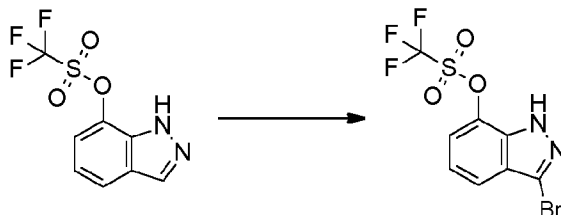
- 15 **Step 1: Synthesis of 1H-indazol-7-yl trifluoromethanesulfonate**



- A mixture of 1H-indazol-7-ol (5.00 g, 37.3 mmol) and caesium carbonate (12.2 g, 37.3 mmol) in THF (100 mL) was cooled to 0°C and treated portion-wise with 1,1,1-trifluoro-N-(2-pyridyl)-N-(trifluoromethylsulfonyl)methanesulfonamide (13.4 g, 37.3 mmol). The reaction mixture was stirred overnight at RT. The reaction mixture was diluted with water and extracted with ethyl acetate. The combined organic extracts were washed with water and brine, dried over MgSO₄ and evaporated to dryness under reduced pressure. The crude product was purified by flash chromatography on silica gel using a gradient of EtOAc in cyclohexane to give the desired product (7.35 g, 74%) as a colourless solid.
- 20
- 25

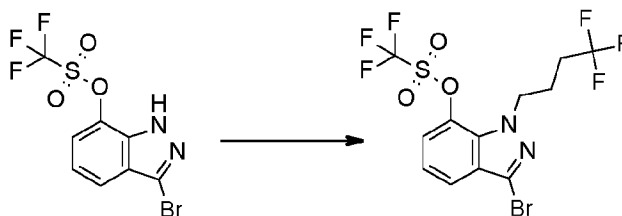
¹H NMR (400 MHz, CDCl₃) δ 10.72 (br s, 1 H), 8.21 (s, 1 H), 7.80 (dd, 1 H), 7.36 (d, 1 H), 7.22 (t, 1H)

Step 2: Synthesis of (3-bromo-1H-indazol-7-yl) trifluoromethanesulfonate



- 5 A solution of 1H-indazol-7-yl trifluoromethanesulfonate (4.20 g, 15.8 mmol) and *N*-bromosuccinimide (2.98 g, 16.6 mmol) in DMF (42 mL) was stirred overnight at RT. The reaction mixture was concentrated, and the crude product was purified by flash chromatography on silica gel using a gradient of EtOAc in cyclohexane to give the desired product (4.66 g, 86%) as a colourless solid.
- 10 ¹H NMR (400 MHz, CDCl₃) δ 10.39 (br s, 1H), 7.70 (d, 1 H), 7.43 (dd, 1 H), 7.29 (m, 1 H)

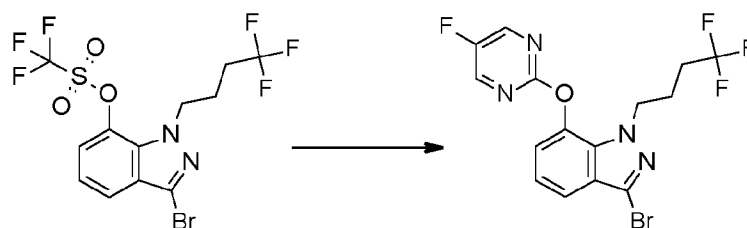
Step 3: Synthesis of [3-bromo-1-(4,4,4-trifluorobutyl)indazol-7-yl] trifluoromethanesulfonate



- 15 A solution of (3-bromo-1H-indazol-7-yl) trifluoromethanesulfonate (2.46 g, 7.12 mmol) and triphenylphosphine (2.45 g, 9.25 mmol) in chloroform (49 mL) was cooled to 0°C and treated with 4,4,4-trifluoro-1-butanol (1.20 g, 0.99 mL, 9.25 mmol) and diisopropyl azodicarboxylate (1.91 g, 1.86 mL, 9.25 mmol). The reaction mixture was stirred at RT for 2 hours. The reaction mixture was diluted with water and the
- 20 organics were removed under reduced pressure. The aqueous mixture was extracted with EtOAc and the combined organic extracts were washed with water and brine, dried over MgSO₄ and evaporated to dryness under reduced pressure. The crude product was purified by flash chromatography on silica gel using a gradient of EtOAc in cyclohexane to give the desired product (2.06 g, 64%) as a yellow oil.

¹H NMR (400 MHz, CDCl₃) δ 7.66 (dd, 1 H), 7.41 (d, 1 H), 7.25 (t, 1 H), 4.64 - 4.57 (m, 2 H), 2.26 - 2.13 (m, 4 H)

Step 4: Synthesis of 3-bromo-7-(5-fluoropyrimidin-2-yl)oxy-1-(4,4,4-trifluorobutyl)indazole

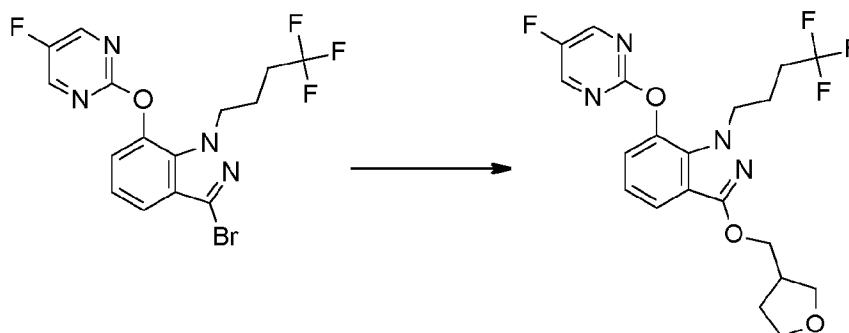


5

A solution of [3-bromo-1-(4,4,4-trifluorobutyl)indazol-7-yl] trifluoromethanesulfonate (1.97 g, 4.32 mmol) and 2-chloro-5-fluoro-pyrimidine (0.86 g, 0.80 mL, 6.48 mmol) in CH₃CN (16 mL) was treated with caesium carbonate (4.17 g, 21.6 mmol) and stirred at 80°C overnight. On completion the reaction mixture was cooled to RT, diluted with water and extracted with EtOAc. The combined organic extracts were washed with water and brine, dried over MgSO₄ and evaporated to dryness under reduced pressure. The crude product was purified by flash chromatography on silica gel using a gradient of EtOAc in cyclohexane to give the desired product (1.42 g, 78%) as a colourless solid.

¹H NMR (400 MHz, CDCl₃) δ 8.45 (s, 2H), 7.56 - 7.50 (m, 1H), 7.26 - 7.21 (m, 2H), 4.50 - 4.43 (m, 2H), 2.10 - 1.99 (m, 4H)

Step 5: Synthesis of 7-(5-fluoropyrimidin-2-yl)oxy-3-(tetrahydrofuran-3-ylmethoxy)-1-(4,4,4-trifluorobutyl)indazole (Compound 1.008)



A mixture of 3-bromo-7-(5-fluoropyrimidin-2-yl)oxy-1-(4,4,4-trifluorobutyl)indazole (100 mg, 0.239 mmol), tetrahydrofuran-3-ylmethanol (122 mg, 0.115 mL, 1.19 mmol), RockPhos Pd G3 (20 mg, 0.024 mmol) and caesium carbonate (117 mg, 0.358 mmol) in toluene (1 mL) was heated at 120°C for 1 hour under microwave irradiation.

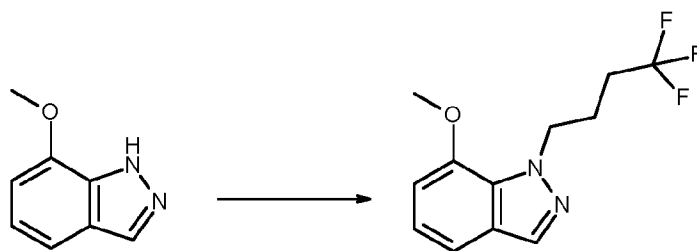
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The reaction mixture was diluted with aqueous ammonium chloride and extracted with EtOAc. The combined organic extracts were washed with water and brine, dried over MgSO_4 and evaporated to dryness under reduced pressure. The crude product was purified by HPLC to give the desired product (34 mg, 32%) as a colourless gum.

