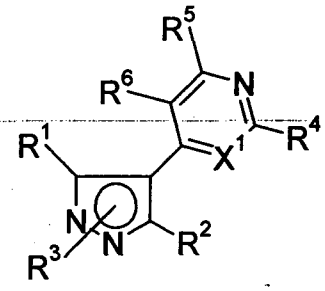
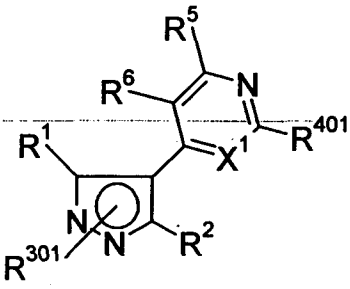
Phenylpyri(mi)dinylazoles

Abstract

Phenylpyri(mi)dinylazoles of the formula **[I-a]** and **[I-b]**,



[I-a]

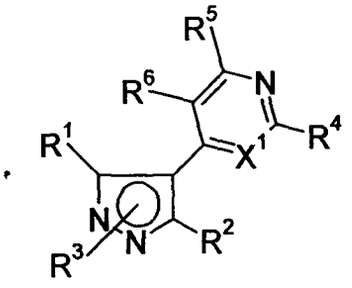


[I-b]

wherein the symbols have the meanings stated in the description, and agrochemically active salts thereof and the use thereof for the control of undesired microorganisms in the protection of plants and materials and for the reduction of mycotoxins in plants and plant parts and methods for the production of compounds of the formula **[I-a]** and **[I-b]**.

Patent Claims

1. Compounds of the formula **[I-a]**,



[I-a]

wherein the symbols have the following meanings:

X^1 stands for C-H or N,

R^1 stands for phenyl, naphthalenyl, quinolin-5-yl, quinolin-8-yl, isoquinolin-5-yl, isoquinolin-8-yl, 1-benzothiophen-4-yl, 1-benzothiophen-7-yl, 1-benzo-furan-4-yl, 1-benzofuran-7-yl, 1,3-benzodioxol-4-yl or 1,3-benzodioxol-5-yl, each optionally singly or multiply, identically or differently substituted with R^7,

R^2 stands for cyano, nitro, halogen, C_1-C_6 alkyl, C_1-C_6 alkoxy, C_1-C_6 haloalkyl, C_3-C_6 cycloalkyl, C_3-C_6 halocycloalkyl, C_1-C_6 haloalkoxy, C_1-C_6 alkylthio C_2-C_9 heterocyclyl or hydrogen,

R^3 stands for C_1-C_6 alkyl, C_2-C_6 alkenyl, C_2-C_6 alkynyl, C_3-C_6 cycloalkyl, C_3-C_6 cycloalkyl-C_1-C_6 alkyl, C_3-C_6 cycloalkyloxy, C_1-C_6 alkoxy, C_1-C_6 alkoxy-C_1-C_6 alkyl, acyloxy-C_1-C_6 alkyl, heteroaryl-C_1-C_6 alkyl, aryl-C_1-C_6 alkyl, C_1-C_6 alkylthio-C_1-C_6 alkyl, C_1-C_4 alkyl-C(O)-C_1-C_6 alkyl, C_3-C_6 cycloalkyl-C(O)-C_1-C_4 alkyl, C_2-C_9 heterocycyl-C(O)-C_1-C_4 alkyl, C_1-C_4 alkyl-C(O)O-C_1-C_6 alkyl, C_1-C_4 alkyl-C(O)O-C_3-C_6 cycloalkyl, C_1-C_4 alkyl-C(O)O heterocyclyl, heterocyclyl-C_1-C_6 alkyl, heterocyclyl, oxoheterocyclyl or heteroaryl, each optionally singly or multiply, identically or differently substituted with halogen, cyano, hydroxy, C_1-C_6 alkyl, C_1-C_6 alkoxy, haloalkoxy, phenyl or phenoxy,

R^4 stands for hydrogen, halogen, cyano, $-C(O)OR^{12}$, $-SR^{12}$, $-NR^{12}R^{13}$, $-C(O)NR^{12}R^{13}$ or $-NR^{12}R^{14}$, $-N=C=NR^{22}$, $-N=C(H)OR^{22}$, $-N=C(OR^{22})R^{23}$, $-N=C(SR^{22})R^{23}$, $-C(=NR^{22})NR^{22}R^{23}$, $-SO(=NR^{22})R^{23}$ or $-SO_2R^{20}$

or for C_1-C_6 alkyl, C_3-C_8 cycloalkyl, C_2-C_6 alkenyl, C_6-C_{14} aryl, C_2-C_9 heterocyclyl or C_2-C_9 heteroaryl, each optionally singly or multiply, identically or differently substituted with R^{11},

R^5 and R^6 mutually independently stand for hydrogen, fluorine, chlorine, bromine, cyano, nitro, -OH or -SH,

or for C_1-C_6 alkyl, C_3-C_6 cycloalkyl, C_2-C_6 alkenyl, C_2-C_6 alkynyl, C_6-C_{14} aryl, -O-(C_1-C_4 alkyl), -O-(C_6-C_{14} aryl), -S-(C_1-C_4 alkyl), -S(O)-(C_1-C_6 alkyl) or -C(O)-(C_1-C_6 alkyl), each optionally singly or multiply, identically or differently substituted with R^{11}

or else together with the carbon atom to which they are bound form a ring with 3 to 8 ring atoms, wherein the ring can contain 1 to 4 hetero atoms from the range oxygen, sulphur or -NR^{19}, optionally singly or multiply, identically or differently substituted with halogen, oxygen, cyano or C_1-C_4 alkyl,

R^7 mutually independently stands for one or more of the following groups: fluorine, chlorine, bromine, cyano, nitro, -OH or -SH,

or for C_1-C_6 alkyl, C_3-C_6 cycloalkyl, C_2-C_6 alkenyl, C_2-C_6 alkynyl, tri(C_1-C_4 alkyl)silyl, C_6-C_{14} aryl, -O-(C_1-C_4 alkyl), -O-(C_6-C_{14} aryl), -S-(C_1-C_4 alkyl), -S(O)-(C_1-C_6 alkyl) or -$S(O)_2$-(C_1-C_6 alkyl), each optionally singly or multiply, identically or differently substituted with fluorine, chlorine, bromine, -OH, cyano, C_1-C_6 alkyl or -O-(C_1-C_4 alkyl),

