



- (51) **International Patent Classification:**
C07D 403/04 (2006.01) *A01P 13/00* (2006.01)
A01N 43/58 (2006.01)
- (21) **International Application Number:**
PCT/EP2014/071264
- (22) **International Filing Date:**
3 October 2014 (03.10.2014)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
1317791.0 8 October 2013 (08.10.2013) GB
- (71) **Applicant:** SYNGENTA LIMITED [GB/GB]; European Regional Centre, Priestley Road, Surrey Research Park, Surrey, Guildford Surrey GU2 7YH (GB).
- (72) **Inventors:** BURTON, Paul; Jealott's Hill International Research Centre, Bracknell Berkshire RG42 6EY (GB). EGAN, Benjamin Andrew; Jealott's Hill International Research Centre, Bracknell Berkshire RG42 6EY (GB). SHAHANAN, Stephen; Jealott's Hill International Research Centre, Bracknell Berkshire RG42 6EY (GB).
- (74) **Agent:** SYNGENTA INTERNATIONAL AG; Intellectual Property, WRO 1008-Z1-26, Schwarzwaldallee 215, CH-4058 Basel (CH).

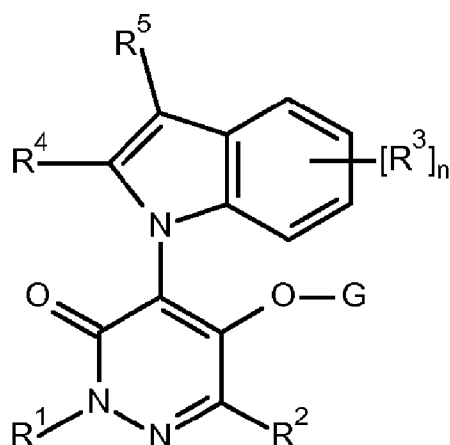
(81) **Designated States** (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, 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, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, 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))

[Continued on next page]

(54) **Title:** PYRIDAZINONES DERIVATIVES AS HERBICIDAL COMPOUNDS

(I)

(57) **Abstract:** The present invention relates to novel herbicidal pyridazinones of formula (I), processes and intermediates used for their preparation, as well as herbicidal compositions comprising such pyridazinones. The invention further extends to the use of such compounds and compositions in controlling undesirable plant and in particular the use in controlling weeds, such as broadleaved dicotyledonous weeds, in crops of useful plants.



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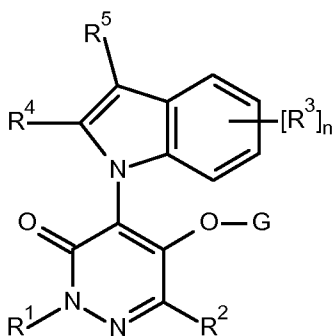
— *with international search report (Art. 21(3))*

PYRIDAZINONES DERIVATIVES AS HERBICIDAL COMPOUNDS

The present invention relates to novel herbicidal pyridazinones, processes and intermediates used for their preparation, as well as herbicidal compositions comprising such pyridazinones. The invention further extends to the use of such compounds and compositions in controlling undesirable plant and in particular the use in controlling weeds, such as broad-leaved dicotyledonous weeds, in crops of useful plants.

Herbicidal pyridazinones are known from WO2009/086041. In addition, herbicidal 5/6 membered heterocyclyl-substituted pyridazinones are known from WO2011/045271. Co-pending International Patent Application No. PCT/EP2013/057676 also discloses indolyl-pyridazinone derivatives having herbicidal utility. The present invention is based upon the identification of further heterocyclyl-substituted pyridazinones which exhibit improved herbicidal properties.

Thus, in a first aspect there is provided a compound of formula (I)



(I) or a salt or N-oxide thereof, wherein, R¹ is selected from the group consisting of C₁-C₄ alkyl, C₁-C₂ alkoxy-C₁-C₂ alkyl, C₂-C₄ alkenyl, C₁-C₄ haloalkyl, C₂-C₄ haloalkenyl, C₂-C₄ alkynyl and C₂-C₄ haloalkynyl;

R² is selected from the group consisting of hydrogen, halogen, cyano, C₁-C₆alkyl, C₁-C₆haloalkyl, C₁-C₆haloalkoxy, C₁-C₃haloalkoxy-C₁-C₃alkyl-, C₁-C₆alkoxy, C₁-C₃alkoxy-C₁-C₃alkyl, C₁-C₃alkoxy-C₁-C₃alkoxy-C₁-C₃alkyl-, C₃-C₆cycloalkyl, C₂-C₆ alkenyl, C₂-C₆ haloalkenyl, C₂-C₆ alkynyl, C₁-C₆hydroxyalkyl-, C₁-C₆alkylcarbonyl-, -S(O)_pC₁-C₆alkyl, amino, C₁-C₆alkylamino, C₁-C₆dialkylamino, -C(C₁-C₃alkyl)=N-O-C₁-C₃alkyl and C₂-C₆ haloalkynyl;

each R³ is independently selected from the group consisting of hydrogen, halogen, nitro, cyano, amino, C₁-C₆alkyl, C₁-C₆haloalkyl, C₃-C₆cycloalkyl, C₁-C₆alkoxy, C₁-C₆alkoxycarbonyl and -S(O)_pC₁-C₆ alkyl; R⁴ is selected from the group consisting of C₂-C₆alkenyl, C₂-C₆alkynyl, C₂-C₆haloalkenyl, C₂-C₆haloalkynyl, C₁-C₃alkoxy-C₁-C₃alkyl-, -C₁-C₃alkyl-S-(R¹⁰), C₁-C₆alkylsulfonyl, -S(R¹⁰), optionally substituted phenyl, optionally substituted heteroaryl, and C₁-C₆cyanoalkyl-; R⁵ is selected from the group consisting of hydrogen, hydroxyl, halogen, C₁-C₃alkyl, C₁-C₃haloalkyl, C₃-C₆cycloalkyl, C₁-C₃alkoxy;

G is hydrogen, or -C(O)-R⁶;

R⁶ is selected from the group consisting of C₁-C₆alkyl, C₂-C₆alkenyl, C₂-C₆alkynyl, C₁-C₆alkyl-S-, C₁-C₆alkoxy, -NR⁷R⁸ and phenyl optionally substituted by one or more R⁹;

R⁷ and R⁸ are independently selected from the group consisting of C₁-C₆ alkyl, C₁-C₆ alkoxy-;

5 or R⁷ and R⁸ can together form a morpholinyl ring;

R⁹ is selected from the group consisting of halogen, cyano, nitro, C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkoxy and C₁-C₃haloalkoxy;

R¹⁰ is C₁-C₆alkyl; n = 0, 1, 2, 3 or 4; and p = 0, 1 or 2.

Each alkyl moiety either alone or as part of a larger group (such as alkoxy, alkylthio, alkoxy carbonyl, alkyl carbonyl, alkylaminocarbonyl, or dialkylaminocarbonyl, et al.) may be
10 straight-chained or branched. Typically, the alkyl is, for example, methyl, ethyl, *n*-propyl, isopropyl, *n*-butyl, *sec*-butyl, isobutyl, *tert*-butyl, *n*-pentyl, neopentyl, or *n*-hexyl. The alkyl groups are generally C₁-C₆alkyl groups (except where already defined more narrowly), but are preferably C₁-C₄alkyl or C₁-C₃alkyl groups (except where already defined more narrowly), and,
15 more preferably, are C₁-C₂alkyl groups (such as methyl).

Alkenyl and alkynyl moieties can be in the form of straight or branched chains, and the alkenyl moieties, where appropriate, can be of either the (*E*)- or (*Z*)-configuration. The alkenyl or alkynyl are typically C₂-C₄alkenyl or C₂-C₄alkynyl, more specifically vinyl, allyl, ethynyl, propargyl or prop-1-ynyl. Alkenyl and alkynyl moieties can contain one or more double and/or
20 triple bonds in any combination; but preferably contain only one double bond (for alkenyl) or only one triple bond (for alkynyl).

Preferably, the term cycloalkyl refers to cyclopropyl, cyclobutyl, cyclopentyl or cyclohexyl.

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

Haloalkyl groups having a chain length of from 1 to 6 carbon atoms are, for example, fluoromethyl, difluoromethyl, trifluoromethyl, chloromethyl, dichloromethyl, trichloromethyl, 2,2,2-trifluoroethyl, 2-fluoroethyl, 2-chloroethyl, pentafluoroethyl, 1,1-difluoro-2,2,2-trichloroethyl, 2,2,3,3-tetrafluoroethyl and 2,2,2-trichloroethyl, heptafluoro-*n*-propyl and
30 perfluoro-*n*-hexyl.

Alkoxy groups preferably have a chain length of from 1 to 6 carbon atoms. Alkoxy is, for example, methoxy, ethoxy, propoxy, isopropoxy, *n*-butoxy, isobutoxy, *sec*-butoxy or *tert*-butoxy or a pentyloxy or hexyloxy isomer, preferably methoxy and ethoxy. It should also be appreciated that two alkoxy substituents present on the same carbon atom.

Haloalkoxy is, 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 difluoromethoxy, 2-chloroethoxy or trifluoromethoxy.

C₁-C₆alkyl-S- (alkylthio) is, for example, methylthio, ethylthio, propylthio, isopropylthio, n-butylthio, isobutylthio, sec-butylthio or tert-butylthio, preferably methylthio or ethylthio.

C₁-C₆alkyl-S(O)- (alkylsulfinyl) is, for example, methylsulfinyl, ethylsulfinyl, propylsulfinyl, isopropylsulfinyl, n-butylsulfinyl, isobutylsulfinyl, sec-butylsulfinyl or tert-butylsulfinyl, preferably methylsulfinyl or ethylsulfinyl.

C₁-C₆alkyl-S(O)₂- (alkylsulfonyl) is, for example, methylsulfonyl, ethylsulfonyl, propylsulfonyl, isopropylsulfonyl, n-butylsulfonyl, isobutylsulfonyl, sec-butylsulfonyl or tert-butylsulfonyl, preferably methylsulfonyl or ethylsulfonyl.

Compounds of Formula I may contain asymmetric centres and may be present as a single enantiomer, pairs of enantiomers in any proportion or, where 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.

Similarly, where there are di-substituted alkenes, these may be present in E or Z form or as mixtures of both in any proportion.

Furthermore, compounds of formula (I) may be in equilibrium with alternative tautomeric forms. It should be appreciated that all tautomeric forms (single tautomer or mixtures thereof), racemic mixtures and single isomers are included within the scope of the present invention.

