



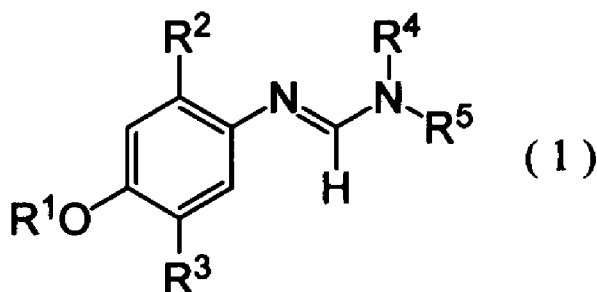
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(54) Title: AMIDINE COMPOUNDS AND USE THEREOF FOR PLANT DISEASE CONTROL



(57) Abstract: An amidine compound represented by formula (1): wherein R¹ represent a C1-C11 fluoroalkyl group, a C3-C11 fluoroalkenyl group or a C3-C11 fluoroalkynyl group; R² represent a C1-C3 alkyl group; R³ represent a C1-C3 alkyl group; R⁴ represent a C3-C6 cycloalkyl group or a C1-C6 alkyl group optionally having one or more halogens and R⁵ represent a C3-C6 cycloalkyl group or a C1-C6 alkyl group optionally having one or more halogens, said compound having excellent plant disease controlling effect.

DESCRIPTION

AMIDINE COMPOUNDS AND USE THEREOF FOR PLANT DISEASE CONTROL

Technical Field

5 The present invention relates to amidine compounds and use thereof for plant disease control.

Background Art

10 Hitherto, agents for controlling plant diseases have been developed, and compounds having a plant disease controlling effect have been found and put to practical use.

Disclosure of the Invention

Problems to be Solved by the Invention

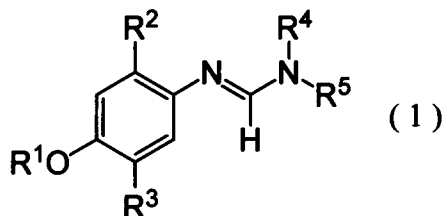
15 An object of the present invention is to provide a compound having excellent plant disease controlling effect.

Means for Solving the Problems

20 As a result of intensive research conducted by the present inventors in an attempt to find compounds having excellent plant disease controlling effect, it has been found that amidine compounds represented by the following formula (1) have excellent plant disease controlling effect. Thus, the present invention has been accomplished.

25 That is, the present invention provides:

[1] An amidine compound represented by the formula (1):



wherein R¹ represent a C1-C11 fluoroalkyl group, a C3-C11 fluoroalkenyl group or a C3-C11 fluoroalkynyl group;

5 R² represent a C1-C3 alkyl group;

R³ represent a C1-C3 alkyl group;

R⁴ represent a C3-C6 cycloalkyl group or a C1-C6 alkyl group optionally having one or more halogens and R⁵

represent a C3-C6 cycloalkyl group or a C1-C6 alkyl group
10 optionally having one or more halogens (hereinafter referred to as the present compound);

[2] The amidine compound according to above [1], wherein R⁴ is a C1-C6 alkyl group optionally having one or more halogens and R⁵ is a C1-C6 alkyl group having one or more
15 halogens;

[3] The amidine compound according to above [1], wherein R⁴ is a C1-C6 alkyl group and R⁵ is a C1-C6 alkyl group;

[4] A plant disease controlling agent, which comprises the amidine compound according to above [1] as an active
20 ingredient;

[5] A method for controlling plant diseases, which comprises the step of applying an effective amount of the

amidine compound according to above [1] to plants or soils;
and

[6] Use of the amidine compound according to above [1] for
controlling plant diseases.

5 Effect of the Invention

The present compound has excellent plant disease
controlling effect, and hence is useful as an active
ingredient of plant disease controlling agents.

10 Mode for Carrying Out the Invention

The explanation of substituents of the present
invention is as follows.

The C1-C11 fluoroalkyl group represents the C1-C11
alkyl group having one or more fluorines.

15 Examples of the C1-C11 fluoroalkyl group include a
monofluoromethyl group, a difluoromethyl group, a
trifluoromethyl group, a 2,2,2-trifluoroethyl group, a
pentafluoroethyl group, a 2,2,3,3-tetrafluoropropyl group,
a 2,2,3,3,3-pentafluoropropyl group, a heptafluoropropyl
20 group, a 3,3,3-trifluoropropyl group, a 2-fluorobutyl group,
a 4-fluorobutyl group, a 2,4-difluorobutyl group, a 2,2,4-
trifluorobutyl group, a 2,4,4-trifluorobutyl group, a
2,2,4,4-tetrafluorobutyl group, a 2,4,4,4-tetrafluorobutyl
group, a 2,2,4,4,4-pentafluorobutyl group, a 3,3,3-
25 trifluoro-2-trifluoromethylpropyl group, a 2,2,3,4,4,4-

hexafluorobutyl group, a 2,2,3,3,4,4,4-heptafluorobutyl group, a 4,4,4-trifluorobutyl group, a nonafluorobutyl group, a 4,4,4-trifluoro-3-trifluoromethylbutyl group, a 2,2-difluorobutyl group, a 2,2,3,3,4,4,5,5,5-
5 nonafluoropentyl group, a 5,5,5-trifluoropentyl group, a undecafluoropentyl group, a 5,5,5-trifluoro-4-trifluoromethylpentyl group, a 2,2,3,3,4,4,5,5,6,6,6-undecafluorohexyl group, a 6,6,6-trifluorohexyl group, a tridecafluorohexyl group, a 6,6,6-trifluoro-5-
10 trifluoromethylhexyl group, a 2-fluoropentyl group, a 2,2-difluoropentyl group, a (2-fluoro-4-methyl) pentyl group, a (2,2-difluoro-4-methyl)pentyl group, a 2,2,3,3,4,4,5,5,6,6,7,7,7-tridecafluoroheptyl group, a 7,7,7-trifluoroheptyl group, a pentadecafluoroheptyl group,
15 a 7,7,7-trifluoro-6-trifluoromethylheptyl group, a (2-fluoro-4,4-dimethyl)pentyl group, a (2,2-difluoro-4,4-dimethyl)pentyl group, a 2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-pentadecafluorooctyl group, a 8,8,8-trifluorooctyl group, a heptadecafluorooctyl group, a 8,8,8-trifluoro-7-
20 trifluoromethyloctyl group, a 2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,9-heptadecafluorononyl group, a 9,9,9-trifluorononyl group, a nonadecafluorononyl group, a 9,9,9-trifluoro-8-trifluoromethylnonyl group, a 2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-
25 nonadecafluorodecyl group, a 10,10,10-trifluorodecyl group,

a henicosafluorodecyl group, a 10,10,10-trifluoro-9-trifluoromethyldecyl group, a 2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,11-henicosafluoroundecyl group, a 11,11,11-trifluoroundecyl group and a tricosfluoroundecyl group.

The C3-C11 fluoroalkenyl group represents the C3-C11 alkenyl group having one or more fluorines.

Examples of the C3-C11 fluoroalkenyl group include a 2,3-difluoro-2-propenyl group, a 2,3,3-trifluoro-2-propenyl group, a 1,1,2,3,3-pentafluoro-2-propenyl group, a 2,3-difluoro-2-butenyl group, a 4,4,4-trifluoro-2-butenyl group, a 4,4-difluoro-3-butenyl group, a 2-fluoro-2-butenyl group, a 3-fluoro-2-butenyl group, a 3,4,4-trifluoro-3-butenyl group, a 5,5,5-trifluoro-2-pentenyl group, a 5,5,5-trifluoro-3-pentenyl group, a 5,5,5-trifluoro-4-trifluoromethyl-2-pentenyl group, a 5,5-difluoro-4-pentenyl group, a 3,4-difluoro-3-pentenyl group, a 2-fluoro-2-pentenyl group, a 3-fluoro-2-pentenyl group, a 4,5,5-trifluoro-4-pentenyl group, a 2-fluoro-4-methyl-2-pentenyl group, a 2-fluoro-4,4-dimethyl-2-pentenyl group, a 6,6,6-trifluoro-2-hexenyl group, a 6,6,6-trifluoro-3-hexenyl group, a 6,6,6-trifluoro-5-trifluoromethyl-2-hexenyl group, a 6,6-difluoro-5-hexenyl group, a 7,7,7-trifluoro-2-heptenyl group, a 7,7,7-trifluoro-6-trifluoromethyl-2-heptenyl group, a 8,8,8-trifluoro-5-octenyl group, a 8,8,8-

trifluoro-7-trifluoromethyl-3-octenyl group, a 9,9,9-trifluoro-2-nonenyl group, a 9,9,9-trifluoro-8-trifluoromethyl-2-nonenyl group, a 10,10,10-trifluoro-4-decenyl group, a 10,10,10-trifluoro-9-trifluoromethyl-8-decenyl group and a 11,11,11-trifluoro-2-undecenyl group.

The C3-C11 fluoroalkynyl group represents the C3-C11 alkynyl group having one or more fluorines.

Examples of the C3-C11 fluoroalkynyl group include a 1-fluoro-2-propynyl group, a 1,4-difluoro-2-butynyl group, a 4,4,4-trifluoro-2-butynyl group, a 4-fluoro-2-butynyl group, a 4,4-difluoro-2-butynyl group, a 2-fluoro-3-butynyl group, a 5,5,5-trifluoro-3-pentynyl group, a 5,5,5-trifluoro-2-pentynyl group, a 4-fluoro-2-pentynyl group, a 5,5-difluoro-2-pentynyl group, a 2-fluoro-3-pentynyl group, a 2,5,5,5-tetrafluoro-3-pentynyl group, a 2,2,3,3-tetrafluoro-4-pentynyl group, a 3-fluoro-4-pentynyl group, a 5,5,6,6,6-pentafluoro-2-hexynyl group, a 6,6,6-trifluoro-5-trifluoromethyl-2-hexynyl group, a 7,7,7-trifluoro-3-heptynyl group, a 7,7,7-trifluoro-6-trifluoromethyl-2-heptynyl group, a 8,8,8-trifluoro-2-octynyl group, a 8,8,8-trifluoro-7-trifluoromethyl-4-octynyl group, a 9,9,9-trifluoro-2-nonyl group, a 9,9,9-trifluoro-8-trifluoromethyl-2-nonyl group, a 10,10,10-trifluoro-2-decynyl group, a 10,10,10-trifluoro-9-trifluoromethyl-6-decynyl group and a 11,11,11-trifluoro-5-undecynyl group.

Examples of C1-C3 alkyl group include a methyl group, an ethyl group, a propyl group and an isopropyl group.

The C1-C6 alkyl group optionally having one or more halogens represents the C1-C6 alkyl group and the C1-C6
5 haloalkyl group.

Examples of the C1-C6 alkyl group include a methyl group, an ethyl group, a propyl group, an isopropyl group, a butyl group, an isobutyl group, a tert-butyl group, a pentyl group, a 2-methylbutyl group, a 3-methylbutyl group,
10 a 2-methylpentyl group, a 3-methylpentyl group, a 4-methylpentyl group and a hexyl group.

The C1-C6 haloalkyl group is the C1-C6 alkyl group having one or more halogen atoms, provided that when it has two or more halogen atoms, then the halogen atoms may be
15 same or different.

Examples of the C1-C6 haloalkyl group include a monofluoromethyl group, a difluoromethyl group, a trifluoromethyl group, a pentafluoroethyl group, a heptafluoropropyl group, a nonafluorobutyl group, an
20 undecafluoropentyl group, a tridecafluorohexyl group, a 2-chloropropyl group, a 2-bromopropyl group, a 2-iodopropyl group, a 6-chlorohexyl group, a 6-bromohexyl group and a 6-iodohexyl group.

Examples of the C3-C6 cycloalkyl group include a
25 cyclopropyl group, a cyclobutyl group, a cyclopentyl group

and a cyclohexyl group.

Examples of the amidine compound represent by the formula (1) include:

an amidine compound represented by the formula (1), wherein

5 R^1 is a C1-C11 fluoroalkyl group;

an amidine compound represented by the formula (1), wherein

R^1 is a C3-C11 fluoroalkenyl group;

an amidine compound represented by the formula (1), wherein

R^1 is a C3-C11 fluoroalkynyl group;

10 an amidine compound represented by the formula (1), wherein

R^1 is a C1-C6 fluoroalkyl group;

an amidine compound represented by the formula (1), wherein

R^1 is a C3-C6 fluoroalkenyl group;

an amidine compound represented by the formula (1), wherein

15 R^1 is a C3-C6 fluoroalkynyl group;

an amidine compound represented by the formula (1), wherein

R^1 is a C7-C11 fluoroalkyl group;

an amidine compound represented by the formula (1), wherein

R^1 is a C7-C11 fluoroalkenyl group;

20 an amidine compound represented by the formula (1), wherein

R^1 is a C7-C11 fluoroalkynyl group;

an amidine compound represented by the formula (1), wherein

R^2 is a methyl group;

an amidine compound represented by the formula (1), wherein

25 R^3 is a methyl group;

an amidine compound represented by the formula (1), wherein
R⁴ is a C1-C6 alkyl group optionally having one or more
halogens;

an amidine compound represented by the formula (1), wherein
5 R⁴ is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein
R⁴ is a methyl group;

an amidine compound represented by the formula (1), wherein
R⁵ is an ethyl group;

10 an amidine compound represented by the formula (1), wherein
R¹ is a C1-C11 fluoroalkyl group and R² is a methyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C3-C11 fluoroalkenyl group and R² is a methyl
group;

15 an amidine compound represented by the formula (1), wherein
R¹ is a C3-C11 fluoroalkynyl group and R² is a methyl
group;

an amidine compound represented by the formula (1), wherein
R¹ is a C1-C6 fluoroalkyl group and R² is a methyl group;

20 an amidine compound represented by the formula (1), wherein
R¹ is a C3-C6 fluoroalkenyl group and R² is a methyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C3-C6 fluoroalkynyl group and R² is a methyl group;

an amidine compound represented by the formula (1), wherein
25 R¹ is a C7-C11 fluoroalkyl group and R² is a methyl group;

an amidine compound represented by the formula (1), wherein R^1 is a C7-C11 fluoroalkenyl group and R^2 is a methyl group;

an amidine compound represented by the formula (1), wherein
5 R^1 is a C7-C11 fluoroalkynyl group and R^2 is a methyl group;

an amidine compound represented by the formula (1), wherein R^1 is a C1-C11 fluoroalkyl group and R^3 is a methyl group;

an amidine compound represented by the formula (1), wherein
10 R^1 is a C3-C11 fluoroalkenyl group and R^3 is a methyl group;

an amidine compound represented by the formula (1), wherein R^1 is a C3-C11 fluoroalkynyl group and R^3 is a methyl group;