- 5 ^1H NMR (400 MHz, CDCl_3) δ 8.45 (s, 2H), 7.56 (dd, 1H), 7.15 (dd, 1H), 7.06 (t, 1H), 4.38 - 4.32 (m, 1H), 4.31 - 4.23 (m, 3H), 4.00 - 3.91 (m, 2H), 3.87 - 3.75 (m, 2H), 2.95 - 2.76 (m, 1H), 2.20 - 2.10 (m, 1H), 2.04 - 1.90 (m, 4H), 1.86 - 1.77 (m, 1H)

10 **Example 2: Synthesis of 7-(5-fluoropyrimidin-2-yl)oxy-3-(oxetan-3-ylmethoxy)-1-(4,4,4-trifluorobutyl)indazole (Compound 1.043)**

Step 1: Synthesis of 7-methoxy-1-(4,4,4-trifluorobutyl)indazole

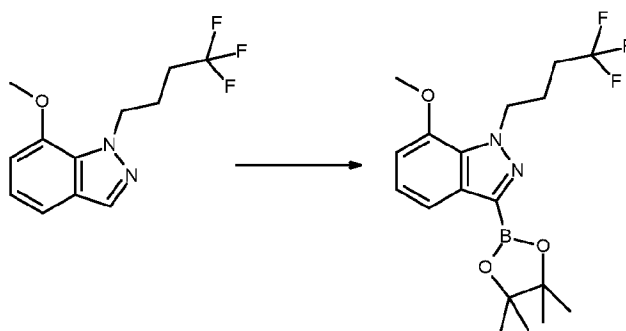


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- To a stirred suspension of 7-methoxy-1H-indazole (10.30 g, 67.43 mmol) and K_2CO_3 (11.41 g, 80.92 mmol) in CH_3CN (103 mL) at RT under an N_2 atmosphere was added 4-bromo-1,1,1-trifluoro-butane (15.77 g, 10.14 mL, 80.92 mmol) and the reaction warmed to 80 °C. The reaction was heated at 80°C for 3 hours and then Cs_2CO_3 (3.30g, 10.12 mmol) was added and the reaction stirred at 80°C overnight. Further 4-bromo-1,1,1-trifluoro-butane (2.628 g, 1.690 mL, 13.49 mmol) was added and the reaction stirred at 80°C for 3 hours. The reaction was cooled to RT and diluted with EtOAc (200 mL). Water was added (250 mL) and the phases were separated. The aqueous was extracted with EtOAc (2x 50 mL). The combined organic extracts were washed with brine and evaporated to dryness under reduced pressure. The crude product was purified by flash chromatography on silica gel using a gradient of 0-40% EtOAc/cyclohexane as eluent to give the desired product (10.66 g, 61%) as a colourless oil.

- 30 ^1H NMR (400 MHz, CDCl_3) δ 7.93 (s, 1H), 7.28 (dd, 1H), 7.04 (t, 1H), 6.72 (d, 1H), 4.72 (t, 2H), 3.98 (s, 3H), 2.27 - 1.93 (m, 4H)

Step 2: Synthesis of 7-methoxy-3-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)-1-(4,4,4-trifluorobutyl)indazole



5

To a flask charged with (1,5-cyclooctadiene)(methoxy)Iridium(I) dimer (0.261 g, 0.39 mmol), 4-tert-butyl-2-(4-tert-butyl-2-pyridyl)pyridine (0.216 g, 0.79 mmol) and 4,4,5,5-tetramethyl-2-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)-1,3,2-dioxaborolane (10.49 g, 41.31 mmol) under an N₂ atmosphere was added a solution of 7-methoxy-1-(4,4,4-trifluorobutyl)indazole (10.16 g, 39.34 mmol) degassed tert-butyl methyl ether (66 mL). The reaction was stirred rapidly at RT until all reagents had solubilised and then heated at reflux for 1.25 hours. The reaction was allowed to cool to RT, evaporated to dryness under reduced pressure and the crude product purified by flash chromatography on silica gel using a gradient of 0-60% EtOAc/cyclohexane as eluent to give the desired product (17.2g, quant.).

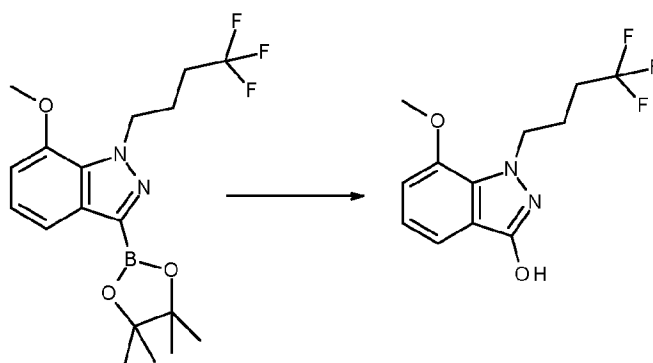
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¹H NMR (400 MHz, CDCl₃) δ 7.65 (dd, 1H), 7.09 (t, 1H), 6.72 (d, 1H), 4.79 (t, 2H), 3.97 (s, 3H), 2.16 (br s, 4H), 1.41 (s, 12H)

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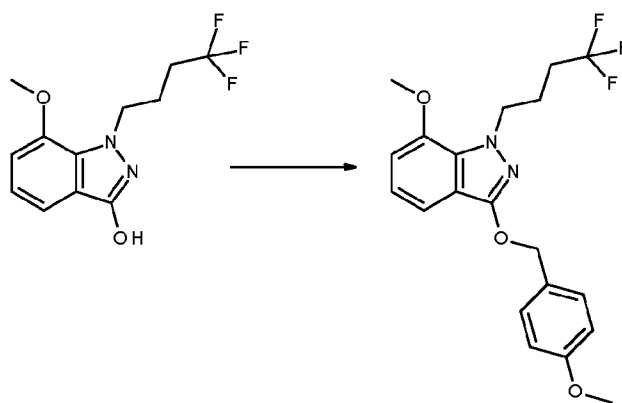
Step 3: Synthesis of 7-methoxy-1-(4,4,4-trifluorobutyl)indazol-3-ol



To a stirred solution of 7-methoxy-3-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)-1-(4,4,4-trifluorobutyl)indazole (11.00 g, 22.90 mmol) in ethanol (165 mL) under an N₂ atmosphere was added 2M NaOH (45.8 mL, 91.62 mmol). The reaction was cooled to 5°C and a 50% solution of H₂O₂ in water (1.95 mL, 34.36 mmol) was then added dropwise over 10 minutes at such a rate that the internal temperature did not exceed 10 °C. The reaction was stirred at 5°C for 1h and then allowed to warm to RT and stirred overnight. Further 50% solution of H₂O₂ in water (0.325 mL, 5.73 mmol) was added and the reaction stirred at RT for 2 hours. The reaction was quenched with 2M sodium thiosulphate (50 mL) and stirred rapidly at RT for 1h. The reaction mixture was diluted with water (500 mL) and extracted with EtOAc (4 x 100 mL). The combined organic extracts were washed with 2M sodium thiosulphate (3 x 50 mL) and brine and then evaporated to dryness under reduced pressure. The crude material was purified by flash chromatography on silica gel using a gradient of 0-80% EtOAc/cyclohexane as eluent to give the desired product (3.00g, 45%) as a white solid.

¹H NMR (400 MHz, CDCl₃) δ 7.31 (dd, 1H), 7.00 (t, 1H), 6.78 (d, 1H), 4.50 (t, 2H), 3.96 (s, 3H), 2.10 (br d, 4H)

Step 4: Synthesis of 7-methoxy-3-[(4-methoxyphenyl)methoxy]-1-(4,4,4-trifluorobutyl)indazole

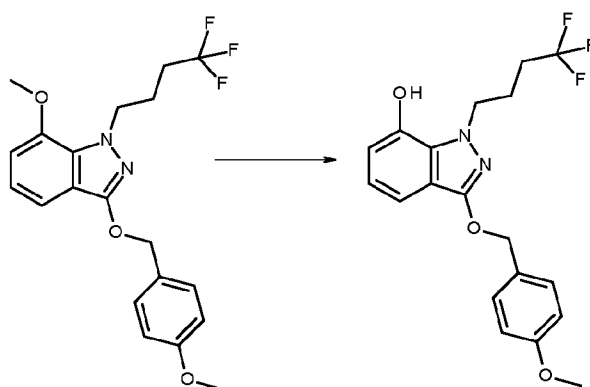


To a stirred suspension of 7-methoxy-1-(4,4,4-trifluorobutyl)indazol-3-ol (3.00 g, 9.85 mmol) and Cs₂CO₃ (3.85 g, 11.8 mmol) in CH₃CN (60 mL) at RT under an N₂ atmosphere was added 1-(chloromethyl)-4-methoxy-benzene (1.95 g, 1.69 mL, 11.8 mmol). The reaction was stirred at RT overnight, quenched with water and extracted with EtOAc. The combined organic extracts were dried over MgSO₄ and evaporated to dryness under reduced pressure. The crude product was purified by flash

chromatography on silica gel using a gradient of 0-80% EtOAc/cyclohexane as eluent to give the desired product (2.32g, 57%) as a colourless oil.