The present invention also includes agronomically acceptable salts that the compounds of formula (I) may form with amines (for example ammonia, dimethylamine and triethylamine), alkali metal and alkaline earth metal bases or quaternary ammonium bases. Among the alkali metal and alkaline earth metal hydroxides, oxides, alkoxides and hydrogen carbonates and carbonates used as salt formers, emphasis is to be given to the hydroxides, alkoxides, oxides and carbonates of lithium, sodium, potassium, magnesium and calcium, but especially those of sodium, magnesium and calcium. The corresponding trimethylsulfonium salt may also be used. The compounds of formula (I) according to the invention also include hydrates which may be formed during the salt formation.

Preferred values of R¹, R², R³, R⁴, R⁵, R⁶, R⁷, R⁸, R⁹, R¹⁰, G, n, and p are as set out below, and a compound of formula (I) according to the invention may comprise any combination of said values.

R¹ is preferably methyl, ethyl, or n-propyl. In one set of embodiments, R¹ is methyl.

In one set of embodiments R² is selected from the group consisting of hydrogen, halogen, C₁-C₆alkyl, C₁-C₆haloalkyl, C₁-C₆alkoxy, C₁-C₃alkoxy-C₁-C₃alkyl, C₃-C₆cycloalkyl, C₂-C₆alkenyl, C₂-C₆haloalkenyl, C₂-C₆alkynyl and C₂-C₆haloalkynyl. More preferably R² is

selected from the group consisting of hydrogen, methyl, ethyl, cyclopropyl and methoxymethyl. Most preferably R^2 is methyl.

As stated above, n is an integer of 0, 1, 2, 3 or 4. Preferably n is 0, 1, 2, or 3, more preferably 0, 1 or 2, and most preferably 0. Where n is 0, the indole ring remains fully unsaturated.

Where n is 1, 2, 3, or 4, each R^3 is independently selected from the group consisting of halogen, nitro, cyano, amino, C_1 - C_6 alkyl, C_1 - C_6 haloalkyl, C_3 - C_6 cycloalkyl, C_1 - C_6 alkoxy, C_1 - C_6 alkoxycarbonyl and $-S(O)_pC_1$ - C_6 alkyl. Preferably each R^3 is independently halogen, C_1 - C_3 alkyl, C_1 - C_3 haloalkyl, C_3 - C_4 cycloalkyl, C_1 - C_3 alkoxy.

Preferably R^4 is selected from the group consisting of C_2 - C_4 alkenyl, C_2 - C_4 alkynyl, C_2 - C_4 haloalkenyl, C_2 - C_4 haloalkynyl, C_1 - C_3 alkoxy- C_1 - C_3 alkyl-, $-C_1$ - C_3 alkyl-S-(R^{10}) wherein R^{10} is preferably C_1 - C_3 alkyl, and optionally substituted heteroaryl wherein the optionally substituted heteroaryl contains one or two heteroatoms independently selected from nitrogen and oxygen and wherein said optional substituents are selected from the group consisting of C_1 - C_3 alkyl, C_1 - C_3 alkoxy, C_2 - C_3 alkenyl, C_2 - C_3 alkynyl, halogen, C_1 - C_3 haloalkyl, and C_1 - C_3 haloalkoxy.

More preferably R^4 is selected from the group consisting of C_2 - C_3 alkenyl, C_2 - C_3 alkynyl, C_2 - C_3 haloalkenyl, C_2 - C_3 haloalkynyl, C_1 - C_3 alkoxy- C_1 - C_3 alkyl-, $-C_1$ - C_3 alkyl-S-Me, optionally substituted pyrimidinyl wherein said optional substituents are selected from the group consisting of C_1 - C_3 alkyl, C_1 - C_3 alkoxy, C_2 - C_3 alkenyl, C_2 - C_3 alkynyl, halogen, C_1 - C_3 haloalkyl, and C_1 - C_3 haloalkoxy.

More preferably still, R^4 is selected from the group consisting of C_2 - C_3 alkenyl, C_2 - C_3 alkynyl, C_2 - C_3 haloalkenyl, C_2 - C_3 haloalkynyl, C_1 - C_3 alkoxy- C_1 - C_3 alkyl-, $-C_1$ - C_3 alkyl-S-Me, and pyrimidinyl substituted by C_1 - C_3 alkyl or C_1 - C_3 alkoxy.

In one set of embodiments R^4 is selected from the group consisting of vinyl, isopropenyl, ethynyl, 2-methoxypyrimidin-5-yl, methoxymethyl, methylsulfanylmethyl, propargyl, acetonitrile, dichlorovinyl, dibromovinyl, 1-cyclopentenyl, 1-cyclohexenyl, chloroethynyl, bromoethynyl, chlorovinyl, and bromovinyl, and preferably R^4 is selected from the group consisting of vinyl, isopropenyl, ethynyl, 2-methoxypyrimidin-5-yl and methoxymethyl.

Preferably R^5 is selected from the group consisting of hydrogen, hydroxyl, and halogen. More preferably R^5 is halogen. More preferably still R^5 is bromine or chlorine.

As described herein, G may be hydrogen or $-C(O)-R^6$, and R^6 is selected from the group consisting of C_1 - C_6 alkyl, C_2 - C_6 alkenyl, C_2 - C_6 alkynyl, C_1 - C_6 alkyl-S-, C_1 - C_6 alkoxy, $-NR^7R^8$ and phenyl optionally substituted by one or more R^9 . As defined herein, R^7 and R^8 are independently selected from the group consisting of C_1 - C_6 alkyl, C_1 - C_6 alkoxy-; or they can together form a morpholinyl ring. Preferably R^7 and R^8 are each independently selected from the group consisting of methyl, ethyl, propyl, methoxy, ethoxy and propoxy. R^9 is selected from

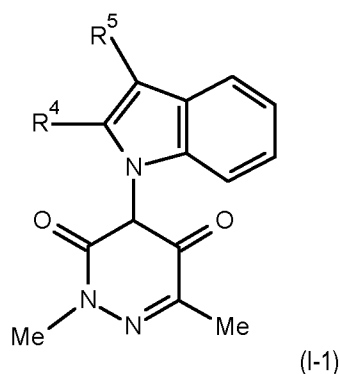
the group consisting of halogen, cyano, nitro, C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkoxy and C₁-C₃haloalkoxy.

Preferably R⁶ is C₁-C₄ alkyl, C₂-C₃alkenyl, C₂-C₃alkynyl, -C₁-C₃alkoxy, or -NR⁷R⁸ wherein R⁷ and R⁸ together form a morpholinyl ring. More preferably R⁶ is isopropyl, t-butyl, methyl, ethyl, propargyl or methoxy.

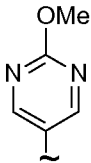
In one set of embodiments G is hydrogen and R⁶ is C₁-C₄ alkyl, C₂-C₃alkenyl, C₂-C₃alkynyl or -C₁-C₃alkoxy. In a further set of embodiments G is hydrogen and R⁶ is isopropyl, t-butyl, methyl, ethyl, propargyl or methoxy. However, it is particularly preferred that G is hydrogen.

Table 1 below provides 32 specific examples of compounds of formula (I) of the invention wherein R¹ and R² are each methyl, n is 0, and R⁴ and R⁵ are as defined in the table.

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



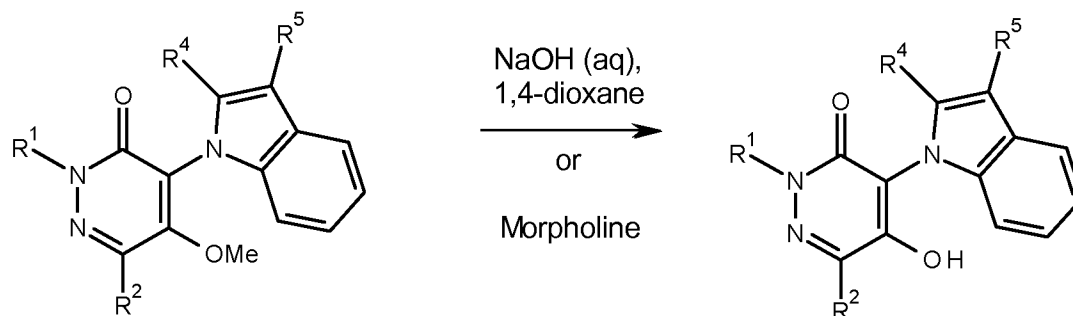
Compound	R ⁴	R ⁵
1.001	-CH=CH ₂	Cl
1.002	-C(Me)=CH ₂	Cl
1.003	-C≡CH	Cl
1.004		Cl
1.005	-CH ₂ OMe	Cl
1.006	-CH ₂ SMe	Cl
1.007	-C≡CMe	Cl
1.008	-CH ₂ CN	Cl

Compound	R ⁴	R ⁵
1.009	-CH=CCl ₂	Cl
1.010	-CH=CBr ₂	Cl
1.011	1-cyclopentenyl	Cl
1.012	1-cyclohexenyl	Cl
1.013	-C≡CCl	Cl
1.014	-C≡CBr	Cl
1.015	-C(Cl)=CH ₂	Cl
1.016	-C(Br)=CH ₂	Cl
1.017	-CH=CH ₂	Br
1.018	-C(Me)=CH ₂	Br
1.019	-C≡CH	Br
1.020		Br
1.021	-CH ₂ OMe	Br
1.022	-CH ₂ SMe	Br
1.023	-C≡CMe	Br
1.024	-CH ₂ CN	Br
1.025	-CH=CCl ₂	Br
1.026	-CH=CBr ₂	Br
1.027	1-cyclopentenyl	Br
1.028	1-cyclohexenyl	Br
1.029	-C≡CCl	Br
1.030	-C≡CBr	Br
1.031	-C(Cl)=CH ₂	Br
1.032	-C(Br)=CH ₂	Br

The compounds of the present invention may be prepared according to the following schemes, in which the substituents R¹, R², R³, R⁴, and R⁵, have (unless otherwise stated explicitly) the definitions described hereinbefore.

Compounds of the present invention may be prepared from compounds of formula (1) as shown in Reaction scheme 1.