15 an amidine compound represented by the formula (1), wherein R^1 is a C1-C6 fluoroalkyl group and R^3 is a methyl group;

an amidine compound represented by the formula (1), wherein R^1 is a C3-C6 fluoroalkenyl group and R^3 is a methyl group;

an amidine compound represented by the formula (1), wherein
20 R^1 is a C3-C6 fluoroalkynyl group and R^3 is a methyl group;

an amidine compound represented by the formula (1), wherein R^1 is a C7-C11 fluoroalkyl group and R^3 is a methyl group;

an amidine compound represented by the formula (1), wherein
25 R^1 is a C7-C11 fluoroalkenyl group and R^3 is a methyl group;

an amidine compound represented by the formula (1), wherein R^1 is a C7-C11 fluoroalkynyl group and R^3 is a methyl group;

an amidine compound represented by the formula (1), wherein
5 R^1 is a C1-C11 fluoroalkyl group and R^4 is a C1-C6 alkyl group optionally having one or more halogens;

an amidine compound represented by the formula (1), wherein R^1 is a C1-C11 fluoroalkyl group and R^4 is a C3-C6 cycloalkyl group;

10 an amidine compound represented by the formula (1), wherein R^1 is a C3-C11 fluoroalkenyl group and R^4 is a C1-C6 alkyl group optionally having one or more halogens;

an amidine compound represented by the formula (1), wherein R^1 is a C3-C11 fluoroalkenyl group and R^4 is a C3-C6
15 cycloalkyl group;

an amidine compound represented by the formula (1), wherein R^1 is a C3-C11 fluoroalkynyl group and R^4 is a C1-C6 alkyl group optionally having one or more halogens;

an amidine compound represented by the formula (1), wherein
20 R^1 is a C3-C11 fluoroalkynyl group and R^4 is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein R^1 is a C1-C11 fluoroalkyl group and R^4 is a methyl group;

an amidine compound represented by the formula (1), wherein
25 R^1 is a C3-C11 fluoroalkenyl group and R^4 is a methyl

group;

an amidine compound represented by the formula (1), wherein R^1 is a C3-C11 fluoroalkynyl group and R^4 is a methyl group;

5 an amidine compound represented by the formula (1), wherein R^1 is a C1-C6 fluoroalkyl group and R^4 is a methyl group;

an amidine compound represented by the formula (1), wherein R^1 is a C3-C6 fluoroalkenyl group and R^4 is a methyl group;

10 an amidine compound represented by the formula (1), wherein R^1 is a C3-C6 fluoroalkynyl group and R^4 is a methyl group;

an amidine compound represented by the formula (1), wherein R^1 is a C7-C11 fluoroalkyl group and R^4 is a methyl group;

15 an amidine compound represented by the formula (1), wherein R^1 is a C7-C11 fluoroalkenyl group and R^4 is a methyl group;

an amidine compound represented by the formula (1), wherein R^1 is a C7-C11 fluoroalkynyl group and R^4 is a methyl group;

20 an amidine compound represented by the formula (1), wherein R^1 is a C1-C6 fluoroalkyl group and R^4 is a C1-C6 alkyl group optionally one or more halogens;

an amidine compound represented by the formula (1), wherein R^1 is a C3-C6 fluoroalkenyl group and R^4 is a C1-C6 alkyl group optionally having one or more halogens;

25 an amidine compound represented by the formula (1), wherein

R¹ is a C3-C6 fluoroalkynyl group and R⁴ is a C1-C6 alkyl group optionally having one or more halogens;

an amidine compound represented by the formula (1), wherein R¹ is a C7-C11 fluoroalkyl group and R⁴ is a C1-C6 alkyl

5 group optionally having one or more halogens;

an amidine compound represented by the formula (1), wherein R¹ is a C7-C11 fluoroalkenyl group and R⁴ is a C1-C6 alkyl group optionally having one or more halogens;

an amidine compound represented by the formula (1), wherein
10 R¹ is a C7-C11 fluoroalkynyl group and R⁴ is a C1-C6 alkyl group optionally having one or more halogens;

an amidine compound represented by the formula (1), wherein R¹ is a C1-C6 fluoroalkyl group and R⁴ is a C3-C6 cycloalkyl group;

15 an amidine compound represented by the formula (1), wherein R¹ is a C3-C6 fluoroalkenyl group and R⁴ is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein R¹ is a C3-C6 fluoroalkynyl group and R⁴ is a C3-C6
20 cycloalkyl group;

an amidine compound represented by the formula (1), wherein R¹ is a C7-C11 fluoroalkyl group and R⁴ is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein
25 R¹ is a C7-C11 fluoroalkenyl group and R⁴ is a C3-C6

cycloalkyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C7-C11 fluoroalkynyl group and R⁴ is a C3-C6
cycloalkyl group;

5 an amidine compound represented by the formula (1), wherein
R¹ is a C1-C11 fluoroalkyl group and R⁵ is an ethyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C3-C11 fluoroalkenyl group and R⁵ is an ethyl
group;

10 an amidine compound represented by the formula (1), wherein
R¹ is a C3-C11 fluoroalkynyl group and R⁵ is an ethyl
group;

an amidine compound represented by the formula (1), wherein
R¹ is a C1-C6 fluoroalkyl group and R⁵ is an ethyl group;

15 an amidine compound represented by the formula (1), wherein
R¹ is a C3-C6 fluoroalkenyl group and R⁵ is an ethyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C3-C6 fluoroalkynyl group and R⁵ is an ethyl group;

an amidine compound represented by the formula (1), wherein
20 R¹ is a C7-C11 fluoroalkyl group and R⁵ is an ethyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C7-C11 fluoroalkenyl group and R⁵ is an ethyl
group;

an amidine compound represented by the formula (1), wherein
25 R¹ is a C7-C11 fluoroalkynyl group and R⁵ is an ethyl

group;

an amidine compound represented by the formula (1), wherein
 R^2 is a methyl group and R^3 is a methyl group;

an amidine compound represented by the formula (1), wherein
5 R^2 is a methyl group and R^4 is a C1-C6 alkyl group
optionally having one or more halogens;

an amidine compound represented by the formula (1), wherein
 R^2 is a methyl group and R^4 is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein
10 R^2 is a methyl group and R^4 is a methyl group;

an amidine compound represented by the formula (1), wherein
 R^2 is a methyl group and R^5 is an ethyl group;

an amidine compound represented by the formula (1), wherein
 R^3 is a methyl group and R^4 is a C1-C6 alkyl group
15 optionally having one or more halogens;

an amidine compound represented by the formula (1), wherein
 R^3 is a methyl group and R^4 is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein
 R^3 is a methyl group and R^4 is a methyl group;

20 an amidine compound represented by the formula (1), wherein
 R^3 is a methyl group and R^5 is an ethyl group;

an amidine compound represented by the formula (1), wherein
 R^4 is a C1-C6 alkyl group optionally having one or more
halogens and R^5 is a C1-C6 alkyl group optionally having

25 one or more halogens;

an amidine compound represented by the formula (1), wherein R^4 is a C1-C6 alkyl group optionally having one or more halogens and R^5 is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein
5 R^4 is a C3-C6 cycloalkyl group and R^5 is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein R^4 is a methyl group and R^5 is a C1-C6 alkyl group optionally having one or more halogens;

10 an amidine compound represented by the formula (1), wherein R^4 is a methyl group and R^5 is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein R^4 is a C1-C6 alkyl group optionally having one or more halogens and R^5 is an ethyl group;

15 an amidine compound represented by the formula (1), wherein R^4 is a C3-C6 cycloalkyl group and R^5 is an ethyl group;

an amidine compound represented by the formula (1), wherein R^4 is a methyl group and R^5 is a methyl group;

an amidine compound represented by the formula (1), wherein
20 R^4 is a methyl group and R^5 is an ethyl group;

an amidine compound represented by the formula (1), wherein R^1 is a C1-C11 fluoroalkyl group, R^2 is a methyl group and R^3 is a methyl group;

an amidine compound represented by the formula (1), wherein
25 R^1 is a C3-C11 fluoroalkenyl group, R^2 is a methyl group

and R³ is a methyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C3-C11 fluoroalkynyl group, R² is a methyl group
and R³ is a methyl group;

5 an amidine compound represented by the formula (1), wherein
R¹ is a C1-C6 fluoroalkyl group, R² is a methyl group and R³
is a methyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C3-C6 fluoroalkenyl group, R² is a methyl group and
10 R³ is a methyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C3-C6 fluoroalkynyl group, R² is a methyl group and
R³ is a methyl group;

an amidine compound represented by the formula (1), wherein
15 R¹ is a C7-C11 fluoroalkyl group, R² is a methyl group and
R³ is a methyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C7-C11 fluoroalkenyl group, R² is a methyl group
and R³ is a methyl group;

20 an amidine compound represented by the formula (1), wherein
R¹ is a C7-C11 fluoroalkynyl group, R² is a methyl group
and R³ is a methyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C1-C11 fluoroalkyl group, R² is a methyl group and
25 R⁴ is a methyl group;

an amidine compound represented by the formula (1), wherein R^1 is a C3-C11 fluoroalkenyl group, R^2 is a methyl group and R^4 is a methyl group;

an amidine compound represented by the formula (1), wherein
5 R^1 is a C3-C11 fluoroalkynyl group, R^2 is a methyl group and R^4 is a methyl group;

an amidine compound represented by the formula (1), wherein R^1 is a C1-C6 fluoroalkyl group, R^2 is a methyl group and R^4 is a methyl group;

10 an amidine compound represented by the formula (1), wherein R^1 is a C3-C6 fluoroalkenyl group, R^2 is a methyl group and R^4 is a methyl group;

an amidine compound represented by the formula (1), wherein R^1 is a C3-C6 fluoroalkynyl group, R^2 is a methyl group and
15 R^4 is a methyl group;

an amidine compound represented by the formula (1), wherein R^1 is a C7-C11 fluoroalkyl group, R^2 is a methyl group and R^4 is a methyl group;

an amidine compound represented by the formula (1), wherein
20 R^1 is a C7-C11 fluoroalkenyl group, R^2 is a methyl group and R^4 is a methyl group;

an amidine compound represented by the formula (1), wherein R^1 is a C7-C11 fluoroalkynyl group, R^2 is a methyl group and R^4 is a methyl group;

25 an amidine compound represented by the formula (1), wherein

R^1 is a C1-C11 fluoroalkyl group, R^2 is a methyl group and R^4 is a C1-C6 alkyl group optionally having one or more halogens;

an amidine compound represented by the formula (1), wherein

5 R^1 is a C1-C11 fluoroalkyl group, R^2 is a methyl group and R^4 is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein

R^1 is a C3-C11 fluoroalkenyl group, R^2 is a methyl group and R^4 is a C1-C6 alkyl group optionally having one or more halogens;

an amidine compound represented by the formula (1), wherein

R^1 is a C3-C11 fluoroalkenyl group, R^2 is a methyl group and R^4 is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein

15 R^1 is a C3-C11 fluoroalkynyl group, R^2 is a methyl group and R^4 is a C1-C6 alkyl group optionally having one or more halogens;

an amidine compound represented by the formula (1), wherein

R^1 is a C3-C11 fluoroalkynyl group, R^2 is a methyl group and R^4 is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein

R^1 is a C1-C6 fluoroalkyl group, R^2 is a methyl group and R^4 is a C1-C6 alkyl group optionally having one or more halogens;

25 an amidine compound represented by the formula (1), wherein

R^1 is a C1-C6 fluoroalkyl group, R^2 is a methyl group and R^4 is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein R^1 is a C3-C6 fluoroalkenyl group, R^2 is a methyl group and

5 R^4 is a C1-C6 alkyl group optionally having one or more halogens;

an amidine compound represented by the formula (1), wherein R^1 is a C3-C6 fluoroalkenyl group, R^2 is a methyl group and R^4 is a C3-C6 cycloalkyl group;

10 an amidine compound represented by the formula (1), wherein R^1 is a C3-C6 fluoroalkynyl group, R^2 is a methyl group and R^4 is a C1-C6 alkyl group optionally having one or more halogens;

an amidine compound represented by the formula (1), wherein
15 R^1 is a C3-C6 fluoroalkynyl group, R^2 is a methyl group and R^4 is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein R^1 is a C7-C11 fluoroalkyl group, R^2 is a methyl group and R^4 is a C1-C6 alkyl group optionally having one or more
20 halogens;

an amidine compound represented by the formula (1), wherein R^1 is a C7-C11 fluoroalkyl group, R^2 is a methyl group and R^4 is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein
25 R^1 is a C7-C11 fluoroalkenyl group, R^2 is a methyl group

and R⁴ is a C1-C6 alkyl group optionally having one or more halogens;

an amidine compound represented by the formula (1), wherein R¹ is a C7-C11 fluoroalkenyl group, R² is a methyl group and R⁴ is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein R¹ is a C7-C11 fluoroalkynyl group, R² is a methyl group and R⁴ is a C1-C6 alkyl group optionally having one or more halogens;

an amidine compound represented by the formula (1), wherein R¹ is a C7-C11 fluoroalkynyl group, R² is a methyl group and R⁴ is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein R¹ is a C1-C11 fluoroalkyl group, R² is a methyl group and R⁵ is an ethyl group;

an amidine compound represented by the formula (1), wherein R¹ is a C3-C11 fluoroalkenyl group, R² is a methyl group and R⁵ is an ethyl group;

an amidine compound represented by the formula (1), wherein R¹ is a C3-C11 fluoroalkynyl group, R² is a methyl group and R⁵ is an ethyl group;

an amidine compound represented by the formula (1), wherein R¹ is a C1-C6 fluoroalkyl group, R² is a methyl group and R⁵ is an ethyl group;

an amidine compound represented by the formula (1), wherein

R^1 is a C3-C6 fluoroalkenyl group, R^2 is a methyl group and R^5 is an ethyl group;

an amidine compound represented by the formula (1), wherein R^1 is a C3-C6 fluoroalkynyl group, R^2 is a methyl group and
5 R^5 is an ethyl group;

an amidine compound represented by the formula (1), wherein R^1 is a C7-C11 fluoroalkyl group, R^2 is a methyl group and R^5 is an ethyl group;

an amidine compound represented by the formula (1), wherein
10 R^1 is a C7-C11 fluoroalkenyl group, R^2 is methyl group and R^5 is an ethyl group;

an amidine compound represented by the formula (1), wherein R^1 is a C7-C11 fluoroalkynyl group, R^2 is a methyl group and R^5 is an ethyl group;