¹H NMR (400 MHz, CDCl₃) δ 7.50 - 7.40 (m, 2H), 7.22 (dd, 1H), 6.97 - 6.84 (m, 3H), 6.70 (d, 1H), 5.32 (s, 2H), 4.53 (t, 2H), 3.94 (s, 3H), 3.82 (s, 3H), 2.18 - 1.91 (m, 4H)

Step 5: 3-[(4-methoxyphenyl)methoxy]-1-(4,4,4-trifluorobutyl)indazol-7-ol



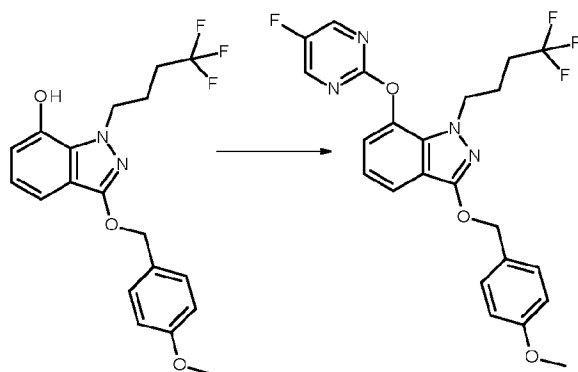
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To a stirred solution of 7-methoxy-3-[(4-methoxyphenyl)methoxy]-1-(4,4,4-trifluorobutyl)indazole (1.58 g, 3.80 mmol) in DMF (24 mL) was added sodium dodecane-1-thiolate (1.16 g, 4.56 mmol) at RT. The reaction was stirred at RT for 10 mins, then warmed to 85 °C overnight. The reaction was cooled to RT and further sodium dodecane-1-thiolate (1.26 g, 4.94 mmol) added. The reaction was stirred at 85°C for 3 hours, then further sodium dodecane-1-thiolate (0.48 g, 1.90 mmol) was added, and the reactions stirred at 85°C for 3 hours. Th reaction was cooled to RT, quenched with 2M HCl and extracted with EtOAc. The combined organic extracts were washed with brine, dried over MgSO₄ and evaporated to dryness under reduced pressure. The crude product was purified by flash chromatography on silica gel using a gradient of 0-60% EtOAc/cyclohexane as eluent to give the desired product (0.811g, 56%) as a dark-green oil.

¹H NMR (400 MHz, CDCl₃) δ 7.45 (d, 2H), 7.23 (dd, 1H), 6.92 (d, 2H), 6.83 (t, 1H), 6.62 (dd, 1H), 5.33 (s, 2H), 5.13 (br s, 1H), 4.54 (t, 2H), 3.82 (s, 3H), 2.17 - 1.96 (m, 4H)

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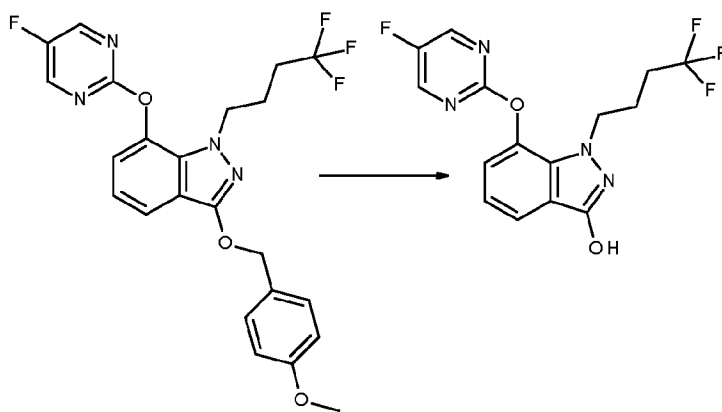
Step 6: Synthesis of 7-(5-fluoropyrimidin-2-yl)oxy-3-[(4-methoxyphenyl)methoxy]-1-(4,4,4-trifluorobutyl)indazole.



To a stirred solution of 3-[(4-methoxyphenyl)methoxy]-1-(4,4,4-trifluorobutyl)indazol-7-ol (0.811 g, 1.919 mmol) in CH₃CN (16 mL) under an N₂ atmosphere was added Cs₂CO₃ (0.75 g, 2.30 mmol) followed by 2-chloro-5-fluoropyrimidine (0.305 g, 2.30 mmol). The reaction was then heated to 75 °C overnight. The reaction was cooled to RT and evaporated to dryness under reduced pressure. The crude product was purified by flash chromatography on silica gel using a gradient of 0-60% EtOAc/cyclohexane as eluent to give the desired product (0.744 g, 77%) as a yellow oil.

¹H NMR (400 MHz, CDCl₃) δ 8.44 (s, 2H), 7.57 (dd, 1H), 7.45 (d, 2H), 7.13 (dd, 1H), 7.04 (t, 1H), 6.92 (d, 2H), 5.34 (s, 2H), 4.27 (t, 2H), 3.82 (s, 3H), 1.96 (s, 4H)

Step 7: Synthesis of 7-(5-fluoropyrimidin-2-yl)oxy-1-(4,4,4-trifluorobutyl)indazol-3-ol.

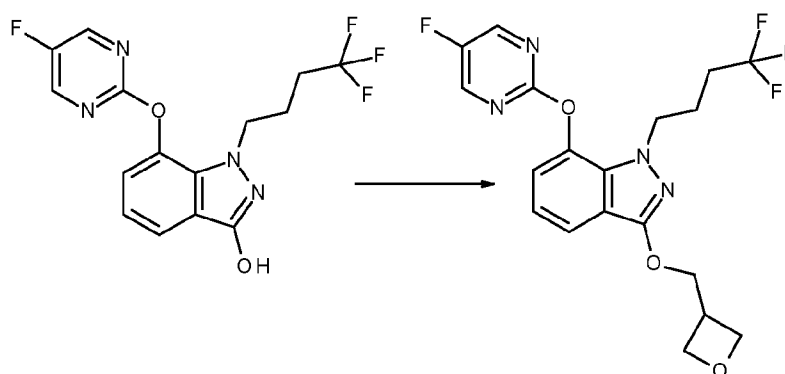


To a stirred solution of 7-(5-fluoropyrimidin-2-yl)oxy-3-[(4-methoxyphenyl)methoxy]-1-(4,4,4-trifluorobutyl)indazole (0.804 g, 1.69 mmol) in dichloromethane (20 mL) at RT

was added dropwise trifluoroacetic acid (1.29 mL, 16.9 mmol). The reaction was stirred at RT for 1.5 h, then evaporated to dryness under reduced pressure. The crude product was purified by flash chromatography on silica gel using a gradient of 0-100% EtOAc/cyclohexane as eluent to give the desired product (0.494g, 78%) as a pale-yellow solid.

¹H NMR (400 MHz, CDCl₃) δ 8.46 (s, 2H), 7.66 (dd, 1H), 7.22 (dd, 1H), 7.12 (t, 1H), 4.29 (t, 2H), 2.26 - 1.80 (m, 4H)

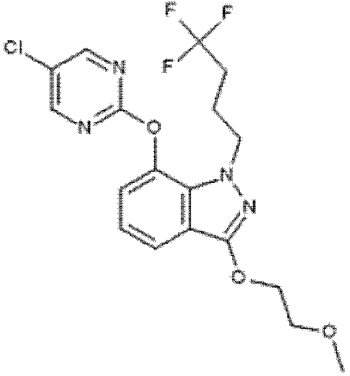
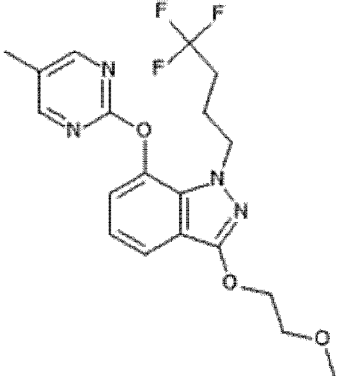
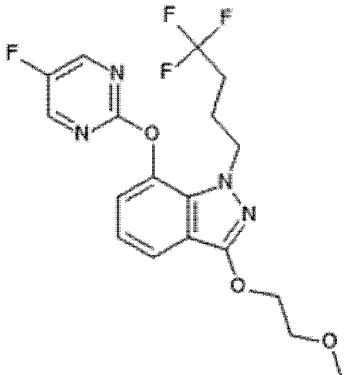
Step 8: Synthesis of 7-(5-fluoropyrimidin-2-yl)oxy-3-(oxetan-3-ylmethoxy)-1-(4,4,4-trifluorobutyl)indazole (Compound 1.043)

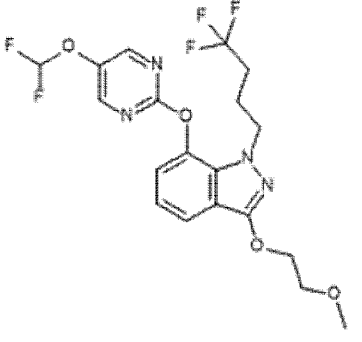
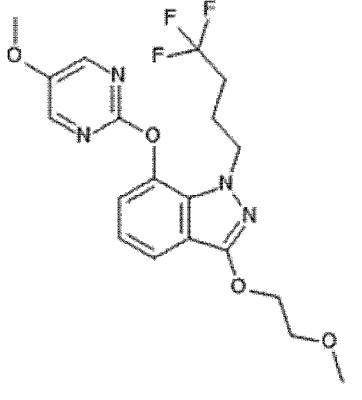
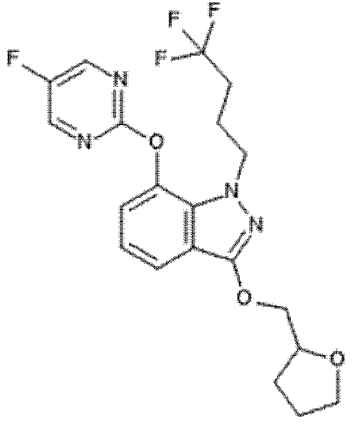