Reaction scheme 1



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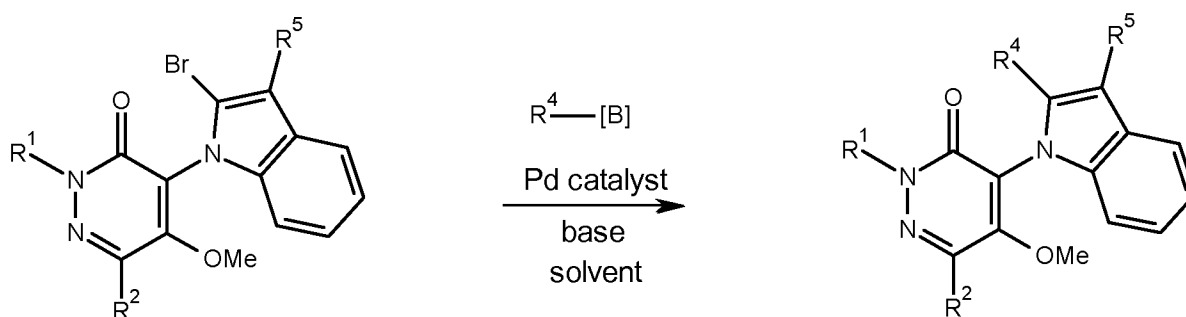
(1)

The methyl enol ether compounds of formula (1) are treated with either NaOH in aqueous 1,4-dioxane or neat morpholine at a temperature between 100°C and 150°C. Microwave irradiation or thermal heating may be used to achieve the required temperature.

Compounds of the formula (1) may be prepared from compounds of formula (2) as shown in Reaction scheme 2.

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Reaction scheme 2



(2)

(1)

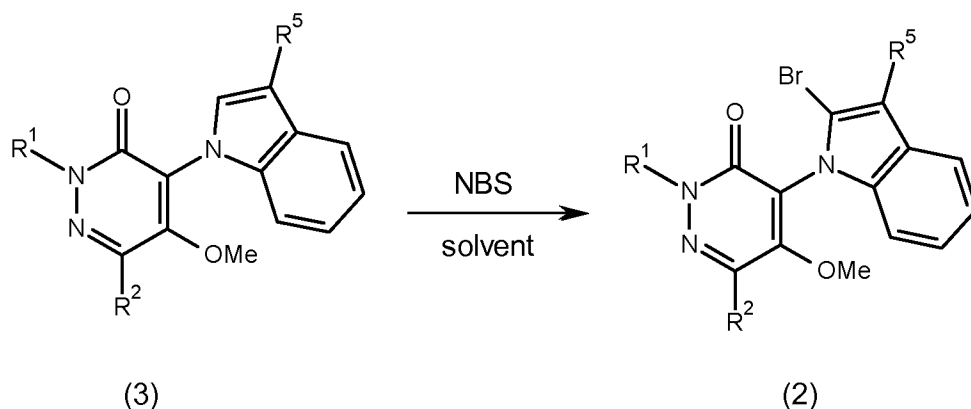
Compounds of formula (1) may be prepared by Suzuki-Miyaura cross-coupling of 2-bromo indoles of formula (2) with an organoboron coupling partner, in the presence of a suitable palladium catalyst, a suitable base and a suitable solvent at a temperature between 25 °C and 200 °C. The reaction may use microwave irradiation or thermal heating to achieve these

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temperatures. Examples of suitable organoboron reagents include boronic acids, pinacol boronic esters and trifluoroborate salts. Further examples of suitable organoboron reagents are boroxines of formula $(R^4)_3B_3O_3$. Examples of suitable solvents include 1,4-dioxane and toluene. An example of a suitable palladium catalyst is 1,1'-bis(diphenylphosphino)ferrocene-palladium(II)dichloride dichloromethane complex. Examples of suitable bases include caesium fluoride or caesium carbonate.

Compounds of the formula (2) may be prepared from compounds of formula (3) as shown in Reaction scheme 3.

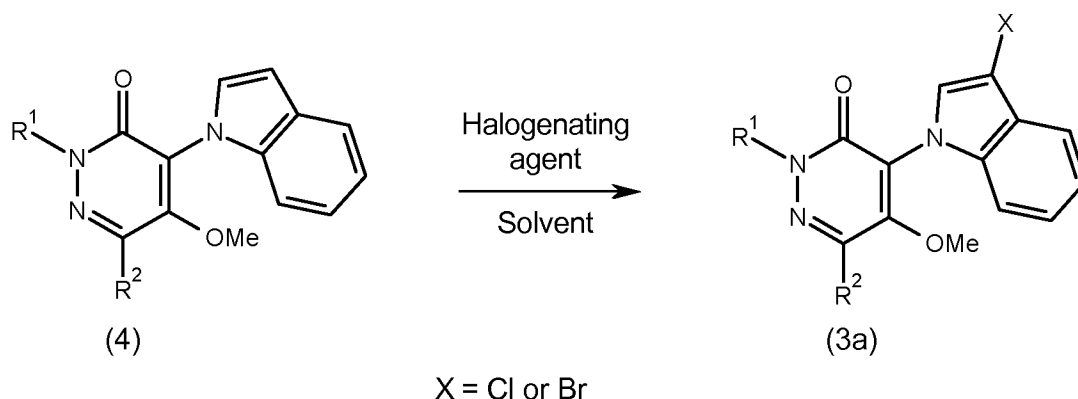
Reaction scheme 3



2-bromoindole compounds of the formula (2) may be prepared by treating 2-unsubstituted indoles of formula (3) with *N*-bromosuccinimide in a suitable solvent at a temperature from -20 °C to 30 °C. Examples of suitable solvents include dichloromethane and acetonitrile.

Certain compounds of formula (3), specifically halo-indoles of formula (3a), may be prepared from compounds of formula (4) as shown in Reaction scheme 4.

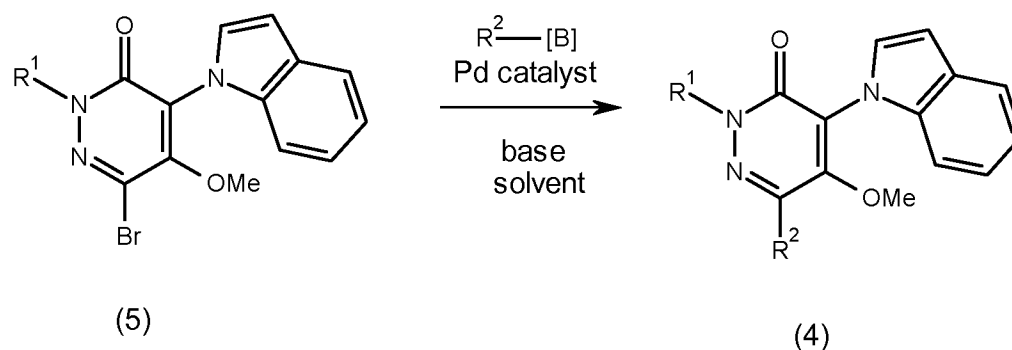
Reaction scheme 4



Compounds of the formula (3a) may be prepared by treating compounds of formula (4) with 1 molar equivalent of a suitable halogenating reagent in a suitable solvent at a temperature from $-20\text{ }^{\circ}\text{C}$ to $30\text{ }^{\circ}\text{C}$. Examples of suitable halogenating agents include sulfonyl chloride (for $X = \text{chlorine}$) and *N*-bromosuccinimide (for $X = \text{bromine}$). Examples of suitable solvents include dichloromethane and acetonitrile.

Compounds of the formula (4) may be prepared from compounds of formula (5) as shown in Reaction scheme 5.

Reaction scheme 5



Compounds of formula (4) may be prepared by Suzuki-Miyaura cross coupling of compounds of formula (5) with an organoboron coupling partner in the presence of a suitable palladium catalyst, a suitable base and a suitable solvent at a temperature between $25\text{ }^{\circ}\text{C}$ and $200\text{ }^{\circ}\text{C}$. The reaction may use microwave irradiation or thermal heating to achieve these temperatures. Examples of suitable organoboron reagents include boronic acids, pinacol boronic esters and trifluoroboronate salts. Further examples of suitable organoboron reagents are boroxines of formula $(R^2)_3B_3O_3$. An example of a suitable palladium catalyst is 1,1'-bis(diphenylphosphino)ferrocene-palladium(II)dichloride dichloromethane complex. Examples

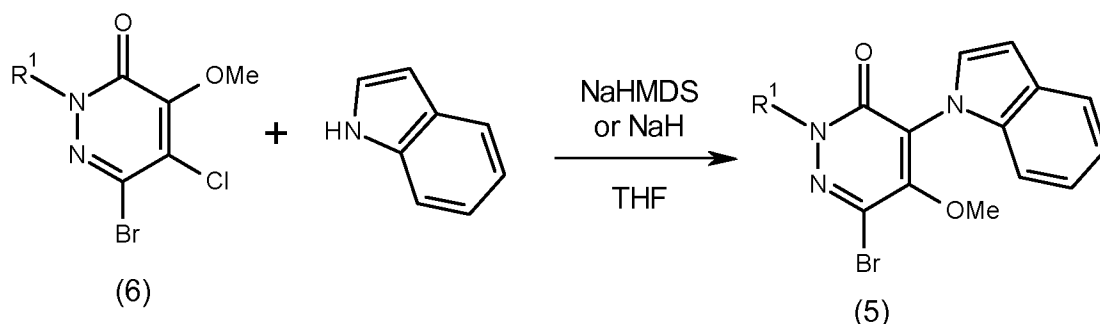
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of suitable bases include caesium fluoride and caesium carbonate. Examples of suitable solvents include 1,4-dioxane and toluene.

Compounds of the formula (5) may be prepared from compounds of formula (6) as shown in Reaction scheme 6.