15 an amidine compound represented by the formula (1), wherein R^1 is a C1-C11 fluoroalkyl group, R^3 is a methyl group and R^4 is a methyl group;

an amidine compound represented by the formula (1), wherein R^1 is a C3-C11 fluoroalkenyl group, R^3 is a methyl group
20 and R^4 is a methyl group;

an amidine compound represented by the formula (1), wherein R^1 is a C3-C11 fluoroalkynyl group, R^3 is a methyl group and R^4 is a methyl group;

an amidine compound represented by the formula (1), wherein
25 R^1 is a C1-C6 fluoroalkyl group, R^3 is a methyl group and R^4

is a methyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C3-C6 fluoroalkenyl group, R³ is a methyl group and
R⁴ is a methyl group;

5 an amidine compound represented by the formula (1), wherein
R¹ is a C3-C6 fluoroalkynyl group, R³ is a methyl group and
R⁴ is a methyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C7-C11 fluoroalkyl group, R³ is a methyl group and
10 R⁴ is a methyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C7-C11 fluoroalkenyl group, R³ is a methyl group
and R⁴ is a methyl group;

an amidine compound represented by the formula (1), wherein
15 R¹ is a C7-C11 fluoroalkynyl group, R³ is a methyl group
and R⁴ is a methyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C1-C11 fluoroalkyl group, R³ is a methyl group and
R⁴ is a C1-C6 alkyl group optionally having one or more
20 halogens;

an amidine compound represented by the formula (1), wherein
R¹ is a C1-C11 fluoroalkyl group, R³ is a methyl group and
R⁴ is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein
25 R¹ is a C3-C11 fluoroalkenyl group, R³ is a methyl group

and R⁴ is a C1-C6 alkyl group optionally having one or more halogens;

an amidine compound represented by the formula (1), wherein R¹ is a C3-C11 fluoroalkenyl group, R³ is a methyl group

5 and R⁴ is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein R¹ is a C3-C11 fluoroalkynyl group, R³ is a methyl group

and R⁴ is a C1-C6 alkyl group optionally having one or more halogens;

10 an amidine compound represented by the formula (1), wherein R¹ is a C3-C11 fluoroalkynyl group, R³ is a methyl group

and R⁴ is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein R¹ is a C1-C6 fluoroalkyl group, R³ is a methyl group and R⁴

15 is a C1-C6 alkyl group optionally having one or more halogens;

an amidine compound represented by the formula (1), wherein R¹ is a C1-C6 fluoroalkyl group, R³ is a methyl group and R⁴

is a C3-C6 cycloalkyl group;

20 an amidine compound represented by the formula (1), wherein R¹ is a C3-C6 fluoroalkenyl group, R³ is a methyl group and

R⁴ is a C1-C6 alkyl group optionally having one or more halogens;

an amidine compound represented by the formula (1), wherein

25 R¹ is a C3-C6 fluoroalkenyl group, R³ is a methyl group and

R⁴ is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C3-C6 fluoroalkynyl group, R³ is a methyl group and
R⁴ is a C1-C6 alkyl group optionally having one or more
5 halogens;

an amidine compound represented by the formula (1), wherein
R¹ is a C3-C6 fluoroalkynyl group, R³ is a methyl group and
R⁴ is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein
10 R¹ is a C7-C11 fluoroalkyl group, R³ is a methyl group and
R⁴ is a C1-C6 alkyl group optionally having one or more
halogens;

an amidine compound represented by the formula (1), wherein
R¹ is a C7-C11 fluoroalkyl group, R³ is a methyl group and
15 R⁴ is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C7-C11 fluoroalkenyl group, R³ is a methyl group
and R⁴ is a C1-C6 alkyl group optionally having one or more
halogens;

20 an amidine compound represented by the formula (1), wherein
R¹ is a C7-C11 fluoroalkenyl group, R³ is a methyl group
and R⁴ is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C3-C6 fluoroalkynyl group, R³ is a methyl group and
25 R⁴ is a C1-C6 alkyl group optionally having one or more

halogens;

an amidine compound represented by the formula (1), wherein
R¹ is a C3-C6 fluoroalkynyl group, R³ is a methyl group and
R⁴ is a C3-C6 cycloalkyl group;

5 an amidine compound represented by the formula (1), wherein
R¹ is a C1-C11 fluoroalkyl group, R³ is a methyl group and
R⁵ is an ethyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C3-C11 fluoroalkenyl group, R³ is a methyl group
10 and R⁵ is an ethyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C3-C11 fluoroalkynyl group, R³ is a methyl group
and R⁵ is an ethyl group;

an amidine compound represented by the formula (1), wherein
15 R¹ is a C1-C6 fluoroalkyl group, R³ is a methyl group and R⁵
is an ethyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C3-C6 fluoroalkenyl group, R³ is a methyl group and
R⁵ is an ethyl group;

20 an amidine compound represented by the formula (1), wherein
R¹ is a C3-C6 fluoroalkynyl group, R³ is a methyl group and
R⁵ is an ethyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C7-C11 fluoroalkyl group, R³ is a methyl group and
25 R⁵ is an ethyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C7-C11 fluoroalkenyl group, R³ is a methyl group
and R⁵ is an ethyl group;

an amidine compound represented by the formula (1), wherein
5 R¹ is a C7-C11 fluoroalkynyl group, R³ is a methyl group
and R⁵ is an ethyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C1-C11 fluoroalkyl group, R⁴ is a C1-C6 alkyl group
optionally having one or more halogens and R⁵ is a C1-C6
10 alkyl group optionally having one or more halogens;

an amidine compound represented by the formula (1), wherein
R¹ is a C3-C11 fluoroalkenyl group, R⁴ is a C1-C6 alkyl
group optionally having one or more halogens and R⁵ is a
C1-C6 alkyl group optionally having one or more halogens;

15 an amidine compound represented by the formula (1), wherein
R¹ is a C3-C11 fluoroalkynyl group, R⁴ is a C1-C6 alkyl
group optionally having one or more halogens and R⁵ is a
C1-C6 alkyl group optionally having one or more halogens;

an amidine compound represented by the formula (1), wherein
20 R¹ is a C1-C11 fluoroalkyl group, R⁴ is a C1-C6 alkyl group
optionally having one or more halogens and R⁵ is a C3-C6
cycloalkyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C3-C11 fluoroalkenyl group, R⁴ is a C1-C6 alkyl
25 group optionally having one or more halogens and R⁵ is a

C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C3-C11 fluoroalkynyl group, R⁴ is a C1-C6 alkyl
group optionally having one or more halogens and R⁵ is a

5 C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C1-C11 fluoroalkyl group, R⁴ is a C3-C6 cycloalkyl
group and R⁵ is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein
10 R¹ is a C3-C11 fluoroalkenyl group, R⁴ is a C3-C6
cycloalkyl group and R⁵ is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C3-C11 fluoroalkynyl group, R⁴ is a C3-C6
cycloalkyl group and R⁵ is a C3-C6 cycloalkyl group;

15 an amidine compound represented by the formula (1), wherein
R¹ is a C1-C11 fluoroalkyl group, R⁴ is a C1-C6 alkyl group
optionally having one or more halogens and R⁵ is a methyl
group;

an amidine compound represented by the formula (1), wherein
20 R¹ is a C1-C11 fluoroalkyl group, R⁴ is a C1-C6 alkyl group
optionally having one or more halogens and R⁵ is an ethyl
group;

an amidine compound represented by the formula (1), wherein
R¹ is a C3-C11 fluoroalkenyl group, R⁴ is a C1-C6 alkyl
25 group optionally having one or more halogens and R⁵ is a

methyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C3-C11 fluoroalkenyl group, R⁴ is a C1-C6 alkyl
group optionally having one or more halogens and R⁵ is an
5 ethyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C3-C11 fluoroalkynyl group, R⁴ is a C1-C6 alkyl
group optionally having one or more halogens and R⁵ is a
methyl group;

10 an amidine compound represented by the formula (1), wherein
R¹ is a C3-C11 fluoroalkynyl group, R⁴ is a C1-C6 alkyl
group optionally having one or more halogens and R⁵ is an
ethyl group;

an amidine compound represented by the formula (1), wherein
15 R¹ is a C1-C11 fluoroalkyl group, R⁴ is a C3-C6 cycloalkyl
group and R⁵ is a methyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C1-C11 fluoroalkyl group, R⁴ is a C3-C6 cycloalkyl
group and R⁵ is an ethyl group;

20 an amidine compound represented by the formula (1), wherein
R¹ is a C3-C11 fluoroalkenyl group, R⁴ is a C3-C6
cycloalkyl group and R⁵ is a methyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C3-C11 fluoroalkenyl group, R⁴ is a C3-C6
25 cycloalkyl group and R⁵ is an ethyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C3-C11 fluoroalkynyl group, R⁴ is a C3-C6
cycloalkyl group and R⁵ is a methyl group;

an amidine compound represented by the formula (1), wherein
5 R¹ is a C3-C11 fluoroalkynyl group, R⁴ is a C3-C6
cycloalkyl group and R⁵ is an ethyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C1-C6 fluoroalkyl group, R⁴ is a C1-C6 alkyl group
optionally having one or more halogens and R⁵ is a C1-C6
10 alkyl group optionally having one or more halogens;

an amidine compound represented by the formula (1), wherein
R¹ is a C7-C11 fluoroalkyl group, R⁴ is a C1-C6 alkyl group
optionally having one or more halogens and R⁵ is a C1-C6
alkyl group optionally having one or more halogens;

15 an amidine compound represented by the formula (1), wherein
R¹ is a C3-C6 fluoroalkenyl group, R⁴ is a C1-C6 alkyl
group optionally having one or more halogens and R⁵ is a
C1-C6 alkyl group optionally having one or more halogens;

an amidine compound represented by the formula (1), wherein
20 R¹ is a C7-C11 fluoroalkenyl group, R⁴ is a C1-C6 alkyl
group optionally having one or more halogens and R⁵ is a
C1-C6 alkyl group optionally having one or more halogens;

an amidine compound represented by the formula (1), wherein
R¹ is a C3-C6 fluoroalkynyl group, R⁴ is a C1-C6 alkyl
25 group optionally having one or more halogens and R⁵ is a

C1-C6 alkyl group optionally having one or more halogens;

an amidine compound represented by the formula (1), wherein

R¹ is a C7-C11 fluoroalkynyl group, R⁴ is a C1-C6 alkyl group optionally having one or more halogens and R⁵ is a

5 C1-C6 alkyl group optionally having one or more halogens;

an amidine compound represented by the formula (1), wherein

R¹ is a C1-C6 fluoroalkyl group, R⁴ is a C1-C6 alkyl group optionally having one or more halogens and R⁵ is a C3-C6 cycloalkyl group;

10 an amidine compound represented by the formula (1), wherein

R¹ is a C7-C11 fluoroalkyl group, R⁴ is a C1-C6 alkyl group optionally having one or more halogens and R⁵ is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein

15 R¹ is a C3-C6 fluoroalkenyl group, R⁴ is a C1-C6 alkyl group optionally having one or more halogens and R⁵ is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein

20 R¹ is a C7-C11 fluoroalkenyl group, R⁴ is a C1-C6 alkyl group optionally having one or more halogens and R⁵ is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein

25 R¹ is a C3-C6 fluoroalkynyl group, R⁴ is a C1-C6 alkyl group optionally having one or more halogens and R⁵ is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein R^1 is a C7-C11 fluoroalkynyl group, R^4 is a C1-C6 alkyl group optionally having one or more halogens and R^5 is a C3-C6 cycloalkyl group;

5 an amidine compound represented by the formula (1), wherein R^1 is a C1-C6 fluoroalkyl group, R^4 is a C3-C6 cycloalkyl group and R^5 is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein R^1 is a C7-C11 fluoroalkyl group, R^4 is a C3-C6 cycloalkyl group and R^5 is a C3-C6 cycloalkyl group;

10

an amidine compound represented by the formula (1), wherein R^1 is a C3-C6 fluoroalkenyl group, R^4 is a C3-C6 cycloalkyl group and R^5 is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein R^1 is a C7-C11 fluoroalkenyl group, R^4 is a C3-C6 cycloalkyl group and R^5 is a C3-C6 cycloalkyl group;

15

an amidine compound represented by the formula (1), wherein R^1 is a C3-C6 fluoroalkynyl group, R^4 is a C3-C6 cycloalkyl group and R^5 is a C3-C6 cycloalkyl group;

20 an amidine compound represented by the formula (1), wherein R^1 is a C7-C11 fluoroalkynyl group, R^4 is a C3-C6 cycloalkyl group and R^5 is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein R^1 is a C1-C6 fluoroalkyl group, R^4 is a C1-C6 alkyl group optionally having one or more halogens and R^5 is a methyl

25

group;

an amidine compound represented by the formula (1), wherein
R¹ is a C7-C11 fluoroalkyl group, R⁴ is a C1-C6 alkyl group
optionally having one or more halogens and R⁵ is a methyl
5 group;

an amidine compound represented by the formula (1), wherein
R¹ is a C3-C6 fluoroalkenyl group, R⁴ is a C1-C6 alkyl
group optionally having one or more halogens and R⁵ is a
methyl group;

10 an amidine compound represented by the formula (1), wherein
R¹ is a C7-C11 fluoroalkenyl group, R⁴ is a C1-C6 alkyl
group optionally having one or more halogens and R⁵ is a
methyl group;

an amidine compound represented by the formula (1), wherein
15 R¹ is a C3-C6 fluoroalkynyl group, R⁴ is a C1-C6 alkyl
group optionally having one or more halogens, R⁵ is a
methyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C7-C11 fluoroalkynyl group, R⁴ is a C1-C6 alkyl
20 group optionally having one or more halogens and R⁵ is a
methyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C1-C6 fluoroalkyl group, R⁴ is a C1-C6 alkyl group
optionally having one or more halogens and R⁵ is an ethyl
25 group;

an amidine compound represented by the formula (1), wherein R^1 is a C7-C11 fluoroalkyl group, R^4 is a C1-C6 alkyl group optionally having one or more halogens and R^5 is an ethyl group;