R^{11} stands for -OH, fluorine, chlorine, bromine, cyano, -NH-C(O)R^{20}, -$NR^{20}R^{21}$, -C(O)R^{20}, -C(O)OR^{20}, -C(O)$NR^{20}R^{21}$ or -SO_2R^{20}

or for C_1-C_6 alkyl, C_2-C_6 alkenyl, C_2-C_6 alkynyl, C_1-C_{11} heteroalkyl, C_3-C_8 cycloalkyl, -O-(C_1-C_4 alkyl), -S-(C_1-C_4 alkyl), -O-(C_3-C_8 cycloalkyl), -S-(C_3-C_8 cycloalkyl), C_6-C_{14} aryl, -O-(C_6-C_{14} aryl), -S-(C_6-C_{14} aryl), C_2-C_9 heterocyclyl or C_2-C_9 heteroaryl, each optionally singly or multiply, identically or differently substituted with fluorine, chlorine, bromine, -OH, carbonyl, cyano, C_1-C_6 alkyl or -O-(C_1-C_4 alkyl),

R^{12} and R^{13} mutually independently stand for one or more of the following groups: H, -C(S)R^{15}, -C(O)R^{15}, -SO_2R^{15}, -C(O)OR^{15}, -OR^{15} or -C(O)$NR^{15}R^{16}$

or for C_1-C_6 alkyl, C_3-C_6 cycloalkyl, C_2-C_6 alkenyl, C_2-C_6 alkynyl, C_3-C_8 cycloalkyl, C_6-C_{14} aryl, C_2-C_9 heterocyclyl or C_2-C_9 heteroaryl, each optionally singly or multiply, identically or differently substituted with fluorine, chlorine, bromine, -OH, cyano, C_1-C_6 alkyl, -O-C(O)R^{11} , -O-P(O)$(OR^{11})_2$, -O-B$(OR^{11})_2$ or -O-(C_1-C_4 alkyl),

R^{14} stands for -CH_2-$NR^{22}R^{23}$, piperidin-1-ylmethyl or morpholin-4-ylmethyl,

or for C_1-C_6 alkyl or -O-(C_1-C_4 alkyl), each optionally singly or multiply, identically or differently substituted with fluorine, chlorine, bromine, -OH or cyano,

R^{15} and R^{16} mutually independently stand for hydrogen or -OH

or for C_1-C_6 alkyl, C_3-C_6 cycloalkyl, C_2-C_6 alkenyl, C_2-C_6 alkynyl, C_3-C_8 cycloalkyl, C_6-C_{14} aryl, C_2-C_9 heterocyclyl or C_2-C_9 heteroaryl, each optionally singly or multiply, identically or differently substituted with R^{11},

or together with the nitrogen atom to which they are bound form a 3 to 7-membered ring, which can contain a further hetero atom from the range N or O not adjacent to the nitrogen,

R^{17} and R^{18} mutually independently stand for one or more of the following groups: H or -C(O)OR^{11}

or for C_1-C_6 alkyl, C_3-C_6 cycloalkyl, C_2-C_6 alkenyl, C_2-C_6 alkynyl, C_3-C_8 cycloalkyl, C_6-C_{14} aryl, C_2-C_9 heterocyclyl or C_2-C_9 heteroaryl, each optionally singly or multiply, identically or differently substituted with fluorine, chlorine, bromine, -OH, cyano, C_1-C_6 alkyl, and -O-(C_1-C_4 alkyl),

R^{19} stands for H, C_1-C_6 alkyl, C_3-C_6 cycloalkyl, C_2-C_6 alkenyl, C_2-C_6 alkynyl, -C(S)R^{15}, -C(O)R^{15}, -SO_2R^{15} or -C(O)OR^{15},

R^{20} and R^{21} mutually independently stand for C_1-C_6 alkyl, C_3-C_6 cycloalkyl, C_2-C_6 alkenyl or C_2-C_6 alkynyl each optionally singly or multiply, identically or differently substituted with fluorine, chlorine, bromine, -OH or cyano, or hydrogen, and

R^{22} and R^{23} mutually independently stand for C_1-C_6 alkyl, C_3-C_6 cycloalkyl, C_2-C_6 alkenyl, C_2-C_6 alkynyl or hydrogen,

and agrochemically active salts thereof,

wherein the following compounds are excepted:

a) Compounds wherein,

X^1 stands for N,

R^1 stands for an optionally substituted phenyl,

R^3 stands for butyl or propyn-2-yl,

R^4 stands for $-NHR_{12}$, and

R^{12} stands for optionally substituted phenyl,

and b) Compounds wherein

X^1 stands for N

R^2, R^4, R^5, R^6 stand for H, and

R^3 stands for methyl, ethyl, allyl, 2-methoxyethyl or benzyl, when R^1 stands for 4-chlorophenyl, or

R^3 stands for methyl, when R^1 stands for phenyl, 4-methoxyphenyl or 4-fluorophenyl.

2. Compounds of the formula **[I-a]** according to Claim 1,

wherein the symbols have the following meanings,

R^1 stands for phenyl, optionally singly or multiply, identically or differently substituted with R^7,

R^2 stands for methyl, ethyl, isopropyl, cyclopropyl or hydrogen,

R^3 stands for propan-2-yl, isobutyl, butan-2-yl, 2-methylpropyl, 2,2-dimethyl-propyl, 3-methylbut-2-en-1-yl, but-2-en-1-yl, but-3-en-2-yl, propadienyl, prop-2-yn-1-yl, but-2-yn-1-yl, but-3-yn-2-yl, 2-methylbut-3-yn-2-yl, 2-methylbut-3-yn-2-yl, cyanomethyl, 2-cyanoethyl, 1-cyanopropan-2-yl, cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, (2,2-dichlorocyclo-propyl)methyl, cyclopropylmethyl, 1-cyclopropylethyl, trichloromethyl,