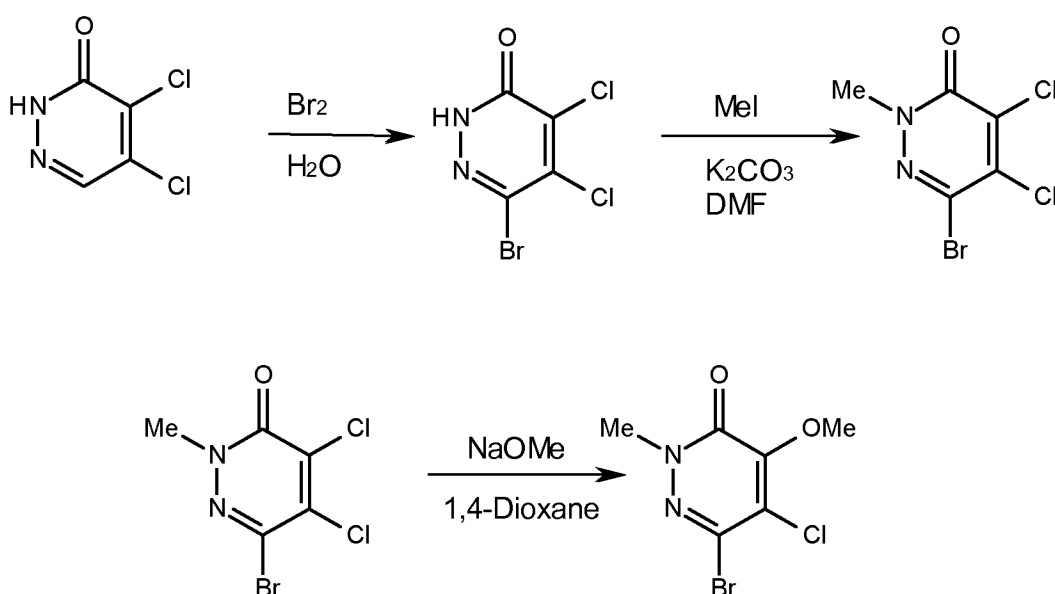
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Reaction scheme 6



Compounds of the formula (5) may be prepared by reacting halo-pyridazinones of formula (6) with indole (readily available commercially from e.g. Sigma Aldrich) employing 1 equivalent of sodium hexamethyldisilazide (NaHMDS) or sodium hydride in tetrahydrofuran (THF) at a temperature between -20 ° and 30 °C. An example of a compound of formula (6) is 6-bromo-5-chloro-4-methoxy-2-methyl-pyridazin-3-one, which may be prepared according to Reaction scheme 7.

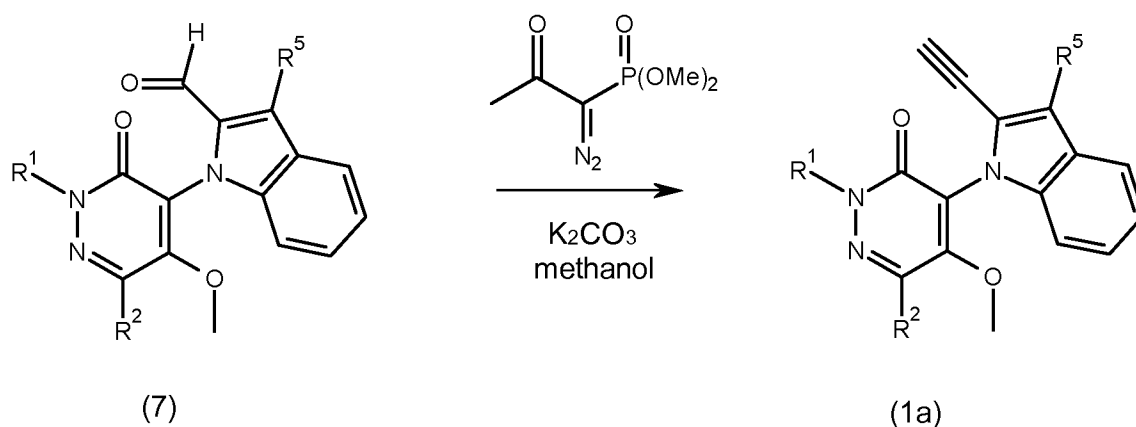
Reaction scheme 7



Certain compounds of the present invention are synthetically accessed via intermediates (1a), which are themselves prepared from compounds of formula (7) as shown below in Reaction scheme 8.

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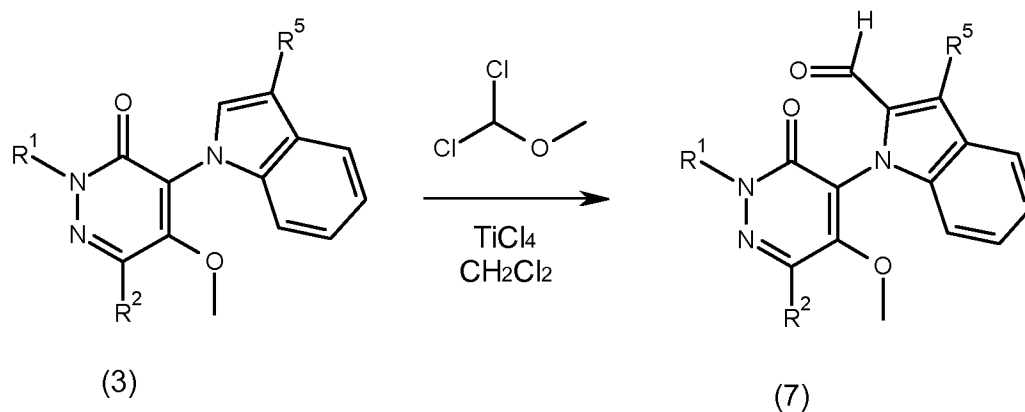
Reaction scheme 8



Compounds of formula (1a) may be prepared by treatment of 2-formylindole compounds of formula (7) with Ohira-Bestmann reagent (1-diazo-1-dimethoxyphosphoryl-propan-2-one) and potassium carbonate in methanol at a temperature between -20 °C and 50 °C.

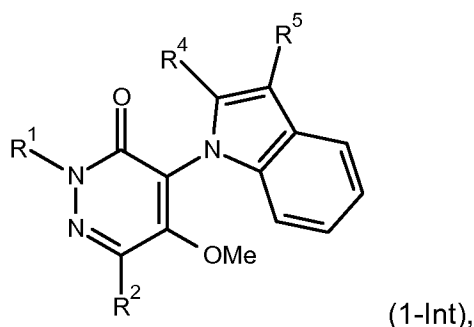
Compounds of formula (7) may be prepared from compounds of formula (3) as shown in Reaction scheme 9.

Reaction scheme 9



Compounds of the formula (7) may be prepared by treatment of compounds (3) with dichloro(methoxy)methane and titanium tetrachloride in dichloromethane at a temperature between -20 °C and 40 °C.

Certain intermediate compounds of formulae 1, 2, 3, 4, 5, and 7 are also novel, and as such are also considered within the scope of the present invention. Thus, in still a further aspect of the invention there is provided a compound of formula (1-Int)



5 wherein R¹, R² and R⁵ are as defined hereinbefore, and R⁴ is selected from hydrogen, halogen, -C(O)H, C₂-C₆alkenyl, C₂-C₆alkynyl, C₂-C₆haloalkenyl, C₂-C₆haloalkynyl, C₁-C₃alkoxy-C₁-C₃alkyl-, -C₁-C₃alkyl-S-(R¹⁰), C₁-C₆alkylsulfonyl, -S(R¹⁰), optionally substituted phenyl, optionally substituted heteroaryl, and C₁-C₆cyanoalkyl-. In certain embodiments, intermediates of formula (1-Int) as defined above will have Br at R².

10 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 (SFAs). 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
15 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
20 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, many of which are known from the Manual on Development and Use of FAO Specifications for Plant
25 Protection Products, 5th Edition, 1999. These include dustable powders (DP), soluble powders (SP), water soluble granules (SG), water dispersible granules (WG), wettable powders (WP), granules (GR) (slow or fast release), soluble concentrates (SL), oil miscible liquids (OL), ultra low volume liquids (UL), emulsifiable concentrates (EC), dispersible concentrates (DC), emulsions (both oil in water (EW) and water in oil (EO)), micro-emulsions (ME), suspension

concentrates (SC), aerosols, capsule suspensions (CS) and seed treatment formulations. 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).

Dustable powders (DP) may be prepared by mixing a compound of Formula (I) with one or more solid diluents (for example natural clays, kaolin, pyrophyllite, bentonite, alumina, montmorillonite, kieselguhr, chalk, diatomaceous earths, calcium phosphates, calcium and magnesium carbonates, sulphur, lime, flours, talc and other organic and inorganic solid carriers) and mechanically grinding the mixture to a fine powder.

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 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 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 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).

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 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 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 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 or more SFAs, 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 more solvents with one or more SFAs, to produce spontaneously a thermodynamically stable isotropic liquid formulation. A compound of Formula (I) is present initially in either the water or the solvent/SFA 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 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 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 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 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.

5 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
10 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
15 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 (SFAs), spray additives based on oils, for example certain mineral oils or natural plant oils (such as soy bean and rape seed oil), and blends of these with other bio-enhancing adjuvants (ingredients which may aid or modify the
20 action of a compound of Formula (I)).

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

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

25 Suitable anionic SFAs 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
30 (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,
35 taurates and lignosulphonates.

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

Suitable SFAs 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;
 5 condensation products of said partial esters with 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); and lecithins.

Suitable suspending agents include hydrophilic colloids (such as polysaccharides, polyvinylpyrrolidone or sodium carboxymethylcellulose) and swelling clays (such as bentonite or attapulgite).
 10

The composition of the present may further comprise at least one additional pesticide. For example, the compounds according to the invention can also be used in combination with other herbicides or plant growth regulators. In a preferred embodiment the additional pesticide
 15 is a herbicide and/or herbicide safener. Examples of such mixtures are (in which 'I' represents a compound of Formula I). I + acetochlor, I + acifluorfen, I + acifluorfen-sodium, I + aclonifen, I + acrolein, I + alachlor, I + alloxydim, I + ametryn, I + amicarbazone, I + amidosulfuron, I + aminopyralid, I + amitrole, I + anilofos, I + asulam, I + atrazine, I + azafenidin, I + azimsulfuron, I + BCPC, I + beflubutamid, I + benazolin, I + bencarbazone, I + benfluralin, I + benfuresate, I +
 20 bensulfuron, I + bensulfuron-methyl, I + bensulide, I + bentazone, I + benzfendizone, I + benzobicyclon, I + benzofenap, I + bicyclopyrone, I + bifenox, I + bilanafos, I + bispyribac, I + bispyribac-sodium, I + borax, I + bromacil, I + bromobutide, I + bromoxynil, I + butachlor, I + butamifos, I + butralin, I + butroxydim, I + butylate, I + cacodylic acid, I + calcium chlorate, I + cafenstrole, I + carbetamide, I + carfentrazone, I + carfentrazone-ethyl, I + chlorflurenol, I +
 25 chlorflurenol-methyl, I + chloridazon, I + chlorimuron, I + chlorimuron-ethyl, I + chloroacetic acid, I + chlorotoluron, I + chlorpropham, I + chlorsulfuron, I + chlorthal, I + chlorthal-dimethyl, I + cinidon-ethyl, I + cinmethylin, I + cinosulfuron, I + cisanilide, I + clethodim, I + clodinafop, I + clodinafop-propargyl, I + clomazone, I + clomeprop, I + clopyralid, I + cloransulam, I + cloransulam-methyl, I + cyanazine, I + cycloate, I + cyclosulfamuron, I + cycloxydim, I +
 30 cyhalofop, I + cyhalofop-butyl, I + 2,4-D, I + daimuron, I + dalapon, I + dazomet, I + 2,4-DB, I + I + desmedipham, I + dicamba, I + dichlobenil, I + dichlorprop, I + dichlorprop-P, I + diclofop, I + diclofop-methyl, I + diclosulam, I + difenzoquat, I + difenzoquat metilsulfate, I + diflufenican, I + diflufenzopyr, I + dimefuron, I + dimepiperate, I + dimethachlor, I + dimethametryn, I + dimethenamid, I + dimethenamid-P, I + dimethipin, I + dimethylarsinic acid, I + dinitramine, I +
 35 dinoterb, I + diphenamid, I + dipropetryn, I + diquat, I + diquat dibromide, I + dithiopyr, I + diuron, I + endothal, I + EPTC, I + esprocarb, I + ethalfluralin, I + ethametsulfuron, I +