5 an amidine compound represented by the formula (1), wherein R^1 is a C3-C6 fluoroalkenyl group, R^4 is a C1-C6 alkyl group optionally having one or more halogens and R^5 is an ethyl group;

an amidine compound represented by the formula (1), wherein
10 R^1 is a C7-C11 fluoroalkenyl group, R^4 is a C1-C6 alkyl group optionally having one or more halogens and R^5 is an ethyl group;

an amidine compound represented by the formula (1), wherein
15 R^1 is a C3-C6 fluoroalkynyl group, R^4 is a C1-C6 alkyl group optionally having one or more halogens and R^5 is an ethyl group;

an amidine compound represented by the formula (1), wherein
20 R^1 is a C7-C11 fluoroalkynyl group, R^4 is a C1-C6 alkyl group optionally having one or more halogens and R^5 is an ethyl group;

an amidine compound represented by the formula (1), wherein R^2 is a methyl group, R^3 is a methyl group and R^4 is a methyl group;

an amidine compound represented by the formula (1), wherein
25 R^2 is a methyl group, R^3 is a methyl group and R^5 is an

ethyl group;

an amidine compound represented by the formula (1), wherein R^2 is a methyl group, R^4 is a methyl group and R^5 is a C1-C6 alkyl group optionally having one or more halogens;

5 an amidine compound represented by the formula (1), wherein R^2 is a methyl group, R^4 is a methyl group and R^5 is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein R^2 is a methyl group, R^4 is a C1-C6 alkyl group optionally
10 having one or more halogens and R^5 is an ethyl group;

an amidine compound represented by the formula (1), wherein R^2 is a methyl group, R^4 is C3-C6 cycloalkyl group and R^5 is an ethyl group;

an amidine compound represented by the formula (1), wherein
15 R^2 is a methyl group, R^4 is a methyl group and R^5 is a methyl group;

an amidine compound represented by the formula (1), wherein R^2 is a methyl group, R^4 is a methyl group and R^5 is an ethyl group;

20 an amidine compound represented by the formula (1), wherein R^3 is a methyl group, R^4 is a methyl group and R^5 is a C1-C6 alkyl group optionally having one or more halogens;

an amidine compound represented by the formula (1), wherein R^3 is a methyl group, R^4 is a methyl group and R^5 is a C3-C6
25 cycloalkyl group;

an amidine compound represented by the formula (1), wherein
R³ is a methyl group, R⁴ is a C1-C6 alkyl group optionally
having one or more halogens and R⁵ is an ethyl group;

an amidine compound represented by the formula (1), wherein
5 R³ is a methyl group, R⁴ is a C3-C6 cycloalkyl group and R⁵
is an ethyl group;

an amidine compound represented by the formula (1), wherein
R³ is a methyl group, R⁴ is a methyl group and R⁵ is a
methyl group;

10 an amidine compound represented by the formula (1), wherein
R³ is a methyl group, R⁴ is a methyl group and R⁵ is an
ethyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C1-C11 fluoroalkyl group, R² is a methyl group, R³
15 is a methyl group and R⁴ is a methyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C3-C11 fluoroalkenyl group, R² is a methyl group, R³
is a methyl group and R⁴ is a methyl group;

an amidine compound represented by the formula (1), wherein
20 R¹ is a C3-C11 fluoroalkynyl group, R² is a methyl group, R³
is a methyl group and R⁴ is a methyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C1-C6 fluoroalkyl group, R² is a methyl group, R³ is
a methyl group and R⁴ is a methyl group;

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an amidine compound represented by the formula (1), wherein R¹ is a C7-C11 fluoroalkyl group, R² is a methyl group, R³ is a methyl group and R⁴ is a methyl group;

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15 an amidine compound represented by the formula (1), wherein R¹ is a C1-C11 fluoroalkyl group, R² is a methyl group, R³ is a methyl group and R⁴ is a C1-C6 alkyl group optionally having one or more halogens;

an amidine compound represented by the formula (1), wherein
20 R¹ is a C1-C11 fluoroalkyl group, R² is a methyl group, R³ is a methyl group and R⁴ is a C3-C6 cycloalkyl group;

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an amidine compound represented by the formula (1), wherein R¹ is a C7-C11 fluoroalkyl group, R² is a methyl group, R⁴ is a C1-C6 alkyl group optionally having one or more halogens and R⁵ is a C1-C6 alkyl group optionally having

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an amidine compound represented by the formula (1), wherein R^1 is a C7-C11 fluoroalkenyl group, R^2 is a methyl group, R^4 is a C1-C6 alkyl group optionally having one or more halogens and R^5 is a methyl group;

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an amidine compound represented by the formula (1), wherein
15 R^1 is a C1-C6 fluoroalkyl group, R^2 is a methyl group, R^4 is a C1-C6 alkyl group optionally having one or more halogens and R^5 is an ethyl group;

an amidine compound represented by the formula (1), wherein
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an amidine compound represented by the formula (1), wherein
R¹ is a C7-C11 fluoroalkyl group, R³ is a methyl group, R⁴
is a C3-C6 cycloalkyl group and R⁵ is a C3-C6 cycloalkyl
5 group;

an amidine compound represented by the formula (1), wherein
R¹ is a C3-C6 fluoroalkenyl group, R³ is a methyl group, R⁴
is a C3-C6 cycloalkyl group and R⁵ is a C3-C6 cycloalkyl
group;

10 an amidine compound represented by the formula (1), wherein
R¹ is a C7-C11 fluoroalkenyl group, R³ is a methyl group, R⁴
is a C3-C6 cycloalkyl group and R⁵ is a C3-C6 cycloalkyl
group;

an amidine compound represented by the formula (1), wherein
15 R¹ is a C3-C6 fluoroalkynyl group, R³ is a methyl group, R⁴
is a C3-C6 cycloalkyl group and R⁵ is a C3-C6 cycloalkyl
group;

an amidine compound represented by the formula (1), wherein
R¹ is a C7-C11 fluoroalkynyl group, R³ is a methyl group, R⁴
20 is a C3-C6 cycloalkyl group and R⁵ is a C3-C6 cycloalkyl
group;

an amidine compound represented by the formula (1), wherein
R¹ is a C1-C6 fluoroalkyl group, R³ is a methyl group, R⁴ is
a C1-C6 alkyl group optionally having one or more halogens
25 and R⁵ is a methyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C7-C11 fluoroalkyl group, R³ is a methyl group, R⁴
is a C1-C6 alkyl group optionally having one or more
halogens and R⁵ is a methyl group;

5 an amidine compound represented by the formula (1), wherein
R¹ is a C3-C6 fluoroalkenyl group, R³ is a methyl group, R⁴
is a C1-C6 alkyl group optionally having one or more
halogens and R⁵ is a methyl group;

an amidine compound represented by the formula (1), wherein
10 R¹ is a C7-C11 fluoroalkenyl group, R³ is a methyl group, R⁴
is a C1-C6 alkyl group optionally having one or more
halogens and R⁵ is a methyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C3-C6 fluoroalkynyl group, R³ is a methyl group, R⁴
15 is a C1-C6 alkyl group optionally having one or more
halogens and R⁵ is a methyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C7-C11 fluoroalkynyl group, R³ is a methyl group, R⁴
is a C1-C6 alkyl group optionally having one or more
20 halogens and R⁵ is a methyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C1-C6 fluoroalkyl group, R³ is a methyl group, R⁴ is
a C1-C6 alkyl group optionally having one or more halogens
and R⁵ is an ethyl group;

25 an amidine compound represented by the formula (1), wherein

R¹ is a C7-C11 fluoroalkyl group, R³ is a methyl group, R⁴ is a C1-C6 alkyl group optionally having one or more halogens and R⁵ is an ethyl group;

an amidine compound represented by the formula (1), wherein

5 R¹ is a C3-C6 fluoroalkenyl group, R³ is a methyl group, R⁴ is a C1-C6 alkyl group optionally having one or more halogens and R⁵ is an ethyl group;

an amidine compound represented by the formula (1), wherein

10 R¹ is a C7-C11 fluoroalkenyl group, R³ is a methyl group, R⁴ is a C1-C6 alkyl group optionally having one or more halogens and R⁵ is an ethyl group;

an amidine compound represented by the formula (1), wherein

15 R¹ is a C3-C6 fluoroalkynyl group, R³ is a methyl group, R⁴ is a C1-C6 alkyl group optionally having one or more halogens, R⁵ is an ethyl group;

an amidine compound represented by the formula (1), wherein

R¹ is a C7-C11 fluoroalkynyl group, R³ is a methyl group, R⁴ is a C1-C6 alkyl group optionally having one or more halogens and R⁵ is an ethyl group;

20 an amidine compound represented by the formula (1), wherein

R² is a methyl group, R³ is a methyl group, R⁴ is a methyl group and R⁵ is a C1-C6 alkyl group optionally having one or more halogens;

an amidine compound represented by the formula (1), wherein

25 R² is a methyl group, R³ is a methyl group, R⁴ is a methyl

group and R⁵ is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein
R² is a methyl group, R³ is a methyl group, R⁴ is a C1-C6
alkyl group optionally having one or more halogens and R⁵
5 is an ethyl group;

an amidine compound represented by the formula (1), wherein
R² is a methyl group, R³ is a methyl group, R⁴ is a C3-C6
cycloalkyl group and R⁵ is an ethyl group;

an amidine compound represented by the formula (1), wherein
10 R² is a methyl group, R³ is a methyl group, R⁴ is a methyl
group and R⁵ is a methyl group;

an amidine compound represented by the formula (1), wherein
R² is a methyl group, R³ is a methyl group, R⁴ is a methyl
group and R⁵ is an ethyl group;

15 an amidine compound represented by the formula (1), wherein
R¹ is a C1-C11 fluoroalkyl group, R² is a methyl group, R³
is a methyl group, R⁴ is a C1-C6 alkyl group optionally
having one or more halogens and R⁵ is a C1-C6 alkyl group
optionally having one or more halogens;

20 an amidine compound represented by the formula (1), wherein
R¹ is a C3-C11 fluoroalkenyl group, R² is a methyl group, R³
is a methyl group, R⁴ is a C1-C6 alkyl group optionally
having one or more halogens and R⁵ is a C1-C6 alkyl group
optionally having one or more halogens;

25 an amidine compound represented by the formula (1), wherein

R¹ is a C3-C11 fluoroalkynyl group, R² is a methyl group, R³ is a methyl group, R⁴ is a C1-C6 alkyl group optionally having one or more halogens and R⁵ is a C1-C6 alkyl group optionally having one or more halogens;

5 an amidine compound represented by the formula (1), wherein R¹ is a C1-C11 fluoroalkyl group, R² is a methyl group, R³ is a methyl group, R⁴ is a C1-C6 alkyl group optionally having one or more halogens and R⁵ is a C3-C6 cycloalkyl group;

10 an amidine compound represented by the formula (1), wherein R¹ is a C3-C11 fluoroalkenyl group, R² is a methyl group, R³ is a methyl group, R⁴ is a C1-C6 alkyl group optionally having one or more halogens and R⁵ is a C3-C6 cycloalkyl group;

15 an amidine compound represented by the formula (1), wherein R¹ is a C3-C11 fluoroalkynyl group, R² is a methyl group, R³ is a methyl group, R⁴ is a C1-C6 alkyl group optionally having one or more halogens and R⁵ is a C3-C6 cycloalkyl group;

20 an amidine compound represented by the formula (1), wherein R¹ is a C1-C11 fluoroalkyl group, R² is a methyl group, R³ is a methyl group, R⁴ is a C3-C6 cycloalkyl group and R⁵ is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein
25 R¹ is a C3-C11 fluoroalkenyl group, R² is a methyl group, R³

is a methyl group, R⁴ is a C3-C6 cycloalkyl group and R⁵ is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein R¹ is a C3-C11 fluoroalkynyl group, R² is a methyl group, R³ is a methyl group, R⁴ is a C3-C6 cycloalkyl group and R⁵ is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein R¹ is a C1-C11 fluoroalkyl group, R² is a methyl group, R³ is a methyl group, R⁴ is a C1-C6 alkyl group optionally having one or more halogens and R⁵ is a methyl group;

an amidine compound represented by the formula (1), wherein R¹ is a C1-C11 fluoroalkyl group, R² is a methyl group, R³ is a methyl group, R⁴ is a C1-C6 alkyl group optionally having one or more halogens and R⁵ is an ethyl group;

an amidine compound represented by the formula (1), wherein R¹ is a C3-C11 fluoroalkenyl group, R² is a methyl group, R³ is a methyl group, R⁴ is a C1-C6 alkyl group optionally having one or more halogens and R⁵ is a methyl group;

an amidine compound represented by the formula (1), wherein R¹ is a C3-C11 fluoroalkenyl group, R² is a methyl group, R³ is a methyl group, R⁴ is a C1-C6 alkyl group optionally having one or more halogens and R⁵ is an ethyl group;

an amidine compound represented by the formula (1), wherein R¹ is a C3-C11 fluoroalkynyl group, R² is a methyl group, R³ is a methyl group, R⁴ is a C1-C6 alkyl group optionally

having one or more halogens and R⁵ is a methyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C3-C11 fluoroalkynyl group, R² is a methyl group, R³
is a methyl group, R⁴ is a C1-C6 alkyl group optionally

5 having one or more halogens and R⁵ is an ethyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C1-C11 fluoroalkyl group, R² is a methyl group, R³
is a methyl group, R⁴ is a C3-C6 cycloalkyl group and R⁵ is
a methyl group;

10 an amidine compound represented by the formula (1), wherein
R¹ is a C1-C11 fluoroalkyl group, R² is a methyl group, R³
is a methyl group, R⁴ is a C3-C6 cycloalkyl group and R⁵ is
an ethyl group;

an amidine compound represented by the formula (1), wherein
15 R¹ is a C3-C11 fluoroalkenyl group, R² is a methyl group, R³
is a methyl group, R⁴ is a C3-C6 cycloalkyl group and R⁵ is
a methyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C3-C11 fluoroalkenyl group, R² is a methyl group, R³
20 is a methyl group, R⁴ is a C3-C6 cycloalkyl group and R⁵ is
an ethyl group;

an amidine compound represented by the formula (1), wherein
R¹ is a C3-C11 fluoroalkynyl group, R² is a methyl group, R³
is a methyl group, R⁴ is a C3-C6 cycloalkyl group and R⁵ is
25 a methyl group;

an amidine compound represented by the formula (1), wherein R^1 is a C3-C11 fluoroalkynyl group, R^2 is a methyl group, R^3 is a methyl group, R^4 is a C3-C6 cycloalkyl group and R^5 is an ethyl group;