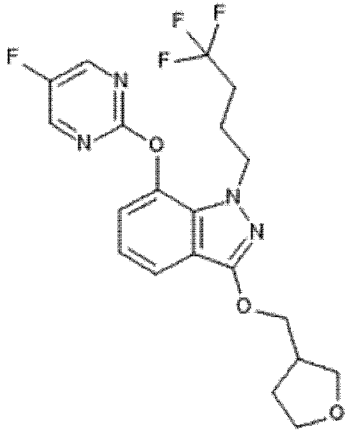
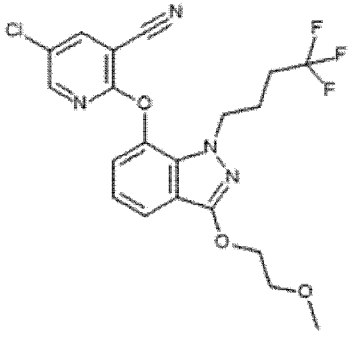
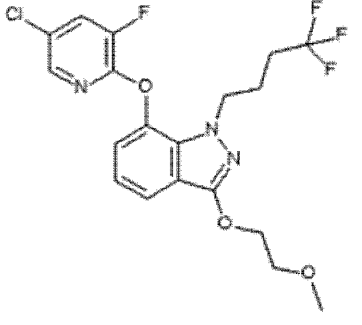
To a solution of 7-(5-fluoropyrimidin-2-yl)oxy-1-(4,4,4-trifluorobutyl)indazol-3-ol (0.05 g, 0.13 mmol), oxetan-3-ylmethanol (0.035 g, 0.032 mL, 0.40 mmol) and triphenylphosphine (0.105 g, 0.40 mmol) in THF (1.3 mL) at 0°C under an N₂ atmosphere was added dropwise isopropyl (E)-*N*-isopropoxycarbonyliminocarbamate (0.081 g, 0.079 mL, 0.40 mmol). The reaction was allowed to warm to RT and stirred for 1.5h. The reaction was evaporated to dryness under reduced pressure and the crude product purified by reverse phase flash chromatography on C-18 silica gel using a gradient of 30-100% CH₃CN/water (+0.1% formic acid) as eluent to give the desired product (0.046 g, 77%) as an off-white solid.

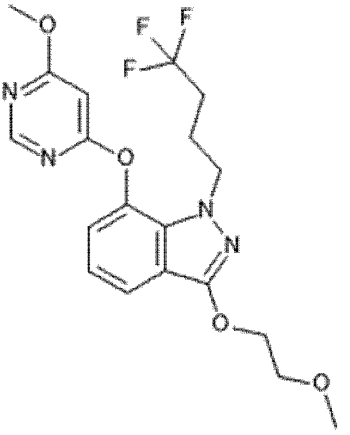
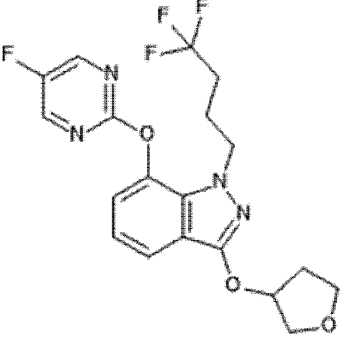
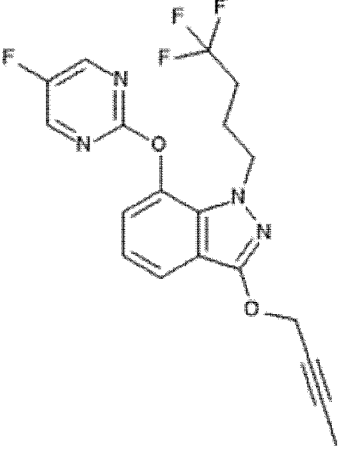
¹H NMR (400 MHz, CDCl₃) δ 8.44 (s, 2H), 7.56 (dd, 1H), 7.15 (dd, 1H), 7.06 (t, 1H), 4.90 (dd, 2H), 4.64 (t, 2H), 4.60 (d, 2H), 4.26 (t, 2H), 3.63 - 3.47 (m, 1H), 2.17 - 1.76 (m, 4H)

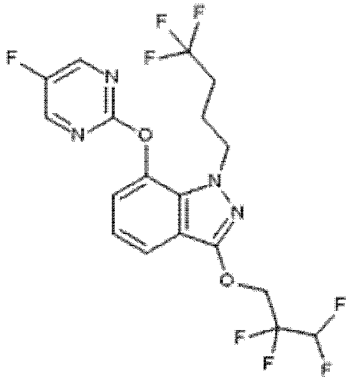
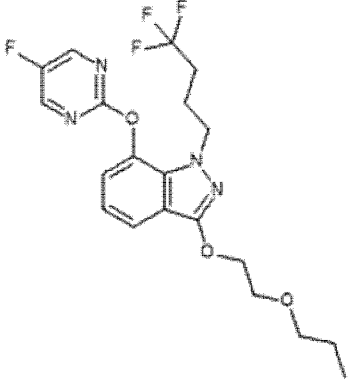
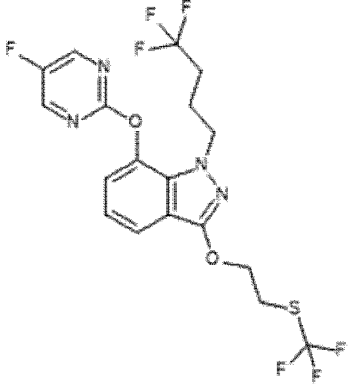
Table 1 – Examples of herbicidal compounds of the present invention.

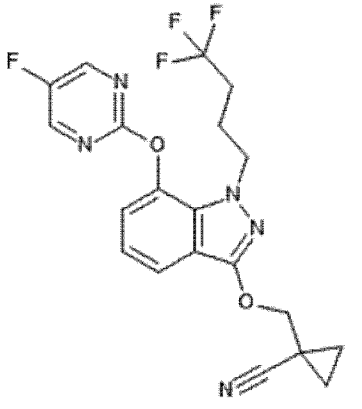
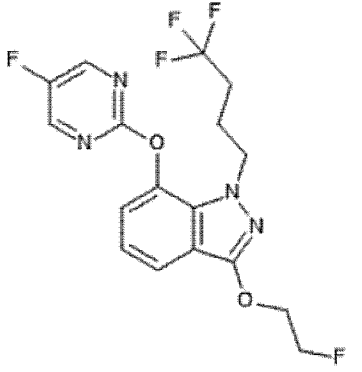
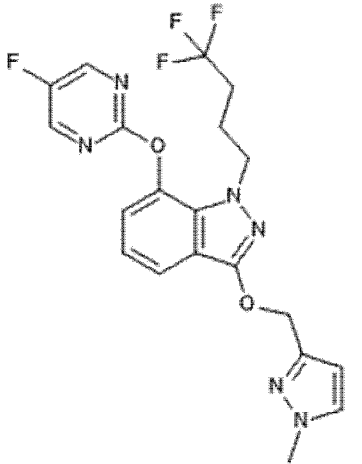
Compound	Structure	¹ H NMR (400 MHz, CDCl ₃ unless stated)
1.001		8.52 (s, 2H), 7.61 (dd, 1H), 7.13 (dd, 1H), 7.05 (t, 1H), 4.56-4.51 (m, 2H), 4.29-4.20 (m, 2H), 3.85-3.79 (m, 2H), 3.47 (s, 3H), 2.07-1.89 (m, 4H)
1.003		8.39 (s, 2H), 7.59 (dd, 1H), 7.13 (dd, 1H), 7.04 (t, 1H), 4.55 - 4.50 (m, 2H), 4.25 (t, 2H), 3.84 - 3.80 (m, 2H), 3.47 (s, 3H), 2.28 (s, 3H), 2.05 - 1.86 (m, 4H)
1.004		8.44 (s, 2H), 7.61 (dd, 1H), 7.13 (dd, 1H), 7.05 (t, 1H), 4.56 - 4.50 (m, 2H), 4.25 (t, 2H), 3.85 - 3.79 (m, 2H), 3.47 (s, 3H), 2.07 - 1.89 (m, 4H)