ethametsulfuron-methyl, I + ethephon, I + ethofumesate, I + ethoxyfen, I + ethoxysulfuron, I +
 etobenzanid, I + fenoxaprop-P, I + fenoxaprop-P-ethyl, I + fentrazamide, I + ferrous sulfate, I +
 flamprop-M, I + flazasulfuron, I + florasulam, I + fluazifop, I + fluazifop-butyl, I + fluazifop-P, I +
 fluazifop-P-butyl, I + fluazolate, I + flucarbazone, I + flucarbazone-sodium, I + flucetosulfuron, I
 5 + fluchloralin, I + flufenacet, I + flufenpyr, I + flufenpyr-ethyl, I + flumetralin, I + flumetsulam, I +
 flumiclorac, I + flumiclorac-pentyl, I + flumioxazin, I + flumipropin, I + fluometuron, I +
 fluoroglycofen, I + fluoroglycofen-ethyl, I + fluoxaprop, I + flupoxam, I + flupropacil, I +
 flupropanate, I + flupyrsulfuron, I + flupyrsulfuron-methyl-sodium, I + flurenol, I + fluridone, I +
 flurochloridone, I + fluroxypyr, I + flurtamone, I + fluthiacet, I + fluthiacet-methyl, I + fomesafen,
 10 I + foramsulfuron, I + fosamine, I + glufosinate, I + glufosinate-ammonium, I + glyphosate, I +
 halauxifen, I + halosulfuron, I + halosulfuron-methyl, I + haloxyfop, I + haloxyfop-P, I +
 hexazinone, I + imazamethabenz, I + imazamethabenz-methyl, I + imazamox, I + imazapic, I +
 imazapyr, I + imazaquin, I + imazethapyr, I + imazosulfuron, I + indanofan, I + indaziflam, I +
 iodomethane, I + iodosulfuron, I + iodosulfuron-methyl-sodium, I + ioxynil, I + isoproturon, I +
 15 isouron, I + isoxaben, I + isoxachlortole, I + isoxaflutole, I + isoxapyrifop, I + karbutilate, I +
 lactofen, I + lenacil, I + linuron, I + mecoprop, I + mecoprop-P, I + mefenacet, I + mefluidide, I +
 mesosulfuron, I + mesosulfuron-methyl, I + mesotrione, I + metam, I + metamifop, I +
 metamidron, I + metazachlor, I + methabenzthiazuron, I + methazole, I + methylarsonic acid, I +
 methylodymron, I + methyl isothiocyanate, I + metolachlor, I + S-metolachlor, I + metosulam, I +
 20 metoxuron, I + metribuzin, I + metsulfuron, I + metsulfuron-methyl, I + molinate, I +
 monolinuron, I + naproanilide, I + napropamide, I + naptalam, I + neburon, I + nicosulfuron, I +
 n-methyl glyphosate, I + nonanoic acid, I + norflurazon, I + oleic acid (fatty acids), I +
 orbencarb, I + orthosulfamuron, I + oryzalin, I + oxadiargyl, I + oxadiazon, I + oxasulfuron, I +
 oxaziclomefone, I + oxyfluorfen, I + paraquat, I + paraquat dichloride, I + pebulate, I +
 25 pendimethalin, I + penoxsulam, I + pentachlorophenol, I + pentanochlor, I + pentoxazone, I +
 pethoxamid, I + phenmedipham, I + picloram, I + picolinafen, I + pinoxaden, I + piperophos, I +
 pretilachlor, I + primisulfuron, I + primisulfuron-methyl, I + prodiamine, I + profoxydim, I +
 prohexadione-calcium, I + prometon, I + prometryn, I + propachlor, I + propanil, I +
 propaquizafop, I + propazine, I + propham, I + propisochlor, I + propoxycarbazone, I +
 30 propoxycarbazone-sodium, I + propyzamide, I + prosulfocarb, I + prosulfuron, I + pyraclonil, I +
 pyraflufen, I + pyraflufen-ethyl, I + pyrasulfotole, I + pyrazolynate, I + pyrazosulfuron, I +
 pyrazosulfuron-ethyl, I + pyrazoxyfen, I + pyribenzoxim, I + pyributicarb, I + pyridafol, I +
 pyridate, I + pyriftalid, I + pyriminobac, I + pyriminobac-methyl, I + pyrimisulfan, I + pyrithiobac, I
 + pyrithiobac-sodium, I + pyroxasulfone, I + pyroxsulam, I + quinclozac, I + quinmerac, I +
 35 quinclamine, I + quizalofop, I + quizalofop-P, I + rimsulfuron, I + saflufenacil, I + sethoxydim, I
 + siduron, I + simazine, I + simetryn, I + sodium chlorate, I + sulcotrione, I + sulfentrazone, I +

sulfometuron, I + sulfometuron-methyl, I + sulfosate, I + sulfosulfuron, I + sulfuric acid, I + tebuthiuron, I + tefuryltrione, I + tembotrione, I + tepraloxym, I + terbacil, I + terbutometon, I + terbuthylazine, I + terbutryn, I + thenylchlor, I + thiazopyr, I + thifensulfuron, I + thiencarbazone, I + thifensulfuron-methyl, I + thiobencarb, I + topramezone, I + tralkoxydim, I + tri-allate, I + triasulfuron, I + triaziflam, I + tribenuron, I + tribenuron-methyl, I + triclopyr, I + trietazine, I + trifloxysulfuron, I + trifloxysulfuron-sodium, I + trifluralin, I + triflusulfuron, I + triflusulfuron-methyl, I + trihydroxytriazine, I + trinexapac-ethyl, I + tritosulfuron, I + [3-[2-chloro-4-fluoro-5-(1-methyl-6-trifluoromethyl-2,4-dioxo-1,2,3,4-tetrahydropyrimidin-3-yl)phenoxy]-2-pyridyloxy]acetic acid ethyl ester (CAS RN 353292-31-6). The compounds of the present invention may also be combined with herbicidal compounds disclosed in WO06/024820 and/or WO07/096576.

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, Fourteenth Edition, British Crop Protection Council, 2006.

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 of Formula (I) according to the invention can also be used in combination with one or more safeners. Likewise, mixtures of a compound of Formula I according to the invention with one or more further herbicides can also be used in combination with one or more safeners. The safeners can be AD 67 (MON 4660), benoxacor, cloquintocet-mexyl, cyprosulfamide (CAS RN 221667-31-8), dichlormid, fenchlorazole-ethyl, fenclorim, fluxofenim, furilazole and the corresponding R isomer, isoxadifen-ethyl, mefenpyr-diethyl, oxabetrinil, N-isopropyl-4-(2-methoxy-benzoylsulfamoyl)-benzamide (CAS RN 221668-34-4). Other possibilities include safener compounds disclosed in, for example, EP0365484 e.g. N-(2-methoxybenzoyl)-4-[(methylaminocarbonyl)amino]benzenesulfonamide. Particularly preferred are mixtures of a compound of Formula I with cyprosulfamide, isoxadifen-ethyl, cloquintocet-mexyl and/or N-(2-methoxybenzoyl)-4-[(methyl-aminocarbonyl)amino]benzenesulfonamide.

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, 14th Edition (BCPC), 2006. 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, and the reference to fenchlorazole-ethyl also applies to fenchlorazole, etc.

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.

5 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 safener).

The present invention still further provides a method of selectively controlling weeds at a locus comprising crop plants and weeds, wherein the method comprises application to the locus
10 of a weed controlling amount of a composition according to the present invention. 'Controlling' means killing, reducing or retarding growth or preventing or reducing germination. Generally the plants to be controlled are unwanted plants (weeds). 'Locus' means the area in which the plants are growing or will grow.

The rates of application of compounds of Formula (I) may vary within wide limits and
15 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.), 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 2000 g/ha, especially from 50 to
20 1000 g/ha.

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.

Useful plants in which the composition according to the invention can be used include
25 crops such as cereals, for example barley and wheat, cotton, oilseed rape, sunflower, maize, rice, soybeans, sugar beet, sugar cane and turf.

Crop plants can also include trees, such as fruit trees, palm trees, coconut trees or other nuts. Also included are vines such as grapes, fruit bushes, fruit plants and vegetables.

Crops are to be understood as also including those crops which have been rendered
30 tolerant to herbicides or classes of herbicides (e.g. ALS-, GS-, EPSPS-, PPO-, ACCase- and HPPD-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
35 glufosinate-resistant maize varieties commercially available under the trade names RoundupReady® and LibertyLink®. In a particularly preferred aspect, the crop plant has been

engineered to over-express homogentisate solanesyltransferase as taught in, for example, WO2010/029311.

Crops 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) 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.

Crops 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).

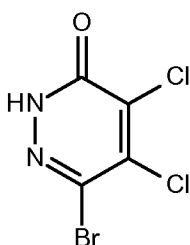
Other useful plants include turf grass for example in golf-courses, lawns, parks and roadsides, or grown commercially for sod, and ornamental plants such as flowers or bushes.

The compositions can be used to control unwanted plants (collectively, 'weeds'). The weeds to be controlled include 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*. Weeds can also include plants which may be considered crop plants but which are growing outside a crop area ('escapes'), or which grow from seed left over from a previous planting of a different crop ('volunteers'). Such volunteers or escapes may be tolerant to certain other herbicides.