trifluoromethyl, 2-fluoroethyl, 2,2-difluoroethyl, 2,2,2-trifluoroethyl, 2,2,2-trichloroethyl, 2-chloroethyl, 2-bromoethyl, 2-fluoropropyl, 3-fluoropropyl, 2-chloropropyl, 3-chloropropyl, 1,3-difluoropropan-2-yl, 2-fluorobenzyl, 3-fluorobenzyl, 4-fluorobenzyl, 2,3-difluorobenzyl, 2-chloro-6-fluorobenzyl, 1-(2-chlorophenyl)ethyl, 1-(3-chlorophenyl)ethyl, 1-(4-chlorophenyl)ethyl, 3-cyanobenzyl, 4-cyanobenzyl, 4-(difluoromethoxy)benzyl, 2-cyanobenzyl, 2-(3-chlorophenyl)ethyl, 2-(2-chlorophenyl)ethyl, 1-naphthylmethyl, (pyridine-3-ylmethyl, 2-chloro-1,3-thiazol-5-yl)methyl, methoxymethyl, 2-methoxyethyl, 2-(methylsulphanyl)ethyl, 2-(trifluoromethoxy)ethyl, 1-methoxypropan-2-yl, 2-[2-(2-methoxyethoxy)ethoxy]ethyl, 2-(2-methoxy-ethoxy)ethyl, tetrahydrofuran-2-ylmethyl, (3-methyloxetan-3-yl)methyl, 1H-imidazol-2-ylmethyl, tetrahydrofuran-3-yl, 2-oxotetrahydrofuran-3-yl, 2-tert-butoxy-2-oxoethyl, 1-methoxy-3-methyl-1-oxobutan-2-yl, 1-methoxy-1-oxopropan-2-yl or 3-ethoxy-3-oxopropyl, propan-2-yloxy, methyl, ethyl, n-propyl, 2-ethoxyethyl or 2-chloroethyl,

R^4 stands for hydrogen or $-NR^{12}R^{13}$ or $-NHR^{13}$,

R^5 and R^6 mutually independently stand for hydrogen, fluorine or cyano

or together with the carbon atoms to which they are bound form a single ring wherein they together stand for -(CH=CH-CH=CH)-, -(CH=CH-$N(R^{19})$), -(CH=CH-CH=N)-, -(NH-CH=N)- or -(CH_2-C(O)-$N(R^{19})$)-, optionally singly or multiply, identically or differently substituted with R^{11},

R^7 mutually independently stands for one or more of the following groups: fluorine, chlorine, cyano or methyl,

R^{11} stands for -OH, fluorine, chlorine, bromine, cyano, $-NH-C(O)R^{20}$, $-C(O)R^{20}$, $-C(O)OR^{20}$, $-C(O)NR^{20}R^{21}$ or $-SO_2R^{20}$

or for C_1-C_6 alkyl, C_3-C_8 cycloalkyl, C_2-C_6 alkenyl, C_2-C_6 alkynyl, -O-(C_1-C_4 alkyl), -S-(C_1-C_4 alkyl), -O-(C_3-C_8 cycloalkyl) or -S-(C_3-C_8 cycloalkyl), each optionally singly or multiply, identically or differently substituted with fluorine, chlorine, bromine, -OH, cyano, C_1-C_6 alkyl or -O-(C_1-C_4 alkyl),

R^{12} stands for hydrogen, $-C(S)R^{15}$, $-C(O)R^{15}$, $-SO_2R^{15}$, $-C(O)OR^{15}$, $-OR^{15}$ or $-C(O)NR^{15}R^{16}$,

R^{13} stands for C_1-C_6 alkyl, C_2-C_6 alkenyl, C_2-C_6 alkynyl, C_2-C_9 heterocyclyl or C_2-C_9 heteroaryl or hydrogen,

R^{15} stands for C_1-C_6 alkyl, C_3-C_6 cycloalkyl, C_2-C_6 alkenyl, C_2-C_6 alkynyl, C_3-C_8 cycloalkyl, C_2-C_9 heterocyclyl or C_2-C_9 heteroaryl, each optionally singly or multiply, identically or differently substituted with halogen, -OH, cyano or C_1-C_4 alkyl,

or for hydrogen

R^{16} stands for hydrogen, methyl, ethyl or propyl,

R^{19} stands for H, C_2-C_6 alkynyl, $-C(O)R^{15}$, $-SO_2R^{15}$ or $-C(O)OR^{15}$, and

R^{20} and R^{21} mutually independently stand for methyl, ethyl, propyl, isopropyl, cyclopropyl or cyclobutyl, each optionally singly or multiply, identically or differently substituted with fluorine, chlorine, bromine, -OH or cyano,

or for hydrogen,

and agrochemically active salts thereof.

3. Compounds of the formula **[I-a]** according to one or more of Claims 1 to 2,

wherein the symbols have the following meanings,

X^1 stands for C-H, and

R^4 stands for hydrogen

and agrochemically active salts thereof.

4. Compounds of the formula **[I-a]** according to one or more of Claims 1 to 2,

wherein the symbols have the following meanings,

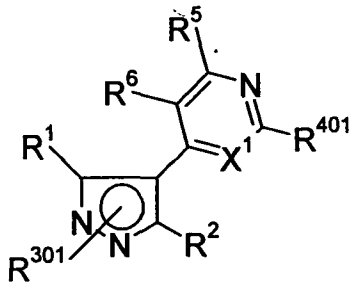
X^1 stands for N,

R^4 stands for $-NHR^{13}$, and

R^{13} stands for C_1-C_6 alkyl, C_3-C_6 cycloalkyl, C_2-C_6 alkenyl, C_2-C_6 alkynyl, C_2-C_9 heterocyclyl or C_2-C_9 heteroaryl, each optionally singly or multiply, identically or differently substituted with fluorine, chlorine, bromine, -OH or cyano,

and agrochemically active salts thereof.

Compounds of the formula **[I-b]**,



[I-b]

wherein the symbols have the following meanings:

X^1 stands for C-H or N,

R^1 stands for phenyl, naphthalenyl, quinolin-5-yl, quinolin-8-yl, isoquinolin-5-yl, isoquinolin-8-yl, 1-benzothiophen-4-yl, 1-benzothiophen-7-yl, 1-benzo-furan-4-yl, 1-benzofuran-7-yl, 1,3-benzodioxol-4-yl or 1,3-benzodioxol-5-yl, each optionally singly or multiply, identically or differently substituted with R^7,

R^2 stands for cyano, nitro, halogen, C_1-C_6 alkyl, C_1-C_6 alkoxy, C_1-C_6 haloalkyl, C_1-C_6 haloalkoxy, C_1-C_6 alkylthio, C_3-C_6 cycloalkyl, C_3-C_6 halocycloalkyl, C_2-C_9 heterocyclyl or hydrogen,

R^{301} stands for $-C(O)N(R^9R^{10})$, $-C(O)R^9$, $-C(O)OR^9$ or $-S(O)_2R^9$ or for C_1-C_6 alkyl, C_2-C_6 alkenyl, C_3-C_6 allenyl, C_2-C_6 alkynyl, C_3-C_8 cycloalkyl, C_1-C_6 alkoxy, C_2-C_9 heterocyclyl, C_2-C_9 oxoheterocyclyl, or heteroaryl, each optionally singly or multiply, identically or differently substituted with R^8,