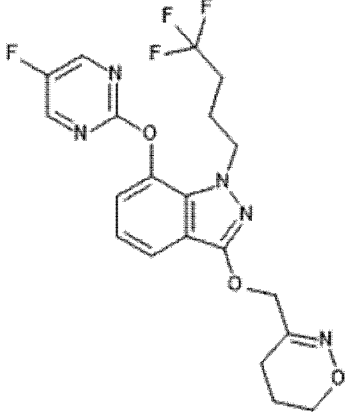
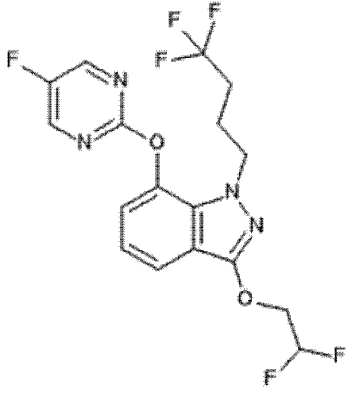
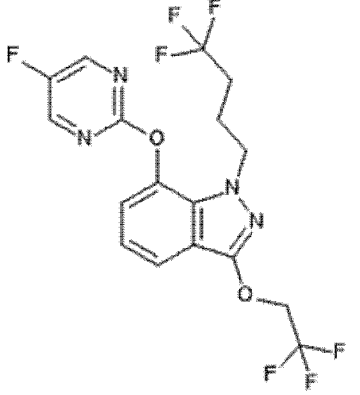
Compound	Structure	¹ H NMR (400 MHz, CDCl ₃ unless stated)
1.005		8.45 (s, 2H), 7.61 (dd, 1H), 7.15 (dd, 1H), 7.05 (t, 1H), 6.54 (t, 1H), 4.56 - 4.50 (m, 2H), 4.26 (t, 2H), 3.85 - 3.79 (m, 2H), 3.47 (s, 3H), 2.05 - 1.89 (m, 4H)
1.006		8.24 (s, 2H), 7.58 (dd, 1H), 7.12 (dd, 1H), 7.03 (t, 1H), 4.55 - 4.50 (m, 2H), 4.27 (t, 2H), 3.89 (s, 3H), 3.85 - 3.80 (m, 2H), 3.47 (s, 3H), 2.05 - 1.88 (m, 4H)
1.007		(500 MHz) 8.43 (s, 2H), 7.60 (dd, 1H), 7.13 (dd, 1H), 7.04 (t, 1H), 4.43 - 4.31 (m, 3H), 4.25 (t, 2H), 4.00 - 3.94 (m, 1H), 3.89 - 3.84 (m, 1H), 2.15 - 2.06 (m, 1H), 2.05 - 1.89 (m, 6H), 1.85 - 1.75 (m, 1H)

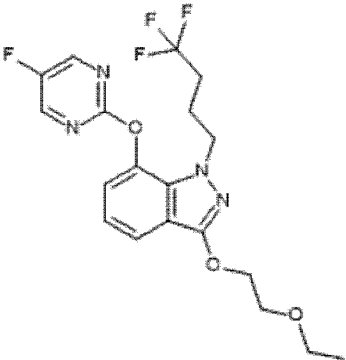
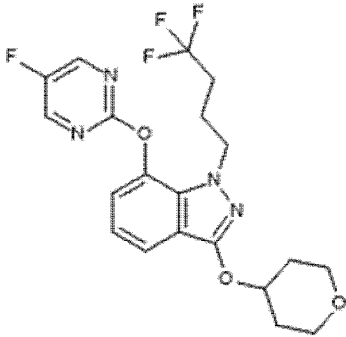
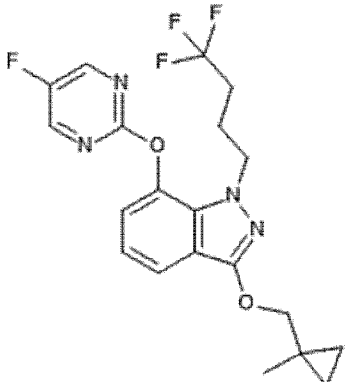
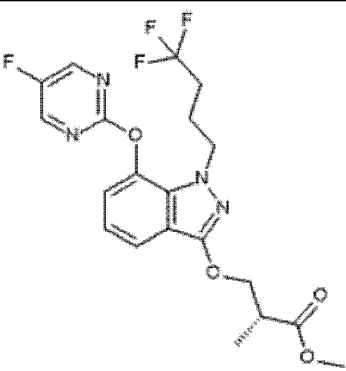
Compound	Structure	¹ H NMR (400 MHz, CDCl ₃ unless stated)
1.008		7.56 (dd, 1H), 7.15 (dd, 1H), 7.06 (t, 1H), 4.38 - 4.32 (m, 1H), 4.31 - 4.23 (m, 3H), 4.00 - 3.91 (m, 2H), 3.87 - 3.75 (m, 2H), 2.95 - 2.76 (m, 1H), 2.20 - 2.10 (m, 1H), 2.04 - 1.90 (m, 4H), 1.86 - 1.77 (m, 1H)
1.009		8.25 (d, 1H), 8.04 (d, 1H), 7.63 (dd, 1H), 7.15 (dd, 1H), 7.05 (t, 1H), 4.63 - 4.44 (m, 2H), 4.28 (t, 2H), 3.86 - 3.79 (m, 2H), 3.47 (s, 3H), 2.11 - 1.95 (m, 4H)
1.010		7.91 (d, 1H), 7.61 - 7.55 (m, 2H), 7.11 (dd, 1H), 7.02 (t, 1H), 4.56 - 4.50 (m, 2H), 4.30 (t, 2H), 3.85 - 3.80 (m, 2H), 3.47 (s, 3H), 2.10 - 1.96 (m, 4H)

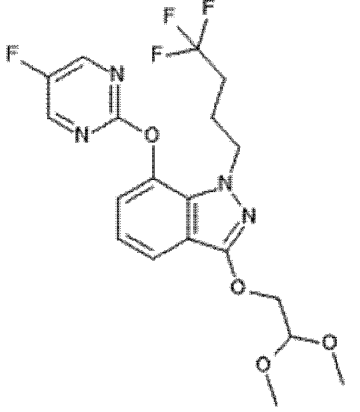
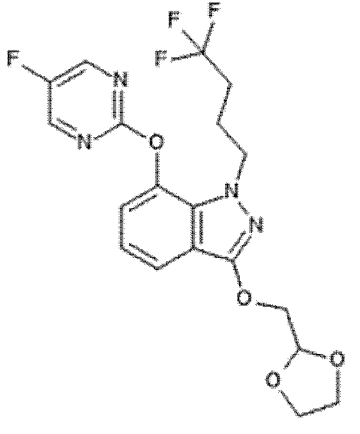
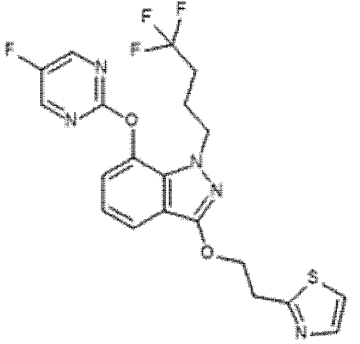
Compound	Structure	¹ H NMR (400 MHz, CDCl ₃ unless stated)
1.011		8.47 (d, 1H), 7.61 (dd, 1H), 7.10 - 7.00 (m, 2H), 6.18 (d, 1H), 4.55 - 4.50 (m, 2H), 4.24 - 4.16 (m, 2H), 3.99 (s, 3H), 3.85 - 3.80 (m, 2H), 3.47 (s, 3H), 2.06 - 1.91 (m, 4H)
1.012		(500 MHz) 8.44 (s, 2H), 7.55 (dd, 1H), 7.14 (dd, 1H), 7.05 (t, 1H), 5.45 - 5.40 (m, 1H), 4.26 (t, 2H), 4.10 - 4.01 (m, 3H), 3.95 - 3.89 (m, 1H), 2.32 - 2.24 (m, 2H), 2.04 - 1.90 (m, 4H)
1.013		(500 MHz) 8.44 (s, 2H), 7.60 (dd, 1H), 7.14 (dd, 1H), 7.06 (t, 1H), 4.97 (q, 2H), 4.28 (t, 2H), 2.10 - 1.91 (m, 4H), 1.88 (t, 3H)