Various aspects and embodiments of the present invention will now be illustrated in more detail by way of example. It will be appreciated that modification of detail may be made without departing from the scope of the invention.

PREPARATION EXAMPLES**EXAMPLE 1 Preparation of 4-(3-chloro-2-vinyl-indol-1-yl)-2,6-dimethyl-pyridazine-3,5-dione****1.1 Preparation of 3-bromo-4,5-dichloro-1H-pyridazin-6-one**

5 4,5-dichloro-1H-pyridazin-6-one (1.95 g, 11.8 mmol; commercially available from e.g. Sigma Aldrich) and bromine (0.73 ml, 14.2 mmol) are suspended in water (10 ml) and the mixture heated under microwave irradiation to 180 °C for 30 min. The resulting reaction mixture is filtered and the crude solid obtained washed thoroughly with water, then dichloromethane, to yield 3-bromo-4,5-dichloro-1H-pyridazin-6-one, 2.06g, as a white solid
10 (71.5% yield).

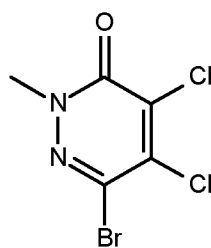


^1H NMR (DMSO- d_6) δ ppm = 13.88 (1H, br. s)

15 1.2 Preparation of 6-bromo-4,5-dichloro-2-methyl-pyridazin-3-one

To a stirred solution of 3-bromo-4,5-dichloro-1H-pyridazin-6-one (12.5 g, 51.3 mmol) in dimethylformamide (75.0 ml) is added K_2CO_3 (10.7 g, 76.9 mmol) and iodomethane (10.9 g, 76.9 mmol, 4.79 ml). The resulting mixture is stirred at ambient temperature for 18 hours.

The reaction mixture is then poured onto ice-water (300 ml) and the mixture stirred for 2
20 hours. The resulting precipitate is collected by filtration then dried to give 6-bromo-4,5-dichloro-2-methyl-pyridazin-3-one (10.7g) as a beige solid (77% yield).

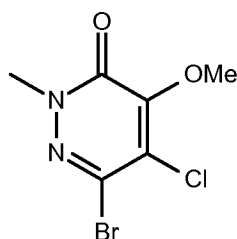


^1H NMR (CDCl_3) δ ppm = 3.83 (3H, s)

1.3 Preparation of 6-bromo-5-chloro-4-methoxy-2-methyl-pyridazin-3-one

25 6-bromo-4,5-dichloro-2-methyl-pyridazin-3-one (1.5 g, 5.8 mmol) is dissolved in 1,4-dioxane (150 ml). Sodium methoxide (1.5 ml, 25 mass% methanolic solution, 6.4 mmol) is

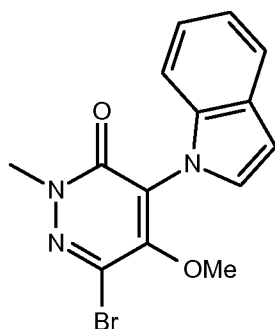
added dropwise and the reaction stirred for 2 h. The mixture is concentrated to a volume of 50 ml then diluted with 50 ml EtOAc. It is washed with 2 x 35 ml aqueous saturated brine. The organic layer is dried thoroughly over sodium sulfate, filtered and concentrated *in vacuo*. The crude residue so obtained was purified by flash chromatography (silica gel, eluant a 0-10 %
5 EtOAc in Isohexane gradient) to afford 6-bromo-5-chloro-4-methoxy-2-methyl-pyridazin-3-one (960 mg) as a white solid (65% yield).



^1H NMR (CDCl_3) δ ppm = 3.75 (3 H, s) 4.32 (3 H, s).

10 1.4 Preparation of 6-bromo-4-indol-1-yl-5-methoxy-2-methyl-pyridazin-3-one

A 3-necked 500 mL flask equipped with a thermometer and dropping funnel was charged with indole (1.39 g, 11.8 mmol), 6-bromo-5-chloro-4-methoxy-2-methyl-pyridazin-3-one (3.00 g, 11.8 mmol) and tetrahydrofuran (THF) (50 mL). The reaction mixture was cooled to 0 °C. hexamethyldisilazane sodium salt (1.0 mol/L) in THF (11.8 mL, 11.8 mmol) was then added
15 through the dropping funnel over 10 min, keeping the temperature below 10 °C. The addition caused the reaction to change colour from pale yellow to blue. After the addition was complete and the reaction was stirred for a further 20 min. The reaction was quenched at 0 °C by the addition of saturated ammonium chloride solution (50 mL) slowly through the dropping funnel and then diluted with water (20 mL). The mixture was then extracted with Et_2O (100 mL x 2)
20 and the combined organic layers were dried (MgSO_4) and concentrated under reduced pressure to give a brown sticky solid. This was then triturated with hexane and then the solid was filtered off to provide the desired product 6-bromo-4-indol-1-yl-5-methoxy-2-methyl-pyridazin-3-one (2.58 g, 7.72 mmol, 65%) as a pale yellow solid.

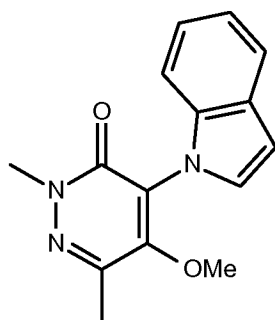


23

¹H NMR (400 MHz, CDCl₃): 7.66 (1H, dd), 7.30 (1H, d), 7.28 - 7.18 (2H, m), 7.07 (1H, d), 6.76 (1H, dd), 3.82 (3H, s), 3.25 (3H, s).

1.5 Preparation of 4-indol-1-yl-5-methoxy-2,6-dimethyl-pyridazin-3-one

5 A round bottomed flask equipped with a reflux condenser was charged with 6-bromo-4-indol-1-yl-5-methoxy-2-methyl-pyridazin-3-one (23.6 mmol, 7.90 g), 1,1'-bis(diphenylphosphino)ferrocene palladium(II)dichloride dichloromethane complex (0.473 mmol, 0.386 g), caesium fluoride (47.3 mmol, 7.56 g) and 2,4,6-trimethyl-1,3,5,2,4,6-trioxatriborinane (13.0 mmol, 1.63 g, 1.82 mL) in anhydrous 1,4-dioxane (70 mL). The reaction was
10 heated at reflux (105 °C) under an atmosphere of nitrogen. After heating at reflux for 19.5 h, the reaction was allowed to cool. Water was added (70 mL), followed by dilution with EtOAc (200 mL). The organics were collected and further washed with brine (3 x 50 mL), dried (MgSO₄) and concentrated in vacuo. Column chromatography (silica gel, elution with 0-25% EtOAc:hexane) afforded the desired product 4-indol-1-yl-5-methoxy-2,6-dimethyl-pyridazin-3-one
15 one (6.00g, 22.3 mmol, 94% yield) as an orange oil.



¹H NMR (400 MHz, CDCl₃): 7.65 (1H, dd), 7.27 (1H, d), 7.25 - 7.15 (2H, m), 7.05 (1H, d), 6.73 (1H, dd), 3.77 (3H, s), 3.20 (3H, s), 2.35 (3H, s).

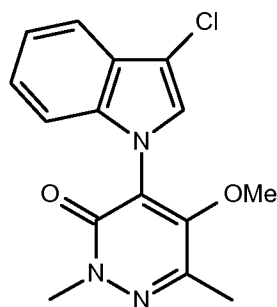
20

1.6 Preparation of 4-(3-chloroindol-1-yl)-5-methoxy-2,6-dimethyl-pyridazin-3-one

A 3-necked round bottom flask fitted with a dropping funnel and thermometer was
25 charged with 4-indol-1-yl-5-methoxy-2,6-dimethyl-pyridazin-3-one (5.75 g, 21.4 mmol) and dichloromethane (250 mL). The dropping funnel was charged with dichloromethane (50 mL) and sulfuryl chloride (2.91 g, 21.6 mmol). The reaction was cooled to 0 °C and then the contents of the dropping funnel was added over 30 min. This caused the reaction to change colour from pale yellow to dark orange. After the addition, the reaction was stirred for a further
30 20 min at 0 °C. The reaction was quenched by the addition of saturated NaHCO₃ solution (100

24

mL) slowly through the dropping funnel, followed by water (100 mL) and saturated $\text{Na}_2\text{S}_2\text{O}_3$ solution (50 mL). After the addition it was allowed to stir for 1 h. The phases of the mixture were then separated and the dichloromethane layer was dried (MgSO_4) and concentrated under reduced pressure onto silica. Flash column chromatography (2.5% EtOAc / DCM) afforded the
 5 desired product 4-(3-chloroindol-1-yl)-5-methoxy-2,6-dimethyl-pyridazin-3-one (6.02 g, 19.8 mmol, 93% yield) as a yellow solid.

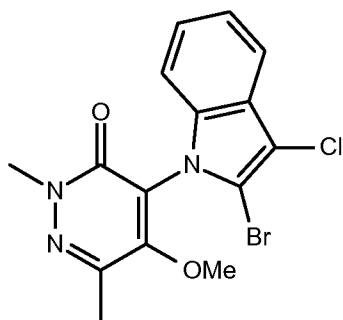


^1H NMR (400 MHz, CDCl_3): 7.68 - 7.65 (1H, m), 7.31 - 7.23 (3H, m), 7.06 - 7.03 (1H, m), 3.76 (3H, s), 3.26 (3H, s), 2.35 (3H, s).

10

1.7 Preparation of 4-(2-bromo-3-chloro-indol-1-yl)-5-methoxy-2,6-dimethyl-pyridazin-3-one

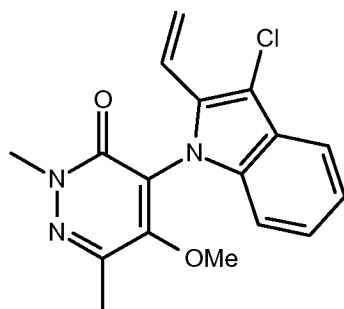
To a stirred solution of 4-(3-chloroindol-1-yl)-5-methoxy-2,6-dimethyl-pyridazin-3-one
 15 (2.88 mmol, 0.875 g) in DCM (30 mL) at 0°C was added *N*-bromosuccinamide (2.97 mmol, 0.528 g) portion-wise over 20 min. After stirring for 45 min, the reaction was quenched with saturated aqueous sodium bicarbonate solution (20 mL) and stirred for 5 min at RT before being passed through a phase separator cartridge and extracted with dichloromethane (3 x 30 mL). Combined organics were concentrated *in vacuo*. Flash column chromatography (silica gel,
 20 eluant 0-20% EtOAc:Hexane) afforded the desired product 4-(2-bromo-3-chloro-indol-1-yl)-5-methoxy-2,6-dimethyl-pyridazin-3-one (2.63 mmol, 1.01 g, 91%) as a yellow solid.