R^{401} stands for $-NR^{12}R^{13}$, $-C(O)NR^{12}R^{13}$ or $-N(R^{12})_2$

R^5 and R^6 mutually independently stand for hydrogen, fluorine, chlorine, bromine, cyano, nitro, -OH or -SH,

or for C_1-C_6 alkyl, C_3-C_6 cycloalkyl, C_2-C_6 alkenyl, C_2-C_6 alkynyl, C_6-C_{14} aryl, -O-(C_1-C_4 alkyl), -O-(C_6-C_{14} aryl), -S-(C_1-C_4 alkyl), -S(O)-(C_1-C_6 alkyl) or -C(O)-(C_1-C_6 alkyl), each optionally singly or multiply, identically or differently substituted with R^{11},

or else together with the carbon atom to which they are bound form a ring with 3 to 8 ring atoms, wherein the ring can contain 1 to 4 hetero atoms from the range oxygen, sulphur or -N-R^{19}, optionally singly or multiply, identically or differently substituted with halogen, oxygen, cyano or C_1-C_4 alkyl,

R^7 mutually independently stands for one or more of the following groups: fluorine, chlorine, bromine, cyano, nitro, -OH or -SH,

or for C_1-C_6 alkyl, C_3-C_6 cycloalkyl, C_2-C_6 alkenyl, C_2-C_6 alkynyl, tri(C_1-C_4 alkyl)silyl, C_6-C_{14} aryl, -O-(C_1-C_4 alkyl), -O-(C_6-C_{14} aryl), -S-(C_1-C_4 alkyl), -S(O)-(C_1-C_6 alkyl) or -$S(O)_2$-(C_1-C_6 alkyl), optionally singly or multiply, identically or differently substituted with fluorine, chlorine, bromine, -OH, cyano, C_1-C_6 alkyl or -O-(C_1-C_4 alkyl),

R^8 stands for -OH, halogen, NO_2 , cyano, -NR^9R^{10}, -C(O)N(R^9R^{10}), -C(O)R^9, -C(O)OR^9, -O-C(O)R^9 or -$(CH_2)_n$C(O)R^9 wherein n = a whole number between 1 and 6

or for C_1-C_6 alkyl, C_2-C_8 alkenyl, C_2-C_8 alkynyl, C_3-C_8 cycloalkyl, C_1-C_6 haloalkyl, C_6-C_{14} aryl, C_2-C_9 heterocyclyl, C_2-C_9 heteroaryl, -O-(C_1-C_4 alkyl), -S-(C_1-C_4 alkyl), -O-(C_3-C_8 cycloalkyl) or -S-(C_3-C_8 cycloalkyl), each optionally singly or multiply, identically or differently substituted with R^{11},

R^9 and R^{10} mutually independently stand for C_1-C_6 alkyl, C_2-C_8Alkenyl, C_2-C_8 alkynyl, C_3-C_8 cycloalkyl, C_6-C_{14} aryl, C_2-C_9 heterocyclyl or C_2-C_9 heteroaryl, each optionally singly or multiply, identically or differently substituted with R^{11},

or for hydrogen,

R^{11} stands for -OH, fluorine, chlorine, bromine, cyano, -NH-C(O)R^{20}, -$NR^{20}R^{21}$, -C(O)R^{20}, -C(O)OR^{20}, -C(O)$NR^{20}R^{21}$ or -SO_2R^{20}

or for C_1-C_6 alkyl, C_2-C_6 alkenyl, C_2-C_6 alkynyl, C_1-C_{11} heteroalkyl, C_3-C_8 cycloalkyl, -O-(C_1-C_4 alkyl), -S-(C_1-C_4 alkyl), -O-(C_3-C_8 cycloalkyl), S-(C_3-C_8 cycloalkyl), C_6-C_{14} aryl, -O-(C_6-C_{14} aryl), -S-(C_6-C_{14} aryl), C_2-C_9 heterocyclyl or C_2-C_9 heteroaryl, optionally singly or multiply identically or differently substituted with fluorine, chlorine, bromine, -OH, carbonyl, cyano, C_1-C_6 alkyl or -O-(C_1-C_4 alkyl),

R^{12} stands for -C(S)R^{15}, -C(O)R^{15}, -SO_2R^{15}, -C(O)OR^{15}, -OR^{15} or -C(O)$NR^{15}R^{16}$,

R^{13} stands for C_1-C_6 alkyl, C_3-C_6 cycloalkyl, C_2-C_6 alkenyl, C_2-C_6 alkynyl, C_3-C_8 cycloalkyl, C_2-C_9 heterocyclyl or C_2-C_9 heteroaryl, each optionally singly or multiply, identically or differently substituted with fluorine, chlorine, bromine, -OH, cyano, C_1-C_6 alkyl, -O-C(O)-C_1-C_4 alkyl, -O-P(O)(O-C_1-C_4 alkyl)$_2$, -O-B(O-C_1-C_4 alkyl)$_2$ or -O-(C_1-C_4 alkyl),

or for hydrogen,

R^{15} and R^{16} mutually independently stand for hydrogen or -OH,

or for C_1-C_6 alkyl, C_3-C_6 cycloalkyl, C_2-C_6 alkenyl, C_2-C_6 alkynyl, C_3-C_8 cycloalkyl, C_6-C_{14} aryl, C_2-C_9 heterocyclyl or C_2-C_9 heteroaryl, each optionally singly or multiply, identically or differently substituted with R^{11},

or together with the nitrogen atom to which they are bound form a 3 to 7-membered ring, which can contain a further hetero atom from the range N or O not adjacent to the nitrogen,

R^{19} stands for H, C_1-C_6 alkyl, C_3-C_6 cycloalkyl, C_2-C_6 alkenyl, C_2-C_6 alkynyl, -C(S)R^{15}, -C(O)R^{15}, -SO_2R^{15} or -C(O)OR^{15}, and

R^{20} and R^{21} mutually independently stand for C_1-C_6 alkyl, C_3-C_6 cycloalkyl, C_2-C_6 alkenyl or C_2-C_6 alkynyl, each optionally singly or multiply, identically or differently substituted with fluorine, chlorine, bromine, -OH or cyano or hydrogen,

and agrochemically active salts thereof,

wherein the following compounds are excepted:

a) Compounds wherein,

R^{301} stands for optionally substituted [1,2,4[triazolo[4,3-b]pyridazin-6-yl, 7,8-dihydro[1,2,4[triazolo[4,3-b]pyridazin 6-yl, 6-oxo-1,6-dihydropyridazin-3-yl, 6-oxo-1,4,5,6-tetrahydropyridazin-3-yl or 6-chloropyridazin-3-yl, and

R^5, R^6 stand for H, and

b) the compounds 4-{1-[2-(dimethylamino)ethyl]-3-(4-fluorophenyl)-1H-pyrazol-4-yl}-N,N-dimethylpyridin-2-amine and 1-(4-{4-[1-ethyl-3-(4-nitrophenyl)-1H-pyrazol-4-yl]-1H-pyrrolo[2,3-b]pyridin-6-yl}phenyl)-N,N-dimethylmethanamine.