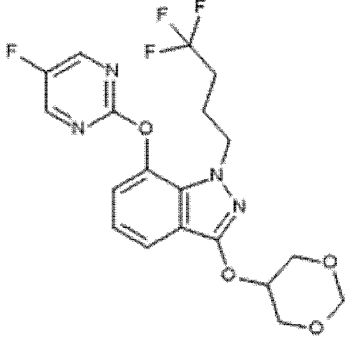
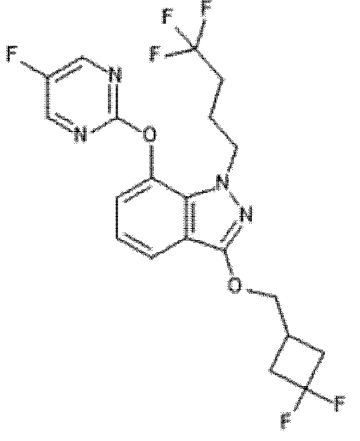
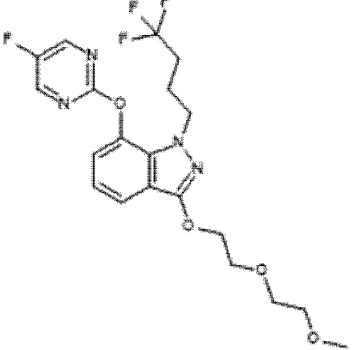
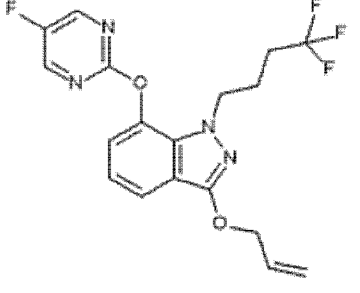
Compound	Structure	¹ H NMR (400 MHz, CDCl ₃ unless stated)
1.014		(500 MHz) 8.44 (s, 2H), 7.56 (dd, 1H), 7.18 (dd, 1H), 7.10 (t, 1H), 6.07 (tt, 1H), 4.77 (t, 2H), 4.28 (t, 2H), 2.09 - 1.91 (m, 4H)
1.015		(500 MHz) 8.44 (s, 2H), 7.60 (d, 1H), 7.13 (d, 1H), 7.05 (t, 1H), 4.55 - 4.48 (m, 2H), 4.25 (t, 2H), 3.88 - 3.83 (m, 2H), 3.52 (t, 2H), 2.03 - 1.90 (m, 4H), 1.64 (sxt, 2H), 0.94 (t, 3H)
1.016		(500 MHz) 8.44 (s, 2H), 7.55 (dd, 1H), 7.15 (dd, 1H), 7.07 (t, 1H), 4.61 (t, 2H), 4.26 (t, 2H), 3.37 (t, 2H), 2.06 - 1.91 (m, 4H)

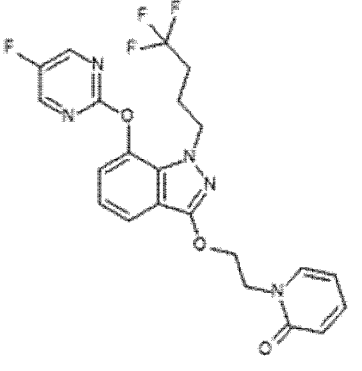
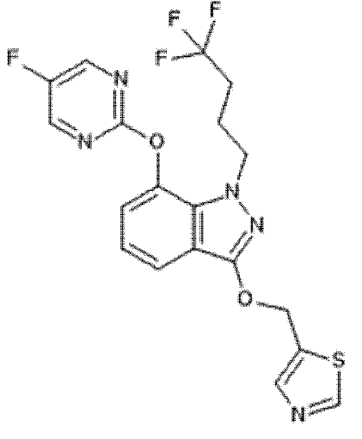
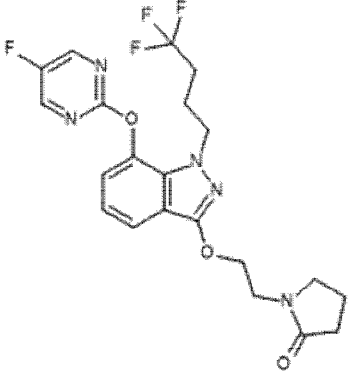
Compound	Structure	¹ H NMR (400 MHz, CDCl ₃ unless stated)
1.017		(500 MHz) 8.44 (s, 2H), 7.63 (dd, 1H), 7.16 (dd, 1H), 7.09 (t, 1H), 4.35 (s, 2H), 4.25 (t, 2H), 2.05 - 1.90 (m, 4H), 1.46 - 1.40 (m, 2H), 1.23 - 1.18 (m, 2H)
1.018		(500 MHz) 8.44 (s, 2H), 7.60 (d, 1H), 7.15 (d, 1H), 7.07 (t, 1H), 4.89 - 4.85 (m, 1H), 4.80 - 4.76 (m, 1H), 4.67 - 4.63 (m, 1H), 4.61 - 4.57 (m, 1H), 4.26 (t, 2H), 2.06 - 1.91 (m, 4H)
1.019		(500 MHz) 8.44 (s, 2H), 7.57 (dd, 1H), 7.34 (d, 1H), 7.12 (dd, 1H), 7.02 (t, 1H), 6.40 (d, 1H), 5.41 (s, 2H), 4.28 (t, 2H), 3.92 (s, 3H), 2.06 - 1.91 (m, 4H)

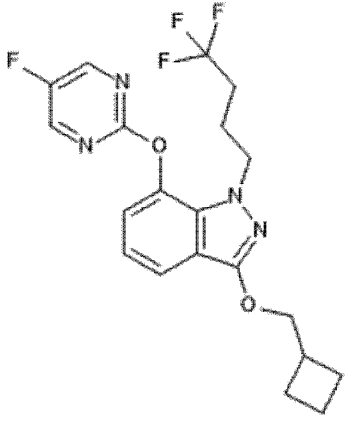
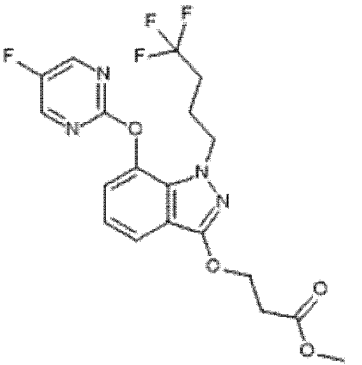
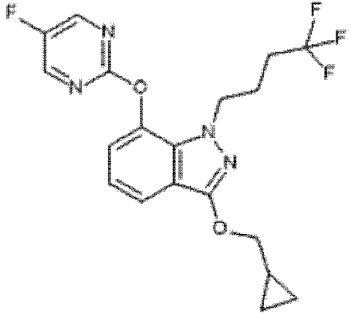
Compound	Structure	¹ H NMR (400 MHz, CDCl ₃ unless stated)
1.020		(500 MHz) 8.44 (s, 2H), 7.56 (dd, 1H), 7.15 (dd, 1H), 7.07 (t, 1H), 4.94 (s, 2H), 4.27 (t, 2H), 4.06 - 4.00 (m, 2H), 2.38 (t, 2H), 2.06 - 1.91 (m, 6H)
1.021		(500 MHz) 8.44 (s, 2H), 7.57 (dd, 1H), 7.17 (dd, 1H), 7.09 (t, 1H), 6.21 (tt, 1H), 4.57 (dt, 2H), 4.27 (t, 2H), 2.06 - 1.92 (m, 4H)
1.022		(500 MHz) 8.44 (s, 2H), 7.60 (dd, 1H), 7.18 (dd, 1H), 7.10 (t, 1H), 4.76 (q, 2H), 4.27 (t, 2H), 2.01 (s, 4H)

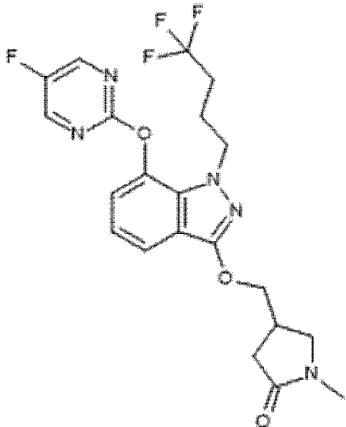
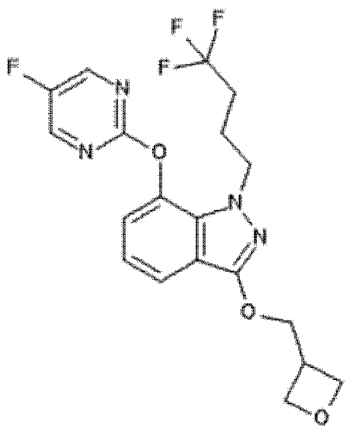
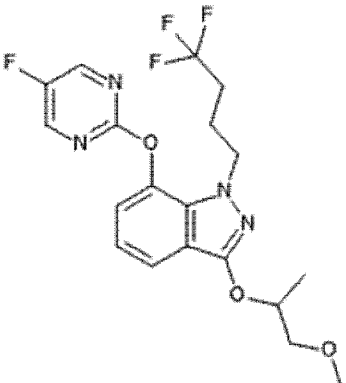
Compound	Structure	¹ H NMR (400 MHz, CDCl ₃ unless stated)
1.023		(500 MHz) 8.44 (s, 2H), 7.60 (dd, 1H), 7.13 (dd, 1H), 7.05 (t, 1H), 4.54 - 4.50 (m, 2H), 4.25 (t, 2H), 3.88 - 3.84 (m, 2H), 3.62 (q, 2H), 2.04 - 1.91 (m, 4H), 1.25 (t, 3H)
1.024		(500 MHz) 8.44 (s, 2H), 7.57 (dd, 1H), 7.14 (dd, 1H), 7.06 (t, 1H), 5.04 - 4.99 (m, 1H), 4.25 (t, 2H), 4.06 - 4.00 (m, 2H), 3.66 - 3.59 (m, 2H), 2.21 - 2.10 (m, 2H), 2.04 - 1.85 (m, 6H)
1.025		(500 MHz) 8.43 (s, 2H), 7.62 (dd, 1H), 7.13 (dd, 1H), 7.05 (t, 1H), 4.24 (t, 2H), 4.14 (s, 2H), 2.05 - 1.89 (m, 4H), 1.27 (s, 3H), 0.65 - 0.58 (m, 2H), 0.46 - 0.43 (m, 2H)
1.026		(500 MHz) 8.43 (s, 2H), 7.54 (dd, 1H), 7.13 (dd, 1H), 7.05 (t, 1H), 4.57 (dd, 1H), 4.40 (dd, 1H), 4.25 (t, 2H), 3.73 (s, 3H), 3.12 - 3.05 (m, 1H), 2.06 - 1.90 (m, 4H), 1.33 (d, 3H)