^1H NMR (400 MHz, CDCl_3): 7.58-7.64 (1H, m), 7.21-7.29 (2H, m), 6.95-6.99 (1H, m), 3.73 (3H, s), 3.44 (3H, s), 2.33 (3H, s).

1.8 Preparation of 4-(3-chloro-2-vinyl-indol-1-yl)-5-methoxy-2,6-dimethyl-pyridazin-3-one

A microwave vial was charged with 4-(2-bromo-3-chloro-indol-1-yl)-5-methoxy-2,6-dimethyl-pyridazin-3-one (120 mg, 0.314 mmol), 4,4,5,5-tetramethyl-2-vinyl-1,3,2-dioxaborolane (62.8 mg, 0.408 mmol), 1,1'-bis(diphenylphosphino)ferrocene-palladium(II) dichloride dichloromethane complex (12.8 mg, 0.0157 mmol), cesium fluoride (100 mg, 0.627 mmol) and 1,4-dioxane (3 mL).. The reaction was heated by microwave irradiation to 150 °C for 20 min. The reaction was poured into a mixture of dichloromethane (30 mL) and brine (30 mL). The layers were separated and the aqueous layer was extracted with dichloromethane (30 mL). The combined dichloromethane layers were dried (MgSO₄) and concentrated under reduced pressure to give the crude product, which was absorbed onto silica and purified by chromatography (0 to 20% EtOAc / isohexane) to afford the desired product 4-(3-chloro-2-vinyl-indol-1-yl)-5-methoxy-2,6-dimethyl-pyridazin-3-one (52 mg, 0.158 mmol, 50%) as a yellow solid.

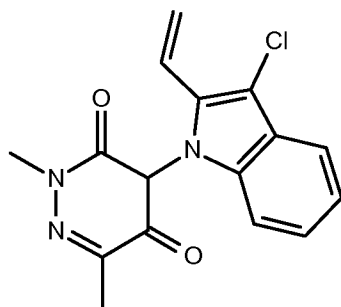


¹H NMR (400 MHz, CDCl₃): 7.66 - 7.62 (1H, m), 7.29 - 7.20 (2H, m), 6.94 - 6.92 (1H, m), 6.55 (1H, dd), 6.02 (1H, d), 5.47 (1H, d), 3.74 (3H, s), 3.36 (3H, s), 2.34 (3H, s).

1.9 Preparation of 4-(3-chloro-2-vinyl-indol-1-yl)-2,6-dimethyl-pyridazine-3,5-dione

A microwave vial was charged with 4-(3-chloro-2-vinyl-indol-1-yl)-5-methoxy-2,6-dimethyl-pyridazin-3-one (47 mg, 0.14 mmol), 1,4-dioxane (1.5 mL) and 30% NaOH aq. solution (1.5 mL). The reaction was heated in a microwave reactor at 125 °C for 15 min. LC/MS analysis indicated incomplete conversion. It was reheated in the microwave reactor at 125 °C for a further 15 min, whereupon LC/MS analysis now showed complete reaction. The reaction mixture was diluted with water (20 mL) then washed with dichloromethane (20 mL). The basic aqueous layer was then transferred to a beaker and cooled to 0 °C, then acidified with conc. HCl to give a white precipitate. This aqueous suspension was extracted with dichloromethane

(50 mL x 2) and the combined dichloromethane layers were dried (MgSO₄) and concentrated under reduced pressure to give the desired product 4-(3-chloro-2-vinyl-indol-1-yl)-2,6-dimethyl-pyridazine-3,5-dione (36 mg, 0.11 mmol, 80%) as a pale brown solid.



- 5 ¹H NMR (400 MHz, d₆-DMSO): 11.68 (1H, brs), 7.57 - 7.53 (1H, m), 7.22 - 7.17 (2H, m), 7.01 - 6.97 (1H, m), 6.46 (1H, dd), 5.89 (1H, d), 5.44 (1H, d), 3.57 (3H, s), 2.28 (3H, s).

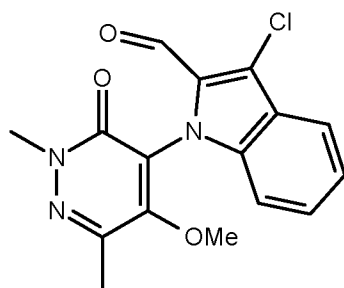
EXAMPLE 2 Preparation of intermediate compounds

- 2.1 Preparation of compounds of formula (7), e.g. 3-chloro-1-(5-methoxy-2,6-dimethyl-3-oxo-pyridazin-4-yl)indole-2-carbaldehyde, according to Reaction Scheme 9.
- 10

An oven dried flask was cooled to room temperature before being charged with 4-(3-chloroindol-1-yl)-5-methoxy-2,6-dimethyl-pyridazin-3-one (3.00 g, 9.88 mmol) and anhydrous dichloromethane (80 mL) and cooled to 0 °C. TiCl₄ (1M in dichloromethane) (39.5 mL, 39.5 mmol) was added dropwise, followed by the dropwise addition of dichloro(methoxy)methane (0.94 mL, 10.4 mmol). The reaction mixture was stirred at 0 °C for 25 mins and then warmed to room temperature and stirred for a further 75 mins, before being diluted with dichloromethane (75 mL) and re-cooled to 0 °C and quenched by the dropwise addition of 2M aq. NaOH solution (60 mL) and water (60 mL). The mixture was further diluted with dichloromethane (50 mL) and stirred for 60 mins, whilst warming to room temperature. The biphasic mixture was passed through a phase separator cartridge and the organics were concentrated *in vacuo* to afford the crude product. Purification via flash column chromatography provided 3-chloro-1-(5-methoxy-2,6-dimethyl-3-oxo-pyridazin-4-yl)indole-2-carbaldehyde (851 mg, 2.57 mmol, 26%) as a pale yellow gum.

15

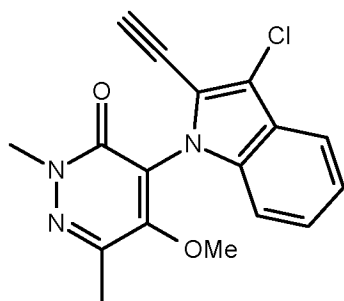
20



^1H NMR (CDCl_3): 2.35 (3H, s), 3.43 (3H, s), 3.70 (3H, s), 7.04 (1H, d), 7.31 (1H, t), 7.47 (1H, t), 7.80 (1H, d), 10.17 (1H, s).

5 2.2 Preparation of compounds of formula (1a), e.g. 4-(3-chloro-2-ethynyl-indol-1-yl)-5-methoxy-2,6-dimethyl-pyridazin-3-one, according to Reaction scheme 8.

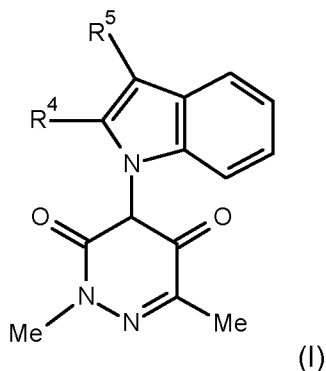
To a stirred solution of 3-chloro-1-(5-methoxy-2,6-dimethyl-3-oxo-pyridazin-4-yl)indole-2-carbaldehyde (0.190 mmol, 0.063 g) in methanol (10 mL) at 0 °C was added potassium carbonate (0.380 mmol, 0.0533 g), followed by 1-diazo-1-dimethoxyphosphoryl-propan-2-one (0.285 mmol, 0.0547 g, 0.0434 mL). The reaction was allowed to warm to RT over 45mins, then left to stir overnight for 16 h. The solvent was then evaporated and the residue was directly purified by chromatography (0-20% EtOAc:isohexane) to afford the desired product 4-(3-chloro-2-ethynyl-indol-1-yl)-5-methoxy-2,6-dimethyl-pyridazin-3-one (0.110 mmol, 0.036 g, 58%) as a colourless gum, which crystallised upon standing.



^1H NMR (400MHz, CDCl_3): 2.34 (3H, s), 3.43 (3H, s), 3.57 (1H, s), 3.75 (3H, s), 6.98 (1H, d), 7.25 (1H, t), 7.33 (1H, t), 7.64 (1H, d).

Compounds 1.001 to 1.005 as shown in Table 2 below, were made in an analogous manner using the methodology described above in Examples 1 and 2.

TABLE 2



Compound	R ⁴	R ⁵	NMR
1.001	-CH=CH ₂	Cl	(d ₆ -DMSO) 11.68 (1H, brs), 7.57 - 7.53 (1H, m), 7.22 - 7.17 (2H, m), 7.01 - 6.97 (1H, m), 6.46 (1H, dd), 5.89 (1H, d), 5.44 (1H, d), 3.57 (3H, s), 2.28 (3H, s)
1.002	-C(Me)=CH ₂	Cl	(CDCl ₃) 7.66 - 7.62 (1H, m), 7.27 - 7.21 (2H, m), 6.87 - 6.81 (1H, m), 5.26 (1H, s), 4.93 (1H, s), 3.63 (3H, s), 2.36 (3H, s), 2.15 (3H, s)
1.003	-C≡CH	Cl	(CDCl ₃) 7.48 (1H, d), 7.16 - 7.08 (2H, m), 6.73 (1H, d), 3.41 (3H, s), 3.34 (1H, s), 2.11 (3H, s)
1.004		Cl	(d ₆ -DMSO) 8.57 (2H, s), 7.67 - 7.63 (1H, m), 7.32 - 7.27 (2H, m), 7.15 - 7.10 (1H, m), 3.96 (3H, s), 3.47 (3H, s), 2.24 (3H, s)
1.005	-CH ₂ OMe	Cl	(DMSO-d ₆) 2.27 (3H, s), 3.13 (3H, s), 3.57 (3H, s), 4.33 (1H, d), 4.41 (1H, d), 7.01-7.04 (1H, m), 7.19-7.23 (2H, m), 7.55-7.58 (1H, m)

5

BIOLOGICAL EXAMPLES

B1 Post-emergence efficacy

Seeds of a variety of test species are sown in standard soil in pots:- *Solanum nigrum* (SOLNI), *Amaranthus retroflexus* (AMARE), *Setaria faberi* (SETFA), *Alopecurus myosuroides* (ALOMY), *Echinochloa crus-galli* (ECHCG), *Ipomoea hederacea* (IPOHE). 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

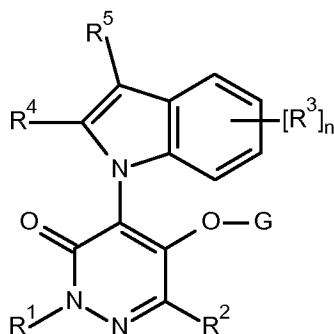
containing 0.5% Tween 20 (polyoxyethelyene sorbitan monolaurate, CAS RN 9005-64-5). Compounds are applied at 1000 g/ha. The test plants are then grown in a glasshouse under controlled conditions in a glasshouse (at 24/16°C, day/night; 14 hours light; 65 % humidity) and watered twice daily. After 13 days, the test is evaluated for the percentage damage caused to the plant. The biological activities are shown below in Table 3, on a five point scale (5 = 80-100%; 4 = 60-79%; 3=40-59%; 2=20-39%; 1=0-19%).