5 an amidine compound represented by the formula (1), wherein R^1 is a C1-C6 fluoroalkyl group, R^2 is a methyl group, R^3 is a methyl group, R^4 is a C1-C6 alkyl group optionally having one or more halogens and R^5 is a C1-C6 alkyl group optionally having one or more halogens;

10 an amidine compound represented by the formula (1), wherein R^1 is a C7-C11 fluoroalkyl group, R^2 is a methyl group, R^3 is a methyl group, R^4 is a C1-C6 alkyl group optionally having one or more halogens and R^5 is a C1-C6 alkyl group optionally having one or more halogens;

15 an amidine compound represented by the formula (1), wherein R^1 is a C3-C6 fluoroalkenyl group, R^2 is a methyl group, R^3 is a methyl group, R^4 is a C1-C6 alkyl group optionally having one or more halogens and R^5 is a C1-C6 alkyl group optionally having one or more halogens;

20 an amidine compound represented by the formula (1), wherein R^1 is a C7-C11 fluoroalkenyl group, R^2 is a methyl group, R^3 is a methyl group, R^4 is a C1-C6 alkyl group optionally having one or more halogens and R^5 is a C1-C6 alkyl group optionally having one or more halogens;

25 an amidine compound represented by the formula (1), wherein

R¹ is a C3-C6 fluoroalkynyl group, R² is a methyl group, R³ is a methyl group, R⁴ is a C1-C6 alkyl group optionally having one or more halogens and R⁵ is a C1-C6 alkyl group optionally having one or more halogens;

5 an amidine compound represented by the formula (1), wherein R¹ is a C7-C11 fluoroalkynyl group, R² is a methyl group, R³ is a methyl group, R⁴ is a C1-C6 alkyl group optionally having one or more halogens and R⁵ is a C1-C6 alkyl group optionally having one or more halogens;

10 an amidine compound represented by the formula (1), wherein R¹ is a C1-C6 fluoroalkyl group, R² is a methyl group, R³ is a methyl group, R⁴ is a C1-C6 alkyl group optionally having one or more halogens and R⁵ is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein
15 R¹ is a C7-C11 fluoroalkyl group, R² is a methyl group, R³ is a methyl group, R⁴ is a C1-C6 alkyl group optionally having one or more halogens and R⁵ is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein
20 R¹ is a C3-C6 fluoroalkenyl group, R² is a methyl group, R³ is a methyl group, R⁴ is a C1-C6 alkyl group optionally having one or more halogens and R⁵ is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein
25 R¹ is a C7-C11 fluoroalkenyl group, R² is a methyl group, R³

is a methyl group, R^4 is a C1-C6 alkyl group optionally having one or more halogens and R^5 is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein
5 R^1 is a C3-C6 fluoroalkynyl group, R^2 is a methyl group, R^3 is a methyl group, R^4 is a C1-C6 alkyl group optionally having one or more halogens and R^5 is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein
10 R^1 is a C7-C11 fluoroalkynyl group, R^2 is a methyl group, R^3 is a methyl group, R^4 is a C1-C6 alkyl group optionally having one or more halogens and R^5 is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein
15 R^1 is a C1-C6 fluoroalkyl group, R^2 is a methyl group, R^3 is a methyl group, R^4 is a C3-C6 cycloalkyl group and R^5 is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein
20 R^1 is a C7-C11 fluoroalkyl group, R^2 is a methyl group, R^3 is a methyl group, R^4 is a C3-C6 cycloalkyl group and R^5 is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein
25 R^1 is a C3-C6 fluoroalkenyl group, R^2 is a methyl group, R^3 is a methyl group, R^4 is a C3-C6 cycloalkyl group and R^5 is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein R^1 is a C7-C11 fluoroalkenyl group, R^2 is a methyl group, R^3 is a methyl group, R^4 is a C3-C6 cycloalkyl group and R^5 is a C3-C6 cycloalkyl group;

5 an amidine compound represented by the formula (1), wherein R^1 is a C3-C6 fluoroalkynyl group, R^2 is a methyl group, R^3 is a methyl group, R^4 is a C3-C6 cycloalkyl group and R^5 is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein
10 R^1 is a C7-C11 fluoroalkynyl group, R^2 is a methyl group, R^3 is a methyl group, R^4 is a C3-C6 cycloalkyl group and R^5 is a C3-C6 cycloalkyl group;

an amidine compound represented by the formula (1), wherein
15 R^1 is a C1-C6 fluoroalkyl group, R^2 is a methyl group, R^3 is a methyl group, R^4 is a C1-C6 alkyl group optionally having one or more halogens and R^5 is a methyl group;

an amidine compound represented by the formula (1), wherein
20 R^1 is a C7-C11 fluoroalkyl group, R^2 is a methyl group, R^3 is a methyl group, R^4 is a C1-C6 alkyl group optionally having one or more halogens and R^5 is a methyl group;

an amidine compound represented by the formula (1), wherein R^1 is a C3-C6 fluoroalkenyl group, R^2 is a methyl group, R^3 is a methyl group, R^4 is a C1-C6 alkyl group optionally having one or more halogens and R^5 is a methyl group;

25 an amidine compound represented by the formula (1), wherein

R¹ is a C7-C11 fluoroalkenyl group, R² is a methyl group, R³ is a methyl group, R⁴ is a C1-C6 alkyl group optionally having one or more halogens and R⁵ is a methyl group;

an amidine compound represented by the formula (1), wherein

5 R¹ is a C3-C6 fluoroalkynyl group, R² is a methyl group, R³ is a methyl group, R⁴ is a C1-C6 alkyl group optionally having one or more halogens and R⁵ is a methyl group;

an amidine compound represented by the formula (1), wherein

10 R¹ is a C7-C11 fluoroalkynyl group, R² is a methyl group, R³ is a methyl group, R⁴ is a C1-C6 alkyl group optionally having one or more halogens and R⁵ is a methyl group;

an amidine compound represented by the formula (1), wherein

15 R¹ is a C1-C6 fluoroalkyl group, R² is a methyl group, R³ is a methyl group, R⁴ is a C1-C6 alkyl group optionally having one or more halogens and R⁵ is an ethyl group;

an amidine compound represented by the formula (1), wherein

R¹ is a C7-C11 fluoroalkyl group, R² is a methyl group, R³ is a methyl group, R⁴ is a C1-C6 alkyl group optionally having one or more halogens and R⁵ is an ethyl group;

20 an amidine compound represented by the formula (1), wherein

R¹ is a C3-C6 fluoroalkenyl group, R² is a methyl group, R³ is a methyl group, R⁴ is a C1-C6 alkyl group optionally having one or more halogens and R⁵ is an ethyl group;

an amidine compound represented by the formula (1), wherein

25 R¹ is a C7-C11 fluoroalkenyl group, R² is a methyl group, R³

is a methyl group, R^4 is a C1-C6 alkyl group optionally having one or more halogens and R^5 is an ethyl group;

an amidine compound represented by the formula (1), wherein R^1 is a C3-C6 fluoroalkynyl group, R^2 is a methyl group, R^3

5 is a methyl group, R^4 is a C1-C6 alkyl group optionally having one or more halogens and R^5 is an ethyl group;

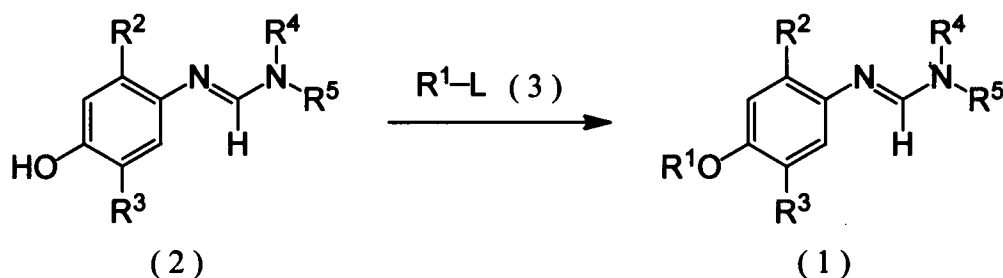
and

an amidine compound represented by the formula (1), wherein R^1 is a C7-C11 fluoroalkynyl group, R^2 is a methyl group, R^3

10 is a methyl group, R^4 is a C1-C6 alkyl group optionally having one or more halogens and R^5 is an ethyl group.

(Production Method 1)

The present compound can be produced by reacting a compound represented formula (2) as follows (hereinafter referred to as Compound (2)) and a compound represented formula (3) as follows (hereinafter referred to as Compound (3)) in the presence of a base.



wherein R^1 , R^2 , R^3 , R^4 and R^5 are defined above, L

20 represents chlorine, bromine, iodine, a methanesulfonyloxy group, a trifluoromethanesulfonyloxy group or a p-

toluenesulfonyloxy group.

The reaction is usually performed in the presence of a solvent.

Examples of the solvent to be used in the reaction
5 include ethers such as tetrahydrofuran, ethyleneglycol
dimethyl ether and tert-butyl methyl ether (hereinafter
referred to as MTBE); aromatic hydrocarbons such as toluene
and xylene; halogenated hydrocarbon such as chlorobenzene;
nitriles such as acetonitrile; acid amides such as N,N-
10 dimethylformamide (hereinafter referred to as DMF), 1,3-
dimethyl-2-imidazolidinone and N-methylpyrrolidone;
sulfoxides such as dimethylsulfoxide; ketones such as
acetone, methyl ethyl ketone and methyl isobutyl ketone;
water and mixture thereof.

15 Examples of the base to be used in the reaction
include alkali metal carbonates such as sodium carbonate,
pottasium carbonate and cesium carbonate; alkali metal
hydroxydes such as sodium hydroxyde and pottasium hydroxide
and alkali metal hydride such as sodium hydride.

20 The amount of Compound (3) to be used in the reaction
is usually 1 to 10 moles besed on 1 mole of Compound (2).
The amount of base to be used in the reaction is usually 1
to 5 moles besed on 1 mole of Compound (2).

The reaction temperature of the reaction is usually
25 within a range of -20 to 150°C. The reaction time of the

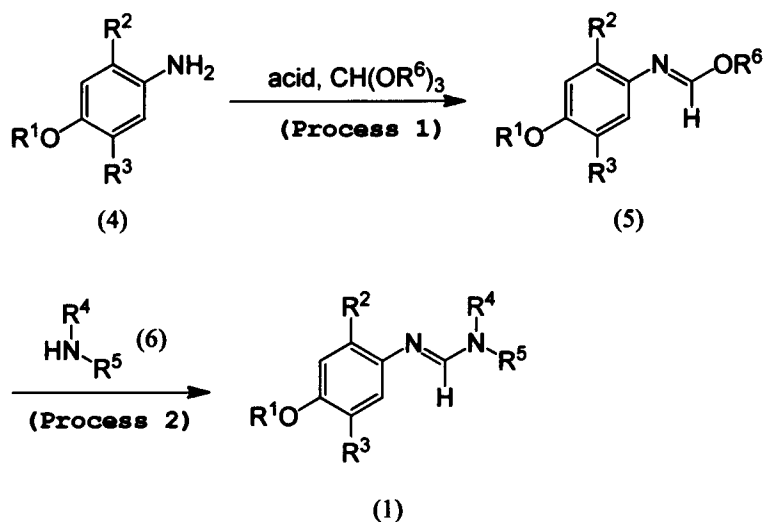
reaction is usually within a range of 0.1 to 24 hours.

This reaction carried out in presence of sodium iodide and/or tetrabutylammonium iodide, if necessary. The amount of sodium iodide and/or tetrabutylammonium iodide to be used is usually 0.05 to 0.2 moles based on 1 mole of Compound (2).

After the completion of the reaction, the present compound can be isolated by carrying out post treatment operation such as extraction of the reaction mixture with an organic solvent drying of the organic layer and concentrate thereof. The present compound thus isolated can also be further purified by chromatography, re-crystallization and the like.

(Production Method 2)

The present compound can also be produced by the following method.



wherein R^1 , R^2 , R^3 , R^4 and R^5 are as defined above, and R^6

represents a methyl group or an ethyl group.

(Process 1)

A compound represented formula (5) as below
(hereinafter referred to as Compound (5)) can be produced
5 by reacting a compound represented formula (4) as below
(hereinafter referred to as Compound (4)); and trimethyl
orthoformate or triethyl orthoformate in the presense of
acid.

10 The reaction is usually carried out in the absence of
a solvent.

Examples of the acid to be used in the reaction
include sulfonic acids such as camphorsulfonic acid and p-
toluenesulfonic acid; and inorganic acids such as
hydrochloric acid and sulfuric acid.

15 The amount of trimethyl orthoformate or triethyl
orthoformate to be used in the reaction is usually 1 mole
to large excess amount based on 1 mole of Compound (4).
The amount of the acid to be used in the reaction is
usually 0.05 to 1 mole based on 1 mole of Compound (4).

20 The reaction temperature of the reaction is usually
within a range of 80 to 150°C. The reaction time of the
reaction is usually within a range of 0.5 to 2 hours.

After the completion of the reaction, Compound (5) can
be isolated by concentrating the reaction mixture; or by
25 carrying out post treatment operation such as extraction of

the reaction mixture with an organic solvent, drying of the organic layer and concentrate thereof.

(Process 2)

The present compound can be produced by reacting
5 Conopund (5) and a compound represented formula (6) as below (hereinafter referred to as Compound (6)).

The reaction usually carried out in the presence of solvent.

Examples of the solvent to be used in the reaction
10 include ethers such as tetrahydrofuran, ethyleneglycol dimethyl ether and MTBE; aromatic hydrocarbons such as toluene and xylene; halogenated hydrocarbon such as chlorobenzene; nitriles such as acetonitrile; acid amides such as DMF, 1,3-dimethyl-2-imidazolidinone and N-
15 methylpyrrolidone; sulfoxides such as dimethylsulfoxide; ketones such as acetone, methyl ethyl ketone and methyl isobutyl ketone and mixture thereof.

The amount of compound (6) to be used in the reaction is usually 1 to 2 moles based on 1 mole of Compound (5).