Compound	Structure	¹ H NMR (400 MHz, CDCl ₃ unless stated)
1.027		(500 MHz) 8.44 (s, 2H), 7.59 (dd, 1H), 7.14 (dd, 1H), 7.05 (t, 1H), 4.84 (t, 1H), 4.41 (d, 2H), 4.26 (t, 2H), 3.48 (s, 6H), 2.05 - 1.90 (m, 4H)
1.028		(500 MHz) 8.43 (s, 2H), 7.59 (dd, 1H), 7.14 (dd, 1H), 7.05 (t, 1H), 5.40 (t, 1H), 4.43 (d, 2H), 4.25 (t, 2H), 4.12 - 4.04 (s, 2H), 4.02 - 3.95 (s, 2H), 2.05 - 1.90 (m, 4H)
1.029		(500 MHz) 8.44 (s, 2H), 7.74 (d, 1H), 7.56 (dd, 1H), 7.27 - 7.25 (m, 1H), 7.14 (dd, 1H), 7.05 (t, 1H), 4.74 (t, 2H), 4.25 (t, 2H), 3.61 (t, 2H), 2.07 - 1.90 (m, 4H)

Compound	Structure	¹ H NMR (400 MHz, CDCl ₃ unless stated)
1.030		(500 MHz) 8.44 (s, 2H), 7.57 (dd, 1H), 7.15 (dd, 1H), 7.06 (t, 1H), 5.12 (s, 1H), 4.98 (s, 1H), 4.57 - 4.51 (m, 1H), 4.48 - 4.39 (m, 2H), 4.26 (t, 2H), 4.12 - 4.06 (m, 1H), 3.91 - 3.85 (m, 1H), 2.06 - 1.91 (m, 4H)
1.031		(500 MHz) 8.44 (s, 2H), 7.55 (dd, 1H), 7.15 (dd, 1H), 7.06 (t, 1H), 4.41 (d, 2H), 4.26 (t, 2H), 2.81 - 2.49 (m, 5H), 2.07 - 1.90 (m, 4H)
1.032		(500 MHz) 8.43 (s, 2H), 7.59 (dd, 1H), 7.13 (dd, 1H), 7.04 (t, 1H), 4.58 - 4.50 (m, 2H), 4.25 (t, 2H), 3.96 - 3.92 (m, 2H), 3.77 - 3.72 (m, 2H), 3.62 - 3.57 (m, 2H), 3.40 (s, 3H), 2.05 - 1.88 (m, 4H)
1.033		(500 MHz) 8.44 (s, 2H), 7.80 (dd, 1H), 7.35 (dd, 1H), 7.26 (t, 1H), 5.87 - 5.75 (m, 1H), 5.28 - 5.17 (m, 2H), 4.50 - 4.47 (m, 2H), 3.89 - 3.82 (m, 2H), 1.97 - 1.86 (m, 2H), 1.56 - 1.46 (m, 2H)

Compound	Structure	¹ H NMR (400 MHz, CDCl ₃ unless stated)
1.035		8.43 (s, 2H), 7.48 (dd, 1H), 7.41 - 7.32 (m, 2H), 7.14 (dd, 1H), 7.05 (t, 1H), 6.63 (d, 1H), 6.17 (dt, 1H), 4.70 (t, 2H), 4.43 (t, 2H), 4.24 (t, 2H), 2.04 - 1.87 (m, 4H)
1.036		(500 MHz) 8.82 (s, 1H), 8.44 (s, 2H), 8.00 (s, 1H), 7.53 (dd, 1H), 7.15 (dd, 1H), 7.06 (t, 1H), 5.64 (s, 2H), 4.33 - 4.26 (m, 2H), 2.06 - 1.95 (m, 4H)
1.037		(500 MHz) 8.44 (s, 2H), 7.53 (dd, 1H), 7.18 - 7.10 (m, 1H), 7.06 (t, 1H), 4.51 (t, 2H), 4.25 (t, 2H), 3.77 (t, 2H), 3.60 (t, 2H), 2.41 (t, 2H), 2.08 - 1.91 (m, 6H)

Compound	Structure	¹ H NMR (400 MHz, CDCl ₃ unless stated)
1.038		(500 MHz) 8.43 (s, 2H), 7.57 (dd, 1H), 7.13 (dd, 1H), 7.04 (t, 1H), 4.33 (d, 2H), 4.25 (t, 2H), 2.91 - 2.79 (m, 1H), 2.21 - 2.11 (m, 2H), 2.05 - 1.88 (m, 8H)
1.039		(500 MHz) 8.44 (s, 2H), 7.54 (dd, 1H), 7.13 (dd, 1H), 7.05 (t, 1H), 4.65 (t, 2H), 4.25 (t, 2H), 3.74 (s, 3H), 2.90 (t, 2H), 2.06 - 1.91 (m, 4H)
1.040		(500 MHz) 8.43 (s, 2H), 7.61 (dd, 1H), 7.13 (dd, 1H), 7.05 (t, 1H), 4.24 (t, 2H), 4.19 (d, 2H), 2.05 - 1.89 (m, 4H), 1.42 - 1.33 (m, 1H), 0.69 - 0.61 (m, 2H), 0.44 - 0.38 (m, 2H)

Compound	Structure	¹ H NMR (400 MHz, CDCl ₃ unless stated)
1.042		(500 MHz) 8.44 (s, 2H), 7.53 (dd, 1H), 7.15 (dd, 1H), 7.07 (t, 1H), 4.39 (dd, 1H), 4.32 (dd, 1H), 4.26 (t, 2H), 3.61 (dd, 1H), 3.38 (dd, 1H), 3.02 - 2.91 (m, 1H), 2.88 (s, 3H), 2.69 - 2.60 (m, 1H), 2.38 (dd, 1H), 2.07 - 1.91 (m, 4H)
1.043		8.44 (s, 2H), 7.56 (dd, 1H), 7.15 (dd, 1H), 7.06 (t, 1H), 4.90 (dd, 2H), 4.64 (t, 2H), 4.60 (d, 2H), 4.26 (t, 2H), 3.63 - 3.47 (m, 1H), 2.17 - 1.76 (m, 4H)
1.044		8.44 (s, 2H), 7.58 (dd, 1H), 7.12 (dd, 1H), 7.04 (t, 1H), 5.14 (dquin, 1H), 4.25 (t, 2H), 3.68 (dd, 1H), 3.61 (dd, 1H), 3.43 (s, 3H), 2.13 - 1.83 (m, 4H), 1.43 (d, 3H)

Biological Examples

- Seeds of a variety of test species are sown in standard soil in pots *Amaranthus retroflexus* (AMARE), *Abutilon theophrasti* (ABUTH), *Echinochloa crus-galli* (ECHCG),
- 5 *Setaria faberi* (SETFA) *Ipomoea hederacea* (IOPHE)). After cultivation for one day

(pre-emergence) or after 8 days cultivation (post-emergence) under controlled conditions in a glasshouse (at 24/16°C, day/night; 14 hours light; 65 % humidity), the plants are sprayed with an aqueous spray solution derived from the formulation of the technical active ingredient in acetone / water (50:50) solution containing 0.5% Tween™ 20 (polyoxyethelyene sorbitan monolaurate, CAS RN 9005-64-5). Compounds are applied at 250 g/ha unless otherwise stated. The test plants are then grown in a glasshouse under controlled conditions in a glasshouse (at 24/16°C, day/night; 14 hours light; 65 % humidity) and watered twice daily. After 13 days for pre- and post-emergence, the test is evaluated for the percentage damage caused to the plant. The biological activities are shown in the following table on a five-point scale (5 = 81-100%; 4 = 61-80%; 3=41-60%; 2=21-40%; 1=0-20%).