6. Compounds of the formula **[I-b]** according to Claim 5,

wherein the symbols have the following meanings,

R^1 stands for phenyl, optionally singly or multiply, identically or differently substituted with R^7,

R^2 stands for methyl, ethyl, isopropyl, cyclopropyl, or hydrogen,

R^{301} stands for C_1-C_6 alkyl, C_2-C_6 alkenyl, C_3-C_6 allenyl, C_2-C_6 alkynyl, C_3-C_8 cycloalkyl or C_1-C_6 alkoxy, each optionally singly or multiply, identically or differently substituted with R^8,

R^{401} stands for $-NR^{12}R^{13}$,

R^5 and R^6 mutually independently stand for hydrogen, fluorine or cyano

or together with the carbon atoms to which they are bound form a single ring wherein they together stand for -(CH=CH-CH=CH)-, -(CH=CH-N(R^{19})-, -(CH=CH-CH=N)- or -(CH_2-C(O)-N(R^{19})-, optionally singly or multiply, identically or differently substituted with R^{11},

R^7 stands for fluorine, chlorine, cyano or methyl,

R^8 stands for fluorine, chlorine or cyano or for C_1-C_6 alkyl, C_2-C_8 alkenyl, C_2-C_8 alkynyl, C_3-C_8 cycloalkyl, C_6-C_{14} aryl, heterocyclyl, heteroaryl, -O-(C_1-C_4 alkyl), -S-(C_1-C_4 alkyl), -O-(C_3-C_8 cycloalkyl) or -S-(C_3-C_8 cycloalkyl), each optionally singly or multiply, identically or differently substituted with R^{11},

R^{11} stands for one or more of the following groups: -OH, fluorine, chlorine, bromine, cyano, $-NH-C(O)R^{20}$, $-C(O)R^{20}$, $-C(O)OR^{20}$, $-C(O)NR^{20}R^{21}$ or $-SO_2R^{20}$

or for C_1-C_6 alkyl, C_3-C_8 cycloalkyl, C_2-C_6 alkenyl, C_2-C_6 alkynyl, -O-(C_1-C_4 alkyl), -S-(C_1-C_4 alkyl), -O-(C_3-C_8 cycloalkyl) or -S-(C_3-C_8 cycloalkyl), each optionally singly or multiply, identically or differently substituted with fluorine, chlorine, bromine, -OH, cyano, C_1-C_6 alkyl or -O-(C_1-C_4 alkyl),

R^{12} stands for: $-C(S)R^{15}$, $-C(O)R^{15}$, $-SO_2R^{15}$, $-C(O)OR^{15}$, $-OR^{15}$ or $-C(O)NR^{15}R^{16}$,

R^{13} stands for C_1-C_6 alkyl, C_2-C_6 alkenyl, C_2-C_6 alkynyl or hydrogen,

R^{15} stands for C_1-C_6 alkyl, C_3-C_6 cycloalkyl, C_2-C_6 alkenyl, C_2-C_6 alkynyl, C_3-C_8 cycloalkyl, C_2-C_9 heterocyclyl or C_2-C_9 heteroaryl, each optionally singly or multiply, identically or differently substituted with halogen, -OH, cyano or C_1-C_4 alkyl,

or for hydrogen,

R^{16} stands for hydrogen, methyl, ethyl or propyl,

R^{19} stands for H, $-C_2$-C_6 alkynyl, $-C(O)R^{15}$, $-SO_2R^{15}$ or $-C(O)OR^{15}$, and

R^{20} and R^{21} mutually independently stand for methyl, ethyl, propyl, isopropyl, cyclo-propyl or cyclobutyl, each optionally singly or multiply, identically or differently substituted with fluorine, chlorine, bromine, -OH or cyano,

or for hydrogen,

and agrochemically active salts thereof.

7. Compounds of the formula **[I-b]** according to one or more of Claims 5 to 6,

wherein the symbols have the following meanings,

X^1 stands for N,

R^1 stands for phenyl, 3-methylphenyl, 2-fluorophenyl, 3-fluorophenyl, 4-fluorophenyl, 3-trifluoromethylphenyl, 4-chlorophenyl, 2,5-difluorophenyl, 2,4-difluorophenyl, 2,6-difluorophenyl, 3-methyl-4-fluorophenyl, 3-cyano-4-fluorophenyl or 2,4,6-trifluorophenyl,

R^{301} stands for methyl, ethyl, 1-propyl, propan-2-yl, isobutyl, butan-2-yl, 2-methylpropyl, 2,2-dimethylpropyl, 2-(morpholin-4-yl)ethyl, 2-cyanoethyl, cyanomethyl, 2-cyano-2-methylpropyl, 3-methylbut-2-en-1-yl, but-2-en-1-yl, but-3-en-2-yl, propadienyl, prop-2-en-1-yl, prop-2-yn-1-yl, but-2-yn-1-yl, but-3-yn-2-yl, 2-methylbut-3-yn-2-yl, 2-methylbut-3-yn-2-yl, cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, (2,2-dichlorocyclopropyl)methyl, cyclopropylmethyl, 1-