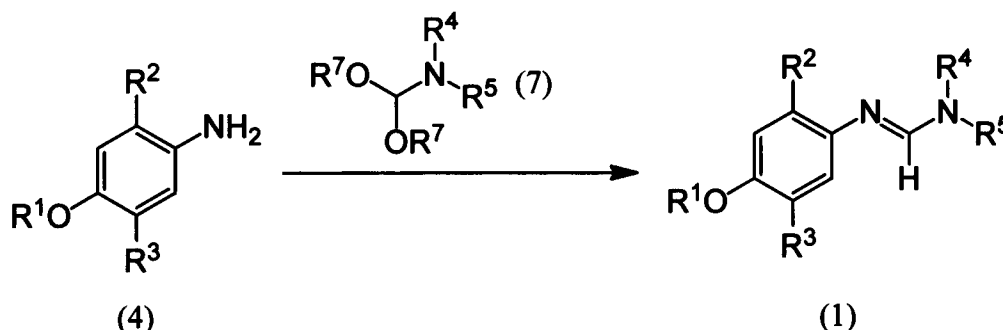
20 The reaction temperature of the reaction is usually within a range of 80 to 150°C. The reaction time of the reaction is usually within a range of 0.5 to 3 hours.

After the completion of the reaction, the present compound can be isolated by concentrating the reaction
25 mixture. The present compound thus isolated can also be

further purified by chromatography.

(Production Method 3)

The present compound also can be produced by reacting Compound (4) and a compound represented formula (7) as follows (hereinafter referred to as Compound (7)).



wherein R^1 , R^2 , R^3 , R^4 and R^5 are as defined above, and R^7 represents a methyl group or an ethyl group.

The reaction usually carried out in the presence of solvent.

Examples of the solvent to be used in the reaction include ethers such as tetrahydrofuran, ethyleneglycol dimethyl ether and MTBE; aromatic hydrocarbons such as toluene and xylene; halogenated hydrocarbon such as chlorobenzene; nitriles such as acetonitrile; acid amides such as DMF, 1,3-dimethyl-2-imidazolidinone and N-methylpyrrolidone; sulfoxides such as dimethylsulfoxide; ketones such as acetone, methyl ethyl ketone and methyl isobutyl ketone and mixture thereof.

The amount of compound (7) to be used in the reaction is usually 1 mole to large excess amount based on 1 mole of

Compound (4).

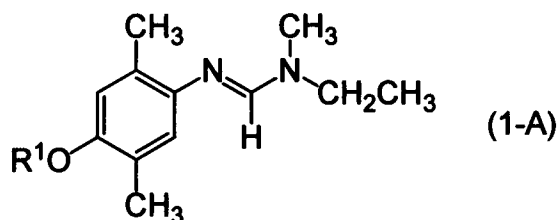
The reaction temperature of the reaction is usually within a range of 80 to 150°C. The reaction time of the reaction is usually within a range of 0.5 to 2 hours.

5 After the completion of the reaction, the present compound can be isolated by concentrating the reaction mixture. The present compound thus isolated can also be further purified by chromatography.

10 In some cases, the present compound has cis-trans isomers, i.e., a cis isomer and a trans isomer, relative to the carbon atom bonded to the carbon atom of the double bond, and in the present invention, a compound containing one of such active isomers or both of them in any ratio can be used as the present compound.

15 Examples of the present compound are shown bellow with the number of the present compound.

A compound of the formula (1-A):



wherein R¹ represents a substituent shown in Tables 1-

20 4:

Table 1.

No.	R ¹
1	2,2,3,4,4,4-hexafluorobutyl
2	2,2,3,3-tetrafluoropropyl
3	2,2,2-trifluoroethyl
4	2,2,3,3,3-pentafluoropropyl
5	2,2,3,3,4,4,4-heptafluorobutyl
6	2,2,3,3,4,4,5,5,5-nonafluoropentyl
7	2,2,3,3,4,4,5,5,6,6,6-undecafluorohexyl
8	2,2,3,3,4,4,5,5,6,6,7,7,7-tridecafluoroheptyl
9	2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-pentadecafluorooctyl
10	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,9-heptadecafluorononyl
11	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-nonadecafluorodecyl
12	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,11-henicosafluoroundecyl
13	monofluoromethyl
14	difluoromethyl
15	trifluoromethyl
16	pentafluoroethyl
17	3,3,3-trifluoropropyl
18	heptafluoropropyl
19	3,3,3-trifluoro-2-trifluoromethylpropyl
20	4,4,4-trifluorobutyl
21	nonafluorobutyl
22	4,4,4-trifluoro-3-trifluoromethylbutyl
23	2,2,4,4,4-pentafluorobutyl
24	5,5,5-trifluoropentyl
25	undecafluoropentyl
26	5,5,5-trifluoro-4-trifluoromethylpentyl

Table 2.

No.	R ¹
27	6,6,6-trifluorohexyl
28	tridecafluorohexyl
29	6,6,6-trifluoro-5-trifluoromethylhexyl
30	7,7,7-trifluoroheptyl
31	pentadecafluoroheptyl
32	7,7,7-trifluoro-6-trifluoromethylheptyl
33	8,8,8-trifluorooctyl
34	heptadecafluorooctyl
35	8,8,8-trifluoro-7-trifluoromethyloctyl
36	9,9,9-trifluorononyl
37	nonadecafluorononyl
38	9,9,9-trifluoro-8-trifluoromethylnonyl
39	10,10,10-trifluorodecyl
40	henicosafluorodecyl
41	10,10,10-trifluoro-9-trifluoromethyldecyl
42	11,11,11-trifluoroundecyl
43	tricosafuoroundecyl
44	2,3-difluoro-2-propenyl
45	4,4-difluoro-3-butenyl
46	5,5,5-trifluoro-4-trifluoromethyl-2-pentenyl
47	6,6,6-trifluoro-3-hexenyl
48	4,5-difluoro-4-heptenyl
49	8,8,8-trifluoro-4-octenyl
50	9,9,9-trifluoro-2-nonenyl
51	10,10,10-trifluoro-6-decenyl

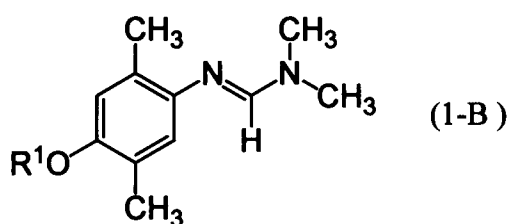
Table 3.

No.	R ¹
52	11,11,11-trifluoro-7-undecenyl
53	1-fluoro-2-propynyl
54	4,4,4-trifluoro-2-butyne
55	2,2,3,3-tetrafluoro-4-pentyne
56	5,5,6,6,6-pentafluoro-2-hexyne
57	7,7,7-trifluoro-3-heptyne
58	8,8,8-trifluoro-5-octyne
59	9,9,9-trifluoro-8-trifluoromethyl-2-nonyne
60	10,10,10-trifluoro-4-decyne
61	11,11,11-trifluoro-7-undecenyl
200	2-fluorobutyl
201	4-fluorobutyl
202	2,2-difluorobutyl
203	2,4-difluorobutyl
204	2,2,4-trifluorobutyl
205	2,4,4-trifluorobutyl
206	2,2,4,4-tetrafluorobutyl
207	2,4,4,4-tetrafluorobutyl
208	2,2,4,4,4-pentafluorobutyl
209	2-fluoropentyl
210	2,2-difluoropentyl

Table 4.

No.	R ¹
211	(2-fluoro-4-methyl)pentyl
212	(2,2-difluoro-4-methyl)pentyl
213	(2-fluoro-4,4-dimethyl)pentyl
214	(2,2-difluoro-4,4-dimethyl)pentyl
215	2-fluoro-2-pentenyl
216	2-fluoro-4-methyl-2-pentenyl
217	2-fluoro-4,4-dimethyl-2-pentenyl
218	2-fluoro-2-butenyl
219	4-fluoro-2-butenyl
220	2,4-difluoro-2-butenyl
221	4,4-difluoro-2-butenyl
222	2,4,4-trifluoro-2-butenyl
223	2,4,4,4-tetrafluoro-2-butenyl

A compound of the formula (1-B):



5 wherein R¹ represents a substituent shown in Tables 5-
8:

Table 5.

No.	R ¹
62	2,2,3,4,4,4-hexafluorobutyl
63	2,2,3,3-tetrafluoropropyl
64	2,2,2-trifluoroethyl
65	2,2,3,3,3-pentafluoropropyl
66	2,2,3,3,4,4,4-heptafluorobutyl
67	2,2,3,3,4,4,5,5,5-nonafluoropentyl
68	2,2,3,3,4,4,5,5,6,6,6-undecafluorohexyl
69	2,2,3,3,4,4,5,5,6,6,7,7,7-tridecafluoroheptyl
70	2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-pentadecafluorooctyl
71	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,9-heptadecafluorononyl
72	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-nonadecafluorodecyl
73	2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,11-henicosafuoroundecyl
74	monofluoromethyl
75	difluoromethyl
76	trifluoromethyl
77	pentafluoroethyl
78	3,3,3-trifluoropropyl
79	heptafluoropropyl
80	3,3,3-trifluoro-2-trifluoromethylpropyl
81	4,4,4-trifluorobutyl
82	nonafluorobutyl
83	4,4,4-trifluoro-3-trifluoromethylbutyl
84	2,2,4,4,4-pentafluorobutyl
85	5,5,5-trifluoropentyl
86	undecafluoropentyl
87	5,5,5-trifluoro-4-trifluoromethylpentyl

Table 6.

No.	R ¹
224	2-fluorobutyl
225	4-fluorobutyl
226	2,2-difluorobutyl
227	2,4-difluorobutyl
228	2,2,4-trifluorobutyl
229	2,4,4-trifluorobutyl
230	2,2,4,4-tetrafluorobutyl
231	2,4,4,4-tetrafluorobutyl
232	2,2,4,4,4-pentafluorobutyl
233	2-fluoropentyl
234	2,2-difluoropentyl
235	(2-fluoro-4-methyl)pentyl
236	(2,2-difluoro-4-methyl)pentyl
237	(2-fluoro-4,4-dimethyl)pentyl
238	(2,2-difluoro-4,4-dimethyl)pentyl
239	2-fluoro-2-pentenyl
240	2-fluoro-4-methyl-2-pentenyl
241	2-fluoro-4,4-dimethyl-2-pentenyl
242	2-fluoro-2-butenyl
243	4-fluoro-2-butenyl
244	2,4-difluoro-2-butenyl
245	4,4-difluoro-2-butenyl
246	2,4,4-trifluoro-2-butenyl
247	2,4,4,4-tetrafluoro-2-butenyl

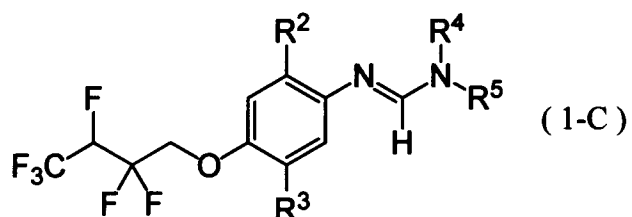
Table 7.

No.	R ¹
88	6,6,6-trifluorohexyl
89	tridecafluorohexyl
90	6,6,6-trifluoro-5-trifluoromethylhexyl
91	7,7,7-trifluoroheptyl
92	pentadecafluoroheptyl
93	7,7,7-trifluoro-6-trifluoromethylheptyl
94	8,8,8-trifluorooctyl
95	heptafluorooctyl
96	8,8,8-trifluoro-7-trifluoromethyloctyl
97	9,9,9-trifluorononyl
98	nonadecafluorononyl
99	9,9,9-trifluoro-8-trifluoromethylnonyl
100	10,10,10-trifluorodecyl
101	henicosafluorodecyl
102	10,10,10-trifluoro-9-trifluoromethyldecyl
103	11,11,11-trifluoroundecyl
104	tricosafuoroundecyl
105	2,3-difluoro-2-propenyl
106	4,4-difluoro-3-butenyl
107	5,5,5-trifluoro-4-trifluoromethyl-2-pentenyl
108	6,6,6-trifluoro-3-hexenyl
109	4,5-difluoro-4-heptenyl
110	8,8,8-trifluoro-4-octenyl
111	9,9,9-trifluoro-2-nonenyl
112	10,10,10-trifluoro-6-decenyl

Table 8.

No.	R ¹
113	11,11,11-trifluoro-7-undecenyl
114	1-fluoro-2-propynyl
115	4,4,4-trifluoro-2-butyryl
116	2,2,3,3-tetrafluoro-4-pentyryl
117	5,5,6,6,6-pentafluoro-2-hexyryl
118	7,7,7-trifluoro-3-heptyryl
119	8,8,8-trifluoro-5-octyryl
120	9,9,9-trifluoro-8-trifluoromethyl-2-nonyl
121	10,10,10-trifluoro-4-decyryl
122	11,11,11-trifluoro-7-undecenyl

A compound of the formula (1-C):



5 wherein R², R³, R⁴ and R⁵ represent a combination shown
in Tables 9-12:

Table 9.

No.	R ²	R ³	R ⁴	R ⁵
123	methyl	methyl	methyl	propyl
124	methyl	methyl	methyl	1-methylethyl
125	methyl	methyl	methyl	butyl
126	methyl	methyl	methyl	1-methylpropyl
127	methyl	methyl	methyl	2-methylpropyl
128	methyl	methyl	methyl	1,1-dimethylethyl
129	methyl	methyl	methyl	pentyl
130	methyl	methyl	methyl	1-methylpentyl
131	methyl	methyl	methyl	2-methylpentyl
132	methyl	methyl	methyl	3-methylpentyl
133	methyl	methyl	methyl	4-methylpentyl
134	methyl	methyl	methyl	hexyl
135	methyl	methyl	methyl	cyclopropyl
136	methyl	methyl	methyl	cyclobutyl
137	methyl	methyl	methyl	cyclopentyl
138	methyl	methyl	methyl	cyclohexyl
139	methyl	methyl	methyl	monofluoromethyl
140	methyl	methyl	methyl	difluoromethyl
141	methyl	methyl	methyl	trifluoromethyl
142	methyl	methyl	methyl	2,2,2-trifluoroethyl
143	methyl	methyl	methyl	3,3,3-trifluoropropyl
144	methyl	methyl	methyl	4,4,4-trifluorobutyl
145	methyl	methyl	methyl	5,5,5-trifluoropentyl
146	methyl	methyl	methyl	6,6,6-trifluorohexyl

Table 10.