TABLE B1 Post-emergence Test

Compound	AMARE	ABUTH	SETFA	ECHCG	IPOHE
1.001	5	5	5	5	4
1.003	5	5	5	5	5
1.004	2	5	5	5	5
1.005	1	2	2	1	2
1.006	3	4	4	4	4
1.007	4	5	5	5	5
1.008	4	5	5	5	5
1.009	4	NT	2	2	2
1.010	4	4	4	3	3
1.011	1	1	1	1	2
1.012	2	NT	4	3	2
1.013	5	5	5	5	4
1.015	5	5	5	5	5
1.016	4	3	4	3	4
1.018	5	5	5	5	5
1.019	3	5	5	5	5
1.020	2	3	4	4	3
1.022	5	5	5	5	5
1.023	4	5	5	5	5
1.024	2	1	2	1	2
1.025	4	4	3	4	4
1.027	3	5	5	5	5
1.031	5	4	4	4	5
1.032	4	4	5	4	5
1.033	5	5	4	4	4
1.035	3	4	2	2	3
1.037	2	3	1	1	3

Compound	AMARE	ABUTH	SETFA	ECHCG	IPOHE
1.038	5	5	5	5	4
1.040	4	5	5	5	4
1.042	4	3	NT	2	2
1.043	1	3	4	4	3
1.044	4	4	4	4	3

NT = Not Tested.

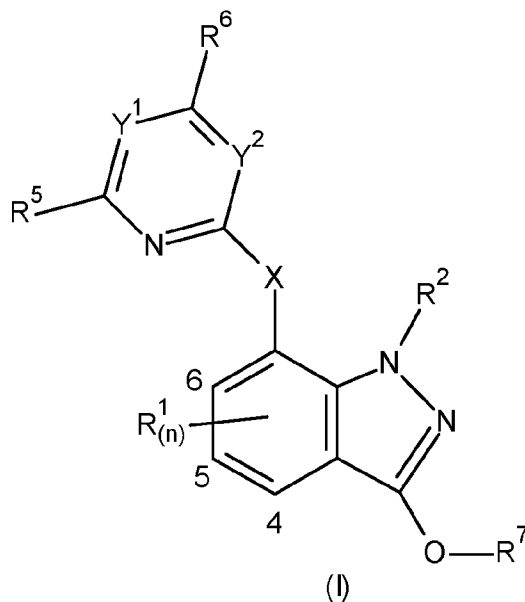
TABLE B2 Pre-emergence Test

Compound	AMARE	ABUTH	SETFA	ECHCG	IPOHE
1.001	5	2	5	5	2
1.003	5	5	5	5	5
1.004	5	4	5	5	5
1.005	1	1	2	1	1
1.006	4	2	4	4	2
1.007	5	2	5	5	2
1.008	5	4	5	5	3
1.009	3	NT	2	4	1
1.010	4	1	5	5	1
1.011	1	1	1	NT	1
1.012	1	1	5	4	2
1.013	5	2	5	5	2
1.015	5	3	5	5	3
1.016	1	4	1	1	1
1.018	5	5	5	5	4
1.019	NT	4	5	5	4
1.020	1	3	5	4	1
1.022	5	1	5	5	1
1.023	5	5	5	5	5
1.024	1	1	1	1	1
1.025	2	3	5	2	1
1.027	5	5	5	5	5
1.031	3	2	5	4	1
1.032	5	5	5	5	5
1.033	5	5	5	3	5
1.035	3	4	1	1	2
1.037	3	1	2	2	1
1.038	4	2	5	5	1
1.040	2	2	5	5	1
1.042	3	4	1	1	1
1.043	2	2	5	3	1
1.044	3	3	5	5	4

NT = Not Tested.

CLAIMS

1. A compound of Formula (I):



5

or an agronomically acceptable salt thereof,

wherein

10

X is O or S(O)_p;

Y¹ is N or CR³;

Y² is N or CR⁴;

15

with the proviso that Y¹ and Y² are not both N;

each R¹ is independently selected from the group consisting of halogen, -CN, nitro, C₁-C₄alkyl, C₂-C₄alkenyl, C₂-C₄alkynyl, C₁-C₄haloalkyl, C₁-C₄alkoxy-, C₁-C₄haloalkoxy-, -S(O)_pC₁-C₄alkyl and -S(O)_pC₁-C₄haloalkyl;

20

R² is C₃-C₈ fluoroalkyl;

R³ is selected from the group consisting of hydrogen, halogen, -CN, nitro, C₁-C₄alkyl, C₂-C₄alkenyl-, C₂-C₄alkynyl-, C₁-C₄haloalkyl-, C₁-C₄alkoxy-, C₁-C₄haloalkoxy- and -S(O)_pC₁-C₄alkyl;

5 R⁴ is selected from the group consisting of hydrogen, halogen, -CN, nitro, C₁-C₄alkyl, C₂-C₄alkenyl-, C₂-C₄alkynyl-, C₁-C₄haloalkyl-, C₁-C₄alkoxy-, C₁-C₄haloalkoxy- and -S(O)_pC₁-C₄alkyl;

10 R⁵ is selected from the group consisting of hydrogen, halogen, C₁-C₃alkyl and C₁-C₃haloalkyl;

R⁶ is selected from the group consisting of hydrogen, halogen, C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkyl and C₁-C₃haloalkoxy;

15 R⁷ is selected from the group consisting of C₃-C₈ alkenyl, C₃-C₈ alkynyl, C₃-C₈ haloalkyl, C₃-C₈ haloalkenyl, C₃-C₈ haloalkynyl, C₁-C₄alkoxy-C₁-C₃alkyl-, C₁-C₄haloalkoxy-C₁-C₃alkyl-, C₁-C₄alkoxy-C₁-C₃haloalkyl-, C₁-C₄alkyl-S(O)_p-C₁-C₃alkyl-, C₁-C₄haloalkyl-S(O)_p-C₁-C₃alkyl-, C₁-C₄alkoxy-C₁-C₃alkoxy-C₁-C₃alkyl-, C₁-C₄alkoxy-C(O)-C₁-C₃alkyl- and -(CH₂)_mR⁸;

20 R⁸ is selected from the group consisting of C₃-C₆ cycloalkyl, phenyl and a 5- or 6- membered heterocyclyl which may be aromatic, saturated or partially saturated and can contain from 1 to 4 heteroatoms each independently selected from the group consisting of oxygen, nitrogen and sulphur, and
25 wherein said C₃-C₆ cycloalkyl, phenyl or heterocyclyl groups are optionally substituted by one, two or three substituents independently selected from the group consisting of C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkoxy, C₂-C₃alkenyl, C₂-C₃alkynyl, halogen, cyano, hydroxy-, oxo and nitro;

30 m is 0, 1, 2, 3 or 4;

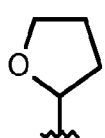
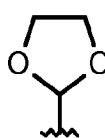
n is 0, 1 or 2; and

p is 0, 1 or 2.

35

2. A compound according to claim 1, wherein Y¹ is CR³ and Y² is N or Y¹ is CR³ and Y² is CR⁴ or Y¹ is N and Y² is CR⁴.

3. A compound according to claim 1, or claim 2 wherein Y^1 is CR^3 and Y^2 is N.
4. A compound according to any one of the previous claims, wherein $n=0$.
5. A compound according to any one of claims 1 to 3, wherein $n=1$ and R^1 is Cl or CN.
6. A compound according to any one of the previous claims, wherein R^2 is C_3 - C_4 fluoroalkyl.
7. A compound according to any one of the previous claims, wherein R^3 is halogen or C_1 - C_4 haloalkoxy-.
8. A compound according to any one of the previous claims, wherein R^5 and R^6 are hydrogen.
9. A compound according to any one of the previous claims, wherein R^7 is C_1 - C_4 alkoxy- C_1 - C_3 alkyl- or C_1 - C_4 alkoxy- C_1 - C_3 alkoxy- C_1 - C_3 alkyl-.
10. A compound according to any one of claims 1 to 8, wherein R^7 is $-(CH_2)_mR^8$ wherein m is 0 or 1 and R^8 is selected from the group consisting of R^{8a} , R^{8b} and R^{8c}

 R^{8a}  R^{8b}  R^{8c}

11. A herbicidal composition comprising a compound according to any one of the previous claims and an agriculturally acceptable formulation adjuvant.
12. A herbicidal composition according to claim 11, further comprising at least one additional pesticide.
13. A herbicidal composition according to claim 12, wherein the additional pesticide is a herbicide or herbicide safener.

14. A method of controlling weeds at a locus comprising application to the locus of a weed controlling amount of a composition according to any one of claims 11 to 13.
- 5 15. Use of a compound of Formula (I) as defined in claim 1 as a herbicide.

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2022/057891

A. CLASSIFICATION OF SUBJECT MATTER INV. C07D401/12 A01N43/40 A01N43/54 C07D403/12 ADD.		
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) C07D A01N		
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) EPO-Internal, CHEM ABS Data		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 448 206 A2 (ICI PLC [GB]) 25 September 1991 (1991-09-25) claims 1-11; examples 1-99 -----	1-15
X,P	WO 2021/094416 A1 (SYNGENTA CROP PROTECTION AG [CH]) 20 May 2021 (2021-05-20) claims 1-17 -----	1-15
☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance;; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance;; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 7 July 2022	Date of mailing of the international search report 15/07/2022	
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Kleidermigg, Oliver	

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2022/057891

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0448206	A2	25-09-1991	AT 116302 T 15-01-1995
			AU 634018 B2 11-02-1993
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			DE 69106189 T2 11-05-1995
			EP 0448206 A2 25-09-1991
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