cyclopropylethyl, trichloromethyl, trifluoromethyl, 2-fluoroethyl, 2,2-difluoroethyl, 2,2,2-trifluoroethyl, 2,2,2-trichloroethyl, 2-chloroethyl, 2-bromoethyl, 2-fluoropropyl, 3-fluoropropyl, 2-chloropropyl, 3-chloropropyl, 1,3-difluoropropan-2-yl, 1,1,1-trifluoropropan-2-yl, 1,1,1-trifluoro-2-methylpropan-2-yl, 3,3,3-trifluoro-2-hydroxypropyl, 2-fluoro-benzyl, 3-fluorobenzyl, 4-fluorobenzyl, 2,3-difluorobenzyl, 2-chloro-6-fluorobenzyl, 1-(2-chlorophenyl)ethyl, 1-(3-chlorophenyl)ethyl, 1-(4-chloro-phenyl)ethyl, 3-cyanobenzyl, 4-cyanobenzyl, 4-(difluoromethoxy)benzyl, 2-cyanobenzyl, 2-(3-chlorophenyl)ethyl, 2-(2-chlorophenyl)ethyl, 1-naphthylmethyl, (pyridine-3-ylmethyl, 2-chloro-1,3-thiazol-5-yl)methyl, methoxymethyl, 2-methoxyethyl, 2-methoxypropyl, 2-(methylsulphanyl)-ethyl, 2-(trifluoromethoxy)ethyl, 1-methoxypropan-2-yl, 2-[2-(2-methoxy-ethoxy)ethoxy]ethyl, 2-(2-methoxyethoxy)ethyl, 1,3-dimethoxypropan-2-yl, 2-(cyclopropyloxy)ethyl, tetrahydrofuran-2-ylmethyl, (3-methyloxetan-3-yl)methyl, 1H-imidazol-2-ylmethyl, tetrahydrofuran-3-yl, 2-oxotetrahydro-furan-3-yl, 2-tert-butoxy-2-oxoethyl, 1-methoxy-3-methyl-1-oxobutan-2-yl, 1-methoxy-1-oxopropan-2-yl or 3-ethoxy-3-oxopropyl, 1-cyanopropan-2-yl, propan-2-yloxy or 2-ethoxyethyl,

R^{401} stands for $-NHR^{12}$,

R^{11} stands for one or more of the following groups: -OH, fluorine, chlorine, cyano, methyl, ethyl or cyclopropyl,

R^{12} stands for $-C(S)R^{15}$, $-SO_2R^{15}$, $-C(O)OR^{15}$ or $-C(O)R^{15}$,

R^{15} stands for methyl, ethyl, n-propyl, isopropyl, sec-butyl, isobutyl, cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, 2-methoxyethyl, (2-methoxyethoxy)-methyl, cyclopentenyl, cyclohexenyl, oxetanyl, tetrahydrofuran-2-yl, ethinyl, prop-1-yn-1-yl, prop-1-en-1-yl, aminomethyl, aminoethyl, amino-propyl, aminobutyl, aminoisopropyl, aminocyclopropyl, aminocyclobutyl, aminocyclopentyl, dimethylamino, ethyl(methyl)amino, pyrrolidinyl, diethylamino, 2-pyridyl, 3-pyridyl, 4-pyridyl, ethoxycarbonyl, benzyl, phenyl, 2-thienyl or 3-thienyl, each optionally singly or multiply, identically or differently substituted with halogen, OH, cyano or C_1-C_4 alkyl,

or for hydrogen, and

R^{19} stands for H, acetyl, ethoxycarbonyl, methoxycarbonyl, prop-2-yn-1-yl or but-2-yn-1-yl,

and agrochemically active salts thereof.

8. Compounds of the formula **[I-b]** according to one or more of Claims 5 to 6,

wherein the symbols have the following meanings,

X^1 stands for C-H,

R^1 stands for 4-fluorophenyl, 3-chlorophenyl, 2,6-difluorophenyl or 3-methylphenyl,

R^2 stands for cyclopropyl, methyl, H or difluoromethoxy, and

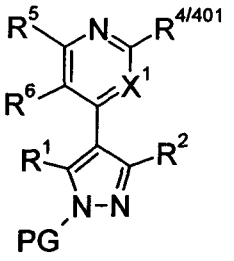
R^{401} stands for acetylamino, n-propionylamino, isobutyrylamino, (cyclopropyl-carbonyl)amino, (methoxyacetyl)amino, 2-methoxypropanoyl, (2-methyl-butanoyl)amino, but-2-enoylamino, prop-2-ynoylamino, 3-(dimethylamino)-prop-2-enoyl]amino, 3,3,3-trifluoropropanoyl)amino, 3,3-difluoro-propanoyl)amino, (cyclopropylacetyl)amino, lactoylamino, (cyclobutyl-carbonyl)amino, (cyclopentylacetyl)amino, 2-methylcyclopropyl)carbonyl]-amino, (3-methylbutanoyl)amino, (phenylacetyl)amino, benzoylamino, (3-thienylcarbonyl)amino, (2-thienylcarbonyl)amino (2-hydroxy-2-methyl-propanoyl)amino, [(2-methoxyethoxy)acetyl]amino or 2,3-dihydroxy-propanoyl)amino,

and agrochemically active salts thereof.

9. Method for the control of phytopathogenic and mycotoxin-producing fungi, characterized in that phenylpyri(mi)dinylazoles of the formula **[I-a]** and/or **[I-b]** according to one or more of Claims 1 to 8 are applied onto the fungi and/or their habitat.

10. Agent for the control of phytopathogenic and mycotoxin-producing fungi, characterized by a content of at least one phenylpyri(mi)dinylazole of the formula **[I-a]** and/or **[I-b]** according to one or more of Claims 1 to 8 as well as thinners and/or surface-active substances.

11. Compounds of the formula **[X]**,



[X]

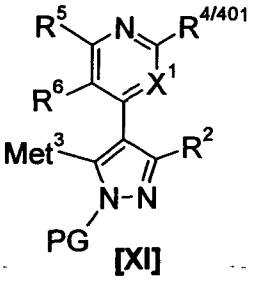
wherein

PG stands for tetrahydro-2H-pyran-2-yl, and

R^1, R^2, X^1, R^6, R^5, $R^{4/401}$ stand for the same residue definitions as defined for formula **[I-a]** and **[I-b]** *in Claims 1 to 8*,

and agrochemically active salts thereof.

12. Compounds of the formula **[XI]**



[XI]

wherein

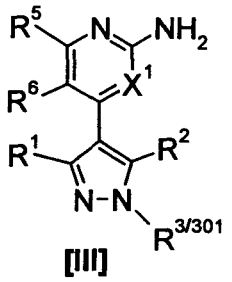
Met^3 stands for tributylstannyl, 4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl,

PG stands for tetrahydro-2H-pyran-2-yl, 2-(trimethylsilyl)ethoxy]methyl, and

R^2, X^1, R^6, R^5, $R^{4/401}$ stand for the same residue definitions as defined for formula **[I-a]** and **[I-b]** in Claims 1 to 8,

and agrochemically active salts thereof, wherein the compound 1-({4-[1-(2,2-difluoroethyl)-3-(trimethylstannyl)-1H-pyrazol-4-yl]pyrimidin-2-yl}amino)propan-2-ol is excepted.

13. Compounds of the formula **[III]**



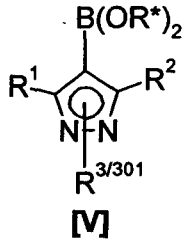
[III]

in which

R^1, R^2, X^1, R^6, R^5, $R^{3/301}$ stand for the same residue definitions as defined for formula **[I-a]** and **[I-b]** in Claims 1 to 8,

and agrochemically active salts thereof, wherein the compounds 4-[3-(4-fluorophenyl)-5-methyl-1H-pyrazol-4-yl]pyridin-2-amine, 4-[3-(4-chlorophenyl)-5-methyl-1H-pyrazol-4-yl]pyridin-2-amine, 4-[3-(4-methoxyphenyl)-5-methyl-1H-pyrazol-4-yl]pyridin-2-amine, 4-[3-(4-fluorophenyl)-1H-pyrazol-4-yl]pyrimidin-2-amine; 4-(5-methyl-3-phenyl-1H-pyrazol-4-yl)pyrimidin-2-amine and [4-(2-aminopyrimidin-4-yl)-3-(3-chloro-5-hydroxy-phenyl)-1H-pyrazol-1-yl]acetonitrile are excepted.

14. Compounds of the formula **[V]**



[V]

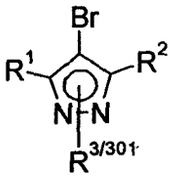
wherein

$B(OR^*)_2$ stands for $-B(OiPr)_2$ or $-B(OH)_2$, and

R^1, R^2, $R^{3/301}$ stand for the same residue definitions as defined for formula **[I-a]** and **[I-b]** in Claims 1 to 8,

and agrochemically active salts thereof, wherein the compound 1-methyl-3-phenyl-4-(4,4,5,5-tetramethyl-1,3,2-dioxaborolan-2-yl)-1H-pyrazoles is excepted.

5. Compounds of the formula **[VI]**



[VI]

wherein

R^1, R^2, $R^{3/301}$ stand for the same residue definitions as defined for formula **[I-a]** and **[I-b]** in Claims 1 to 8,

and agrochemically active salts thereof, wherein compounds in which $R^{3/301}$ = H, CH_3 or $C(CH_3)_3$ are excepted.

Dated this 26/03/2012

(HRISHIKESH RAY CHAUDHURY)
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Phenylpyri(mi)dinylazoles

The present invention relates to novel phenylpyri(mi)dinylazoles, several processes for the production thereof and the use thereof for the control of undesired microorganisms in the protection of plants and materials and for the reduction of mycotoxins in plants and plant parts. The present invention further relates to a process for the control of phytopathogenic fungi and for the reduction of mycotoxins in plants and plant parts in plant protection and to pesticides containing phenylpyri(mi)dinylazoles.

It is already known that certain arylpyrazoles possess fungicidal properties (e.g. see WO 03/049542, WO 01/030154 and *Pharmazie* **1999**, 54(2), 106-11). The effectiveness of the substances described there is good, but in many cases leaves something to be desired.

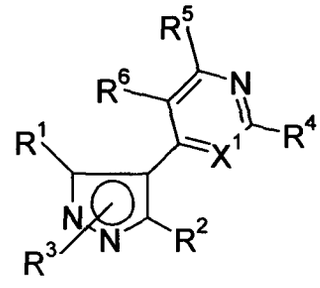
In WO 98/052937, certain heteroaryl-substituted pyrazoles are described which can be used medicinally, here for the inhibition of the production of inflammatory cytokines and for the treatment of human p38 kinase-mediated diseases. Similar compounds are also described in EP-A-1 553 096, WO 04/029043, WO 98/052940, WO 00/031063, WO 95/031451, WO 02/057265 and WO 00/039116. However, an effect on fungal pathogens is not described.

In WO 07/105058 certain heteroaryl-substituted pyrazoles are described which can be used as modulators or inhibitors of the human Raf enzyme. However, the action on fungal pathogens is not described.

Since the ecological and economic requirements for modern pesticides are steadily increasing, for example as regards activity spectrum, toxicity, selectivity, application dose, residue formation and ease of production, and in addition for example problems with resistances can arise, there is the constant task of developing novel pesticides, in particular fungicides, which at least in some fields have advantages compared to the known ones.

Surprisingly it has now been found that the present phenylpyri(mi)dinylazoles solve the said problems at least in some regards and are suitable as pesticides, in particular as fungicides.

The subject of the invention are compounds of the formula **[I-a]**,



[I-a]

wherein the symbols have the following meanings:

X^1 stands for C-H or N,

R^1 stands for phenyl, naphthalenyl, quinolin-5-yl, quinolin-8-yl, isoquinolin-5-yl, isoquinolin-8-yl, 1-benzothiophen-4-yl, 1-benzothiophen-7-yl, 1-benzofuran-4-yl, 1-benzofuran-7-yl, 1,3-benzodioxol-4-yl or 1,3-benzodioxol-5-yl, each optionally singly or multiply, identically or differently substituted with R^7,

R^2 stands for cyano, nitro, halogen, C_1-C_6 alkyl, C_1-C_6 alkoxy, C_1-C_6 haloalkyl, C_1-C_6 haloalkoxy, C_1-C_6 alkylthio, C_3-C_6 cycloalkyl, C_3-C_6 halocycloalkyl, C_2-C_9 heterocyclyl or hydrogen,

R^3 stands for C_1-C_6 alkyl, C_2-C_6 alkenyl, C_2-C_6 alkynyl, C_3-C_6 cycloalkyl, C_3-C_6 cycloalkyl-C_1-C_6 alkyl, C_3-C_6 cycloalkyl-oxy, C_1-C_6 alkoxy, C_1-C_6 alkoxy-C_1-C_6 alkyl, acyloxy-C_1-C_6 alkyl, heteroaryl-C_1-C_6 alkyl (preferably C_2-C_9 heteroaryl-C_1-C_6 alkyl), aryl-C_1-C_6 alkyl (preferably C_6-C_{14} aryl-C_1-C_6 alkyl), C_1-C_6 alkylthio-C_1-C_6 alkyl, C_3-C_6 cycloalkyl-C(O)-C_1-C_4 alkyl, C_2-C_9 heterocyclyl-C(O)-C_1-C_4 alkyl, C_1-C_4 alkyl-C(O)-C_3-C_6 cycloalkyl, C_1-C_4 alkyl-C(O) heterocyclyl (preferably C_1-C_4 alkyl-C(O)-C_2-C_9 heterocyclyl), C_1-C_4 alkyl-C(O)O-C_1-C_6 alkyl, acyloxy-C_3-C_6 cycloalkyl, acyloxy-heterocyclyl, heterocyclyl-C_1-C_6 alkyl (preferably C_2-C_9 heterocyclyl-C_1-C_6 alkyl), heterocyclyl (preferably C_2-C_9 heterocyclyl) , C_2-C_9 oxoheterocycyl or heteroaryl (preferably C_2-C_9 heteroaryl), each optionally singly or multiply, identically or differently substituted with halogen, cyano, hydroxy, C_1-C_6 alkyl, C_1-C_6 alkoxy, haloalkoxy (preferably C_1-C_6 haloalkoxy), phenyl or phenoxy,

R^4 stands for hydrogen, halogen, cyano, $-C(O)OR^{12}$, $-SR^{12}$, $-NR^{12}R^{13}$, $-C(O)NR^{12}R^{13}$ or $-NR^{12}R^{14}$, $-N=C=NR^{22}$, $-N=C(H)OR^{22}$, $-N=C(OR^{22})R^{23}$, $-N=C(SR^{22})R^{23}$, $-C(=NR^{22})NR^{22}R^{23}$, $-SO(=NR^{22})R^{23}$ or $-SO_2R^{20}$,

or for C_1-C_6 alkyl, C_3-C_8 cycloalkyl, C_2-C_6 alkenyl, C_6-C_{14} aryl, C_2-C_9 heterocyclyl or C_2-C_9 heteroaryl, each optionally singly or multiply, identically or differently substituted with R^{11},

wherein R^4 preferably stands for hydrogen or $-NHR^{13}$, wherein R^{13} stands for C_1-C_6 alkyl, C_3-C_6 cycloalkyl, C_2-C_6 alkenyl, C_2-C_6 alkynyl, C_3-C_8 cycloalkyl, C_6-C_{14} aryl, C_2-C_9 heterocyclyl or C_2-C_9 heteroaryl, each optionally singly or multiply, identically or differently substituted with fluorine, chlorine, bromine, -OH, cyano, C_1-C_6 alkyl, $-O-C(O)R^{11}$, $-O-P(O)(OR^{11})_2$, $-O-B(OR^{11})_2$ or -O-(C_1-C_4 alkyl),

R^5 and R^6 mutually independently stand for hydrogen, fluorine, chlorine, bromine, cyano, nitro, -OH or -SH,

or for C_1-C_6 alkyl, C_3-C_6 cycloalkyl, C_2-C_6 alkenyl, C_2-C_6 alkynyl, C_6-C_{14} aryl, -O-(C_1-C_4 alkyl), -O-(C_6-C_{14} aryl), -S-(C_1-C_4 alkyl), -S(O)-(C_1-C_6 alkyl) or -C(O)-(C_1-C_6 alkyl), each optionally singly or multiply, identically or differently substituted with R^{11},

or else together with the carbon atom to which they are bound form a ring (preferably a saturated, unsaturated or partially unsaturated single ring) with 3, preferably 5 to 8 ring atoms, wherein the ring can contain 1 to 4 hetero atoms from the range oxygen, sulphur or -NR^{19}, optionally singly or multiply, identically or differently substituted with halogen, oxygen, cyano or C_1-C_4 alkyl,

R^7 mutually independently stands for one or more of the following groups: fluorine, chlorine, bromine, cyano, nitro, -OH or -SH,

or for C_1-C_6 alkyl, C_3-C_6 cycloalkyl, C_2-C_6 alkenyl, C_2-C_6 alkynyl, tri(C_1-C_4 alkyl)silyl, C_6-C_{14} aryl, -O-(C_1-C_4 alkyl), -O-(C_6-C_{14} aryl), -S-(C_1-C_4 alkyl), -S(O)-(C_1-C_6 alkyl), or -$S(O)_2$-(C_1-C_6 alkyl), each optionally singly or multiply, identically or differently substituted with fluorine, chlorine, bromine, -OH, cyano, C_1-C_6 alkyl or -O-(C_1-C_4 alkyl)

R^{11} stands for -OH, fluorine, chlorine, bromine, cyano, -NH-$C(O)R^{20}$, -$NR^{20}R^{21}$, -$C(O)R^{20}$, -$C(O)OR^{20}$, -$C(O)NR^{20}R^{21}$ or -SO_2R^{20},

or for C_1-C_6 alkyl, C_2-C_6 alkenyl, C_2-C_6 alkynyl, C_1-C_{11} heteroalkyl, C_3-C_8 cycloalkyl, -O-(C_1-C_4 alkyl), -S-(C_1-C_4 alkyl), -O-(C_3-C_8 cycloalkyl), -S-(C_3-C_8 cycloalkyl), C_6-C_{14} aryl, -O-(C_6-C_{14} aryl), -S-(C_6-C_{14} aryl), C_2-C_9 heterocyclyl or C_2-C_9 heteroaryl, each optionally singly or multiply, identically or differently substituted with fluorine, chlorine, bromine, -OH, carbonyl, cyano, C_1-C_6 alkyl or -O-(C_1-C_4 alkyl),

R^{12} and R^{13} mutually independently stand for one or more of the following groups: H, -$C(S)R^{15}$, -$C(O)R^{15}$, -SO_2R^{15}, -$C(O)OR^{15}$, -OR^{15} or -$C(O)NR^{15}R^{16}$

or for C_1-C_6 alkyl, C_3-C_6 cycloalkyl, C_2-C_6 alkenyl, C_2-C_6 alkynyl, C_3-C_8 cycloalkyl, C_6-C_{14} aryl, C_2-C_9 heterocyclyl or C_2-C_9 heteroaryl, each optionally singly or multiply, identically or differently substituted with fluorine, chlorine, bromine, -OH, cyano, C_1-C_6 alkyl, -O-$C(O)R^{11}$, -O-$P(O)(OR^{11})_2$, -O-$B(OR^{11})_2$ or -O-(C_1-C_4 alkyl),

R^{14} stands for -CH_2-$NR^{22}R^{23}$, piperidin-1-ylmethyl or morpholin-4-ylmethyl

or for C_1-C_6 alkyl or -O-(C_1-C_4 alkyl), each optionally singly or multiply, identically or differently substituted with fluorine, chlorine, bromine, -OH or cyano,