No.	R ²	R ³	R ⁴	R ⁵
147	methyl	methyl	monofluoromethyl	trifluoromethyl
148	methyl	methyl	difluoromethyl	trifluoromethyl
149	methyl	methyl	trifluoromethyl	trifluoromethyl
150	methyl	methyl	2,2,2-trifluoroethyl	trifluoromethyl
151	methyl	methyl	3,3,3-trifluoropropyl	trifluoromethyl
152	methyl	methyl	4,4,4-trifluorobutyl	trifluoromethyl
153	methyl	methyl	5,5,5-trifluoropentyl	trifluoromethyl
154	methyl	methyl	6,6,6-trifluorohexyl	trifluoromethyl
155	methyl	methyl	cyclopropyl	trifluoromethyl
156	methyl	methyl	cyclobutyl	trifluoromethyl
157	methyl	methyl	cyclopentyl	trifluoromethyl
158	methyl	methyl	cyclohexyl	trifluoromethyl
159	methyl	methyl	cyclopropyl	cyclopropyl
160	methyl	methyl	cyclobutyl	cyclopropyl
161	methyl	methyl	cyclopentyl	cyclopropyl
162	methyl	methyl	cyclohexyl	cyclopropyl
163	methyl	methyl	cyclobutyl	cyclobutyl
164	methyl	methyl	cyclopentyl	cyclobutyl
165	methyl	methyl	cyclohexyl	cyclobutyl
166	methyl	methyl	cyclopentyl	cyclopentyl
167	methyl	methyl	cyclohexyl	cyclopentyl
168	methyl	methyl	cyclohexyl	cyclohexyl
169	methyl	ethyl	methyl	ethyl
170	methyl	propyl	methyl	ethyl

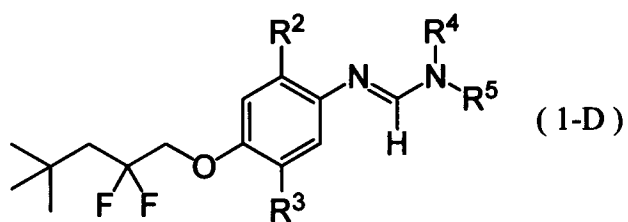
Table 11.

No.	R ²	R ³	R ⁴	R ⁵
171	methyl	1-methylethyl	methyl	ethyl
172	ethyl	methyl	methyl	ethyl
173	ethyl	ethyl	methyl	ethyl
174	ethyl	propyl	methyl	ethyl
175	ethyl	1-methylethyl	methyl	ethyl
176	propyl	methyl	methyl	ethyl
177	propyl	ethyl	methyl	ethyl
178	propyl	propyl	methyl	ethyl
179	propyl	1-methylethyl	methyl	ethyl
180	1-methylethyl	methyl	methyl	ethyl
181	1-methylethyl	ethyl	methyl	ethyl
182	1-methylethyl	propyl	methyl	ethyl
183	1-methylethyl	1-methylethyl	methyl	ethyl
184	methyl	methyl	methyl	methyl
185	methyl	ethyl	methyl	methyl
186	methyl	propyl	methyl	methyl
187	methyl	1-methylethyl	methyl	methyl
188	ethyl	methyl	methyl	methyl
189	ethyl	ethyl	methyl	methyl
190	ethyl	propyl	methyl	methyl
191	ethyl	1-methylethyl	methyl	methyl
192	propyl	methyl	methyl	methyl
193	propyl	ethyl	methyl	methyl
194	propyl	propyl	methyl	methyl

Table 12.

No.	R ²	R ³	R ⁴	R ⁵
195	propyl	1-methylethyl	methyl	methyl
196	1-methylethyl	methyl	methyl	methyl
197	1-methylethyl	ethyl	methyl	methyl
198	1-methylethyl	propyl	methyl	methyl
199	1-methylethyl	1-methylethyl	methyl	methyl
248	methyl	methyl	ethyl	ethyl

A compound of the formula (1-D):



- 5 wherein R², R³, R⁴ and R⁵ represent a combination shown
in Tables 13-17:

Table 13.

No.	R ²	R ³	R ⁴	R ⁵
249	methyl	methyl	methyl	propyl
250	methyl	methyl	methyl	1-methylethyl
251	methyl	methyl	methyl	butyl
252	methyl	methyl	methyl	1-methylpropyl
253	methyl	methyl	methyl	2-methylpropyl
254	methyl	methyl	methyl	1,1-dimethylethyl
255	methyl	methyl	methyl	pentyl
256	methyl	methyl	methyl	1-methylpentyl
257	methyl	methyl	methyl	2-methylpentyl
258	methyl	methyl	methyl	3-methylpentyl
259	methyl	methyl	methyl	4-methylpentyl
260	methyl	methyl	methyl	hexyl

Tables 14

No.	R ²	R ³	R ⁴	R ⁵
261	methyl	methyl	methyl	cyclopropyl
262	methyl	methyl	methyl	cyclobutyl
263	methyl	methyl	methyl	cyclopentyl
264	methyl	methyl	methyl	cyclohexyl
265	methyl	methyl	methyl	monofluoromethyl
266	methyl	methyl	methyl	difluoromethyl
267	methyl	methyl	methyl	trifluoromethyl
268	methyl	methyl	methyl	2,2,2-trifluoroethyl
269	methyl	methyl	methyl	3,3,3-trifluoropropyl
270	methyl	methyl	methyl	4,4,4-trifluorobutyl
271	methyl	methyl	methyl	5,5,5-trifluoropentyl
272	methyl	methyl	methyl	6,6,6-trifluorohexyl
273	methyl	methyl	monofluoromethyl	trifluoromethyl
274	methyl	methyl	difluoromethyl	trifluoromethyl
275	methyl	methyl	trifluoromethyl	trifluoromethyl
276	methyl	methyl	2,2,2-trifluoroethyl	trifluoromethyl
277	methyl	methyl	3,3,3-trifluoropropyl	trifluoromethyl
278	methyl	methyl	4,4,4-trifluorobutyl	trifluoromethyl
279	methyl	methyl	5,5,5-trifluoropentyl	trifluoromethyl
280	methyl	methyl	6,6,6-trifluorohexyl	trifluoromethyl

Table 15.

No.	R ²	R ³	R ⁴	R ⁵
281	methyl	methyl	cyclopropyl	trifluoromethyl
282	methyl	methyl	cyclobutyl	trifluoromethyl
283	methyl	methyl	cyclopentyl	trifluoromethyl
284	methyl	methyl	cyclohexyl	trifluoromethyl
285	methyl	methyl	cyclopropyl	cyclopropyl
286	methyl	methyl	cyclobutyl	cyclopropyl
287	methyl	methyl	cyclopentyl	cyclopropyl
288	methyl	methyl	cyclohexyl	cyclopropyl
289	methyl	methyl	cyclobutyl	cyclobutyl
290	methyl	methyl	cyclopentyl	cyclobutyl
291	methyl	methyl	cyclohexyl	cyclobutyl
292	methyl	methyl	cyclopentyl	cyclopentyl
293	methyl	methyl	cyclohexyl	cyclopentyl
294	methyl	methyl	cyclohexyl	cyclohexyl
295	methyl	ethyl	methyl	ethyl
296	methyl	propyl	methyl	ethyl
297	methyl	1-methylethyl	methyl	ethyl
298	ethyl	methyl	methyl	ethyl
299	ethyl	ethyl	methyl	ethyl
300	ethyl	propyl	methyl	ethyl

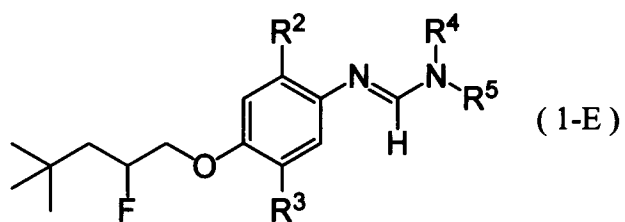
Table 16.

No.	R ²	R ³	R ⁴	R ⁵
301	ethyl	1-methylethyl	methyl	ethyl
302	propyl	methyl	methyl	ethyl
303	propyl	ethyl	methyl	ethyl
304	propyl	propyl	methyl	ethyl
305	propyl	1-methylethyl	methyl	ethyl
306	1-methylethyl	methyl	methyl	ethyl
307	1-methylethyl	ethyl	methyl	ethyl
308	1-methylethyl	propyl	methyl	ethyl
309	1-methylethyl	1-methylethyl	methyl	ethyl
310	methyl	methyl	methyl	methyl
311	methyl	ethyl	methyl	methyl
312	methyl	propyl	methyl	methyl
313	methyl	1-methylethyl	methyl	methyl

Table 17.

No.	R ²	R ³	R ⁴	R ⁵
314	ethyl	methyl	methyl	methyl
315	ethyl	ethyl	methyl	methyl
316	ethyl	propyl	methyl	methyl
317	ethyl	1-methylethyl	methyl	methyl
318	propyl	methyl	methyl	methyl
319	propyl	ethyl	methyl	methyl
320	propyl	propyl	methyl	methyl
321	propyl	1-methylethyl	methyl	methyl
322	1-methylethyl	methyl	methyl	methyl
323	1-methylethyl	ethyl	methyl	methyl
324	1-methylethyl	propyl	methyl	methyl
325	1-methylethyl	1-methylethyl	methyl	methyl
326	methyl	methyl	ethyl	ethyl

A compound of the formula (1-E):



5 wherein R², R³, R⁴ and R⁵ represent a combination shown
in Tables 18-21:

Table 18.

No.	R ²	R ³	R ⁴	R ⁵
327	methyl	methyl	methyl	propyl
328	methyl	methyl	methyl	1-methylethyl
329	methyl	methyl	methyl	butyl
330	methyl	methyl	methyl	1-methylpropyl
331	methyl	methyl	methyl	2-methylpropyl
332	methyl	methyl	methyl	1,1-dimethylethyl
333	methyl	methyl	methyl	pentyl
334	methyl	methyl	methyl	1-methylpentyl
335	methyl	methyl	methyl	2-methylpentyl
336	methyl	methyl	methyl	3-methylpentyl
337	methyl	methyl	methyl	4-methylpentyl
338	methyl	methyl	methyl	hexyl
339	methyl	methyl	methyl	cyclopropyl
340	methyl	methyl	methyl	cyclobutyl
341	methyl	methyl	methyl	cyclopentyl
342	methyl	methyl	methyl	cyclohexyl
343	methyl	methyl	methyl	monofluoromethyl
344	methyl	methyl	methyl	difluoromethyl
345	methyl	methyl	methyl	trifluoromethyl

Table 19.

No.	R ²	R ³	R ⁴	R ⁵
346	methyl	methyl	methyl	2,2,2-trifluoroethyl
347	methyl	methyl	methyl	3,3,3-trifluoropropyl
348	methyl	methyl	methyl	4,4,4-trifluorobutyl
349	methyl	methyl	methyl	5,5,5-trifluoropentyl
350	methyl	methyl	methyl	6,6,6-trifluorohexyl
351	methyl	methyl	monofluoromethyl	trifluoromethyl
352	methyl	methyl	difluoromethyl	trifluoromethyl
353	methyl	methyl	trifluoromethyl	trifluoromethyl
354	methyl	methyl	2,2,2-trifluoroethyl	trifluoromethyl
355	methyl	methyl	3,3,3-trifluoropropyl	trifluoromethyl
356	methyl	methyl	4,4,4-trifluorobutyl	trifluoromethyl
357	methyl	methyl	5,5,5-trifluoropentyl	trifluoromethyl
358	methyl	methyl	6,6,6-trifluorohexyl	trifluoromethyl
359	methyl	methyl	cyclopropyl	trifluoromethyl
360	methyl	methyl	cyclobutyl	trifluoromethyl
361	methyl	methyl	cyclopentyl	trifluoromethyl
362	methyl	methyl	cyclohexyl	trifluoromethyl
363	methyl	methyl	cyclopropyl	cyclopropyl
364	methyl	methyl	cyclobutyl	cyclopropyl
365	methyl	methyl	cyclopentyl	cyclopropyl
366	methyl	methyl	cyclohexyl	cyclopropyl
367	methyl	methyl	cyclobutyl	cyclobutyl
368	methyl	methyl	cyclopentyl	cyclobutyl

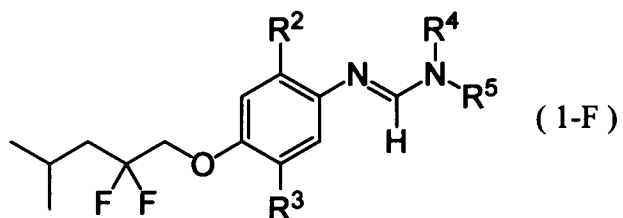
Table 20.

No.	R ²	R ³	R ⁴	R ⁵
369	methyl	methyl	cyclohexyl	cyclobutyl
370	methyl	methyl	cyclopentyl	cyclopentyl
371	methyl	methyl	cyclohexyl	cyclopentyl
372	methyl	methyl	cyclohexyl	cyclohexyl
373	methyl	ethyl	methyl	ethyl
374	methyl	propyl	methyl	ethyl
375	methyl	1-methylethyl	methyl	ethyl
376	ethyl	methyl	methyl	ethyl
377	ethyl	ethyl	methyl	ethyl
378	ethyl	propyl	methyl	ethyl
379	ethyl	1-methylethyl	methyl	ethyl
380	propyl	methyl	methyl	ethyl
381	propyl	ethyl	methyl	ethyl
382	propyl	propyl	methyl	ethyl
383	propyl	1-methylethyl	methyl	ethyl
384	1-methylethyl	methyl	methyl	ethyl
385	1-methylethyl	ethyl	methyl	ethyl
386	1-methylethyl	propyl	methyl	ethyl

Table 21.

No.	R ²	R ³	R ⁴	R ⁵
387	1-methylethyl	1-methylethyl	methyl	ethyl
388	methyl	methyl	methyl	methyl
389	methyl	ethyl	methyl	methyl
390	methyl	propyl	methyl	methyl
391	methyl	1-methylethyl	methyl	methyl
392	ethyl	methyl	methyl	methyl
393	ethyl	ethyl	methyl	methyl
394	ethyl	propyl	methyl	methyl
395	ethyl	1-methylethyl	methyl	methyl
396	propyl	methyl	methyl	methyl
397	propyl	ethyl	methyl	methyl
398	propyl	propyl	methyl	methyl
399	propyl	1-methylethyl	methyl	methyl
400	1-methylethyl	methyl	methyl	methyl
401	1-methylethyl	ethyl	methyl	methyl
402	1-methylethyl	propyl	methyl	methyl
403	1-methylethyl	1-methylethyl	methyl	methyl
404	methyl	methyl	ethyl	ethyl

A compound of the formula (1-F):



wherein R^2 , R^3 , R^4 and R^5 represent a combination shown in Tables 22-25:

5

Table 22.

No.	R^2	R^3	R^4	R^5
405	methyl	methyl	methyl	propyl
406	methyl	methyl	methyl	1-methylethyl
407	methyl	methyl	methyl	butyl

Tables 23.

No.	R ²	R ³	R ⁴	R ⁵
408	methyl	methyl	methyl	1-methylpropyl
409	methyl	methyl	methyl	2-methylpropyl
410	methyl	methyl	methyl	1,1-dimethylethyl
411	methyl	methyl	methyl	pentyl
412	methyl	methyl	methyl	1-methylpentyl
413	methyl	methyl	methyl	2-methylpentyl
414	methyl	methyl	methyl	3-methylpentyl
415	methyl	methyl	methyl	4-methylpentyl
416	methyl	methyl	methyl	hexyl
417	methyl	methyl	methyl	cyclopropyl
418	methyl	methyl	methyl	cyclobutyl
419	methyl	methyl	methyl	cyclopentyl
420	methyl	methyl	methyl	cyclohexyl
421	methyl	methyl	methyl	monofluoromethyl
422	methyl	methyl	methyl	difluoromethyl
423	methyl	methyl	methyl	trifluoromethyl
424	methyl	methyl	methyl	2,2,2-trifluoroethyl
425	methyl	methyl	methyl	3,3,3-trifluoropropyl
426	methyl	methyl	methyl	4,4,4-trifluorobutyl
427	methyl	methyl	methyl	5,5,5-trifluoropentyl
428	methyl	methyl	methyl	6,6,6-trifluorohexyl
429	methyl	methyl	monofluoromethyl	trifluoromethyl
430	methyl	methyl	difluoromethyl	trifluoromethyl
431	methyl	methyl	trifluoromethyl	trifluoromethyl
432	methyl	methyl	2,2,2-trifluoroethyl	trifluoromethyl

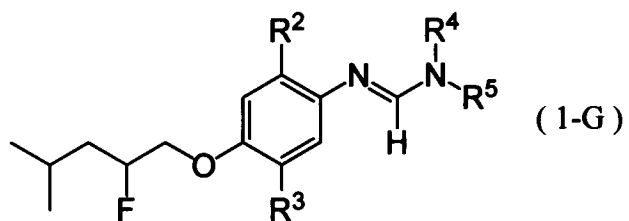
Table 24.

No.	R ²	R ³	R ⁴	R ⁵
433	methyl	methyl	3,3,3-trifluoropropyl	trifluoromethyl
434	methyl	methyl	4,4,4-trifluorobutyl	trifluoromethyl
435	methyl	methyl	5,5,5-trifluoropentyl	trifluoromethyl
436	methyl	methyl	6,6,6-trifluorohexyl	trifluoromethyl
437	methyl	methyl	cyclopropyl	trifluoromethyl
438	methyl	methyl	cyclobutyl	trifluoromethyl
439	methyl	methyl	cyclopentyl	trifluoromethyl
440	methyl	methyl	cyclohexyl	trifluoromethyl
441	methyl	methyl	cyclopropyl	cyclopropyl
442	methyl	methyl	cyclobutyl	cyclopropyl
443	methyl	methyl	cyclopentyl	cyclopropyl
444	methyl	methyl	cyclohexyl	cyclopropyl
445	methyl	methyl	cyclobutyl	cyclobutyl
446	methyl	methyl	cyclopentyl	cyclobutyl
447	methyl	methyl	cyclohexyl	cyclobutyl
448	methyl	methyl	cyclopentyl	cyclopentyl
449	methyl	methyl	cyclohexyl	cyclopentyl
450	methyl	methyl	cyclohexyl	cyclohexyl
451	methyl	ethyl	methyl	ethyl
452	methyl	propyl	methyl	ethyl
453	methyl	1-methylethyl	methyl	ethyl
454	ethyl	methyl	methyl	ethyl
455	ethyl	ethyl	methyl	ethyl

Table 25

No.	R ²	R ³	R ⁴	R ⁵
456	ethyl	propyl	methyl	ethyl
457	ethyl	1-methylethyl	methyl	ethyl
458	propyl	methyl	methyl	ethyl
459	propyl	ethyl	methyl	ethyl
460	propyl	propyl	methyl	ethyl
461	propyl	1-methylethyl	methyl	ethyl
462	1-methylethyl	methyl	methyl	ethyl
463	1-methylethyl	ethyl	methyl	ethyl
464	1-methylethyl	propyl	methyl	ethyl
465	1-methylethyl	1-methylethyl	methyl	ethyl
466	methyl	methyl	methyl	methyl
467	methyl	ethyl	methyl	methyl
468	methyl	propyl	methyl	methyl
469	methyl	1-methylethyl	methyl	methyl
470	ethyl	methyl	methyl	methyl
471	ethyl	ethyl	methyl	methyl
472	ethyl	propyl	methyl	methyl
473	ethyl	1-methylethyl	methyl	methyl
474	propyl	methyl	methyl	methyl
475	propyl	ethyl	methyl	methyl
476	propyl	propyl	methyl	methyl
477	propyl	1-methylethyl	methyl	methyl
478	1-methylethyl	methyl	methyl	methyl
479	1-methylethyl	ethyl	methyl	methyl
480	1-methylethyl	propyl	methyl	methyl
481	1-methylethyl	1-methylethyl	methyl	methyl
482	methyl	methyl	ethyl	ethyl

A compound of the formula (1-G):



wherein R², R³, R⁴ and R⁵ represent a combination shown in Tables 26-28:

Table 26.

No.	R ²	R ³	R ⁴	R ⁵
483	methyl	methyl	methyl	propyl
484	methyl	methyl	methyl	1-methylethyl
485	methyl	methyl	methyl	butyl
486	methyl	methyl	methyl	1-methylpropyl
487	methyl	methyl	methyl	2-methylpropyl
488	methyl	methyl	methyl	1,1-dimethylethyl
489	methyl	methyl	methyl	pentyl
490	methyl	methyl	methyl	1-methylpentyl
491	methyl	methyl	methyl	2-methylpentyl
492	methyl	methyl	methyl	3-methylpentyl
493	methyl	methyl	methyl	4-methylpentyl
494	methyl	methyl	methyl	hexyl
495	methyl	methyl	methyl	cyclopropyl
496	methyl	methyl	methyl	cyclobutyl
497	methyl	methyl	methyl	cyclopentyl
498	methyl	methyl	methyl	cyclohexyl
499	methyl	methyl	methyl	monofluoromethyl
500	methyl	methyl	methyl	difluoromethyl
501	methyl	methyl	methyl	trifluoromethyl
502	methyl	methyl	methyl	2,2,2-trifluoroethyl

Table 27.

No.	R ²	R ³	R ⁴	R ⁵
503	methyl	methyl	methyl	3,3,3-trifluoropropyl
504	methyl	methyl	methyl	4,4,4-trifluorobutyl
505	methyl	methyl	methyl	5,5,5-trifluoropentyl
506	methyl	methyl	methyl	6,6,6-trifluorohexyl
507	methyl	methyl	monofluoromethyl	trifluoromethyl
508	methyl	methyl	difluoromethyl	trifluoromethyl
509	methyl	methyl	trifluoromethyl	trifluoromethyl
510	methyl	methyl	2,2,2-trifluoroethyl	trifluoromethyl
511	methyl	methyl	3,3,3-trifluoropropyl	trifluoromethyl
512	methyl	methyl	4,4,4-trifluorobutyl	trifluoromethyl
513	methyl	methyl	5,5,5-trifluoropentyl	trifluoromethyl
514	methyl	methyl	6,6,6-trifluorohexyl	trifluoromethyl
515	methyl	methyl	cyclopropyl	trifluoromethyl
516	methyl	methyl	cyclobutyl	trifluoromethyl
517	methyl	methyl	cyclopentyl	trifluoromethyl
518	methyl	methyl	cyclohexyl	trifluoromethyl
519	methyl	methyl	cyclopropyl	cyclopropyl
520	methyl	methyl	cyclobutyl	cyclopropyl
521	methyl	methyl	cyclopentyl	cyclopropyl
522	methyl	methyl	cyclohexyl	cyclopropyl
523	methyl	methyl	cyclobutyl	cyclobutyl
524	methyl	methyl	cyclopentyl	cyclobutyl
525	methyl	methyl	cyclohexyl	cyclobutyl

Table 28.

No.	R ²	R ³	R ⁴	R ⁵
526	methyl	methyl	cyclopentyl	cyclopentyl
527	methyl	methyl	cyclohexyl	cyclopentyl
528	methyl	methyl	cyclohexyl	cyclohexyl
529	methyl	ethyl	methyl	ethyl
530	methyl	propyl	methyl	ethyl
531	methyl	1-methylethyl	methyl	ethyl
532	ethyl	methyl	methyl	ethyl
533	ethyl	ethyl	methyl	ethyl
534	ethyl	propyl	methyl	ethyl
535	ethyl	1-methylethyl	methyl	ethyl
536	propyl	methyl	methyl	ethyl
537	propyl	ethyl	methyl	ethyl
538	propyl	propyl	methyl	ethyl
539	propyl	1-methylethyl	methyl	ethyl
540	1-methylethyl	methyl	methyl	ethyl
541	1-methylethyl	ethyl	methyl	ethyl
542	1-methylethyl	propyl	methyl	ethyl
543	1-methylethyl	1-methylethyl	methyl	ethyl
544	methyl	methyl	methyl	methyl
545	methyl	ethyl	methyl	methyl
546	methyl	propyl	methyl	methyl
547	methyl	1-methylethyl	methyl	methyl
548	ethyl	methyl	methyl	methyl
549	ethyl	ethyl	methyl	methyl

Table 29.

No.	R ²	R ³	R ⁴	R ⁵
550	ethyl	propyl	methyl	methyl
551	ethyl	1-methylethyl	methyl	methyl
552	propyl	methyl	methyl	methyl
553	propyl	ethyl	methyl	methyl
554	propyl	propyl	methyl	methyl
555	propyl	1-methylethyl	methyl	methyl
556	1-methylethyl	methyl	methyl	methyl
557	1-methylethyl	ethyl	methyl	methyl
558	1-methylethyl	propyl	methyl	methyl
559	1-methylethyl	1-methylethyl	methyl	methyl
560	methyl	methyl	ethyl	ethyl

While the present controlling composition can be composed only of the present compound, it is usually used in a formulation form such as wettable powders, water dispersible granules, flowable concentrates, granules, dry flowable concentrates, emulsifiable concentrates, aqueous liquid formulations, oil formulations, smoking formulations, aerosols, microcapsules or the like, by mixing the present compound with a carrier (e.g., a solid, liquid or gaseous carrier), surfactants and auxiliary agents for formulation such as binders, dispersants and stabilizers. Such formulations usually contain the present compound in an amount of 0.1 to 99% by weight, preferably 0.2 to 90% by weight.

Examples of the solid carrier used for the formulation procedure include fine powders or particles of clays (e.g., kaolin, diatomaceous earth, synthetic hydrous silicon oxide fubasami clay, bentonite and acid clay), talc and other
5 inorganic minerals (e.g., sericite, quartz powder, sulfur powder, activated carbon, calcium carbonate and hydrated silica); and examples of the liquid carrier include such as water, alcohols (e.g., methanol and ethanol), ketones (e.g., acetone and methyl ethyl ketone), aromatic hydrocarbons
10 (e.g., benzene, toluene, xylene, ethylbenzene and methylnaphthalene), aliphatic or alicyclic hydrocarbons (e.g., n-hexane, cyclohexanone and kerosene), esters (e.g., ethyl acetate and butyl acetate), nitriles (e.g., acetonitrile and isobutyronitrile), ethers (e.g., dioxane
15 and diisopropyl ether), acid amides (e.g., dimethylformamide and dimethylacetoamide) and halogenated hydrocarbons (e.g., dichloroethane, trichloroethylene and carbon tetrachloride).

Examples of the surfactant include such as alkyl
20 sulfates, alkylsulfonates, alkylarylsulfonates, alkylaryl ethers and polyoxyethylenated products thereof, polyoxyethylene glycol ethers, polyhydric alcohol esters and sugar alcohol derivatives.

Examples of the other auxiliary agents for formulation
25 include such as binders and dispersants. Specific example

thereof include such as casein, gelatin, polysaccharides (e.g., starch, gum arabic, cellulose derivatives and alginic acid), lignin derivatives, bentonite, saccharides, synthetic water-soluble polymers (e.g., polyvinyl alcohols, polyvinylpyrrolidones and polyacrylic acids), PAP (acidic isopropyl phosphate), BHT (2,6-di-tert-butyl-4-methylphenol), BHA (a mixture of 2-tert-butyl-4-methoxyphenol and 3-tert-butyl-4-methoxyphenol), vegetable oils, mineral oils, and fatty acids and esters thereof.

Although there is no particular limitation on a method for applying the present controlling agent in order to control plant diseases, the method is exemplified by treatment of plants such as foliar application, treatment of planting sites such as soil treatment, and treatment of seeds such as seed disinfection.

The present controlling agent can also be used in a mixture form with other fungicides, insecticides, acaricides or nematocides. It is also possible to use the present controlling agent simultaneously with such other chemicals without mixing with them.

Examples of the fungicides used with the present controlling agent include as follows.

(1) Azole fungicides:

propiconazole, prothioconazole, triadimenol, prochloraz, penconazole, tebuconazole, flusilazole, diniconazole,

bromuconazole, epoxiconazole, difenoconazole cyproconazole,
metconazole, triflumizole, tetraconazole, microbutanil,
fenbuconazole, hexaconazole, fluquinconazole, triticonazole,
bitertanol, imazalil, flutriafol, simeconazole, ipconazole,
5 and the like;

(2) Amine fungicides:

fenpropimorph, tridemorph, fenpropidin, spiroxamine, and
the like;

(3) Benzimidazole fungicides:

10 carbendazim, benomyl, thiabendazole, thiophanate-methyl,
and the like;

(4) Dicarboxyimide fungicides:

procymidone, iprodione, vinclozolin, and the like;

(5) Anilino pyrimidine fungicides:

15 cyprodinil, pyrimethanil, mepanipyrim, and the like;

(6) Phenylpyrrole fungicides:

fenpiclonil, fludioxonil, and the like;

(7) Strobilurin fungicides:

kresoxim-methyl, azoxystrobin, trifloxystrobin,