Table 3 Control of weed species by compounds of formula (I) after post-emergence application at a rate of 1000g/Ha

Compound No.	SOLNI	AMARE	SETFA	ALOMY	ECHCG	IPOHE
1.001	5	5	1	1	1	5
1.002	5	5	5	2	3	5
1.003	5	5	2	1	2	5
1.004	5	3	1	1	1	5
1.005	5	5	5	1	5	5

CLAIMS

1. A compound of formula (I)



(I) or a salt or N-oxide thereof,

5 wherein,

R^1 is selected from the group consisting of C_1 - C_4 alkyl, C_1 - C_2 alkoxy- C_1 - C_2 alkyl, C_2 - C_4 alkenyl, C_1 - C_4 haloalkyl, C_2 - C_4 haloalkenyl, C_2 - C_4 alkynyl and C_2 - C_4 haloalkynyl;

10 R^2 is selected from the group consisting of hydrogen, halogen, cyano, C_1 - C_6 alkyl, C_1 - C_6 haloalkyl, C_1 - C_6 haloalkoxy, C_1 - C_3 haloalkoxy- C_1 - C_3 alkyl-, C_1 - C_6 alkoxy, C_1 - C_3 alkoxy- C_1 - C_3 alkyl, C_1 - C_3 alkoxy- C_1 - C_3 alkoxy- C_1 - C_3 alkyl-, C_3 - C_6 cycloalkyl, C_2 - C_6 alkenyl, C_2 - C_6 haloalkenyl, C_2 - C_6 alkynyl, C_1 - C_6 hydroxyalkyl-, C_1 - C_6 alkylcarbonyl-, $-S(O)_pC_1$ - C_6 alkyl, amino, C_1 - C_6 alkylamino, C_1 - C_6 dialkylamino, $-C(C_1$ - C_3 alkyl)=N-O- C_1 - C_3 alkyl and C_2 - C_6 haloalkynyl;

15 each R^3 is independently selected from the group consisting of hydrogen, halogen, nitro, cyano, amino, C_1 - C_6 alkyl, C_1 - C_6 haloalkyl, C_3 - C_6 cycloalkyl, C_1 - C_6 alkoxy, C_1 - C_6 alkoxycarbonyl and $-S(O)_pC_1$ - C_6 alkyl;

20 R^4 is selected from the group consisting of C_2 - C_6 alkenyl, C_2 - C_6 alkynyl, C_2 - C_6 haloalkenyl, C_2 - C_6 haloalkynyl, C_1 - C_3 alkoxy- C_1 - C_3 alkyl-, $-C_1$ - C_3 alkyl-S(R^{10}), C_1 - C_6 alkylsulfonyl, $-S(R^{10})$, optionally substituted phenyl, optionally substituted heteroaryl, and C_1 - C_6 cyanoalkyl-;

25 R^5 is selected from the group consisting of hydrogen, hydroxyl, halogen, C_1 - C_3 alkyl, C_1 - C_3 haloalkyl, C_3 - C_6 cycloalkyl, C_1 - C_3 alkoxy;

G is hydrogen, or $-C(O)-R^6$;

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R⁶ is selected from the group consisting of C₁-C₆alkyl, C₁-C₆alkenyl, C₁-C₆alkynyl, C₁-C₆alkyl-S-, C₁-C₆alkoxy, -NR⁷R⁸ and phenyl optionally substituted by one or more R⁹;

R⁷ and R⁸ are independently selected from the group consisting of C₁-C₆ alkyl, C₁-C₆ alkoxy-; or R⁷ and R⁸ can together form a morpholinyl ring;

R⁹ is selected from the group consisting of halogen, cyano, nitro, C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkoxy and C₁-C₃haloalkoxy;

R¹⁰ is C₁-C₆alkyl,

n = 0, 1, 2, 3 or 4; and

p = 0, 1 or 2.

2. A compound according to claim 1, wherein G is hydrogen.

3. A compound according claim 1 or claim 2, wherein R² is selected from the group consisting of hydrogen, C₁-C₆alkyl, C₁-C₆haloalkyl, C₁-C₆alkoxy, C₁-C₃alkoxy-C₁-C₃alkyl, C₃-C₆cycloalkyl, C₂-C₆alkenyl, C₂-C₆haloalkenyl, C₂-C₆ alkynyl and C₂-C₆haloalkynyl;

4. A compound according to claim 3, wherein R² is selected from the group consisting of hydrogen, methyl, ethyl, cyclopropyl and methoxymethyl.

5. A compound according to any one of the previous claims, wherein R² is methyl.

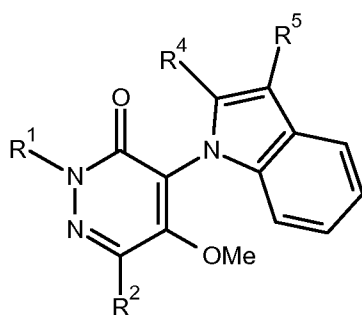
6. A compound according to any one of the previous claims, wherein n = 0.

7. A compound according to any one of the previous claims, wherein R¹ is selected from the group consisting of methyl, ethyl and *n*-propyl.

8. A compound according to any one of the preceding claims, wherein R⁴ is selected from the group consisting of C₂-C₄alkenyl, C₂-C₄alkynyl, C₂-C₄haloalkenyl, C₂-C₄haloalkynyl, C₁-C₃alkoxy-C₁-C₃alkyl-, -C₁-C₃alkyl-S-(R¹⁰) wherein R¹⁰ is preferably C₁-C₃alkyl, and optionally substituted heteroaryl wherein the optionally substituted heteroaryl contains one or two heteroatoms independently selected from nitrogen and oxygen and wherein said optional substituents are selected from the group consisting of C₁-C₃ alkyl, C₁-C₃ alkoxy, C₂-C₃ alkenyl, C₂-C₃ alkynyl, halogen, C₁-C₃ haloalkyl, and C₁-C₃ haloalkoxy.

9. A compound according to any one of the preceding claims, wherein R⁴ is selected from the group consisting of C₂-C₃alkenyl, C₂-C₃alkynyl, C₂-C₃haloalkenyl, C₂-C₃haloalkynyl, C₁-C₃alkoxy-C₁-C₃alkyl-, -C₁-C₃alkyl-S-Me, and pyrimidinyl substituted by C₁-C₃ alkyl or C₁-C₃ alkoxy.
10. A compound according to any one of the preceding claims, wherein R⁴ is selected from the group consisting of vinyl, isopropenyl, ethynyl, 2-methoxypyrimidin-5-yl, methoxymethyl, methylsulfanylmethyl, propargyl, acetonitrile, dichlorovinyl, dibromovinyl, 1-cyclopentenyl, 1-cyclohexenyl, chloroethynyl, bromoethynyl, chlorovinyl, and bromovinyl.
11. A compound according to any one of the preceding claims, wherein R⁵ is halogen.
12. A herbicidal composition comprising a herbicidal compound according to any one of the previous claims and an agriculturally acceptable formulation adjuvant.
13. A herbicidal composition according to claim 12, further comprising at least one additional pesticide.
14. A herbicidal composition according to claim 13, wherein the additional pesticide is a herbicide or herbicide safener.
15. A method of controlling unwanted plant growth, comprising applying a compound of formula (I) as defined in any one of claims 1 to 11, or a herbicidal composition according to any one of claims 12 to 14, to the unwanted plants or to the locus thereof.
16. Use of a compound of Formula (I) as defined in any one of claims 1 to 11 as a herbicide.
17. A compound of formula (1-Int)

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(1-Int)

wherein R^1 , R^2 and R^5 are as defined in any one of claims 1 to 5 or 11, R^4 is selected from the group consisting of hydrogen, halogen, $-C(O)H$, C_2-C_6 alkenyl, C_2-C_6 alkynyl, C_2-C_6 haloalkenyl, C_2-C_6 haloalkynyl, C_1-C_3 alkoxy- C_1-C_3 alkyl-, $-C_1-C_3$ alkyl-S-(R^{10}), C_1-C_6 alkylsulfonyl, $-S(R^{10})$, optionally substituted phenyl, optionally substituted heteroaryl, and C_1-C_6 cyanoalkyl-, and wherein R^{10} is as defined in claim 1.

18. The compound according to claim 17, wherein R^2 is Br.

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2014/071264

A. CLASSIFICATION OF SUBJECT MATTER

INV. C07D403/04 A01N43/58 A01P13/00
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 A01P

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, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2011/045271 A1 (BAYER CROPSOURCE AG [DE]; BOJACK GUIDO [DE]; LEHR STEFAN [DE]; HAEUSE) 21 April 2011 (2011-04-21) cited in the application claims 1-11 page 1, lines 7-9 examples	1-18
Y	WO 2009/086041 A1 (DU PONT [US]; STEVENSON THOMAS MARTIN [US]; MARSHALL ERIC ALLEN [US];) 9 July 2009 (2009-07-09) cited in the application claims 1-10	1-18
X,P	WO 2013/160126 A1 (SYNGENTA LTD [GB]) 31 October 2013 (2013-10-31) the whole document	1-18



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

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"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

10 December 2014

Date of mailing of the international search report

18/12/2014

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

Marzi, Elena

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2014/071264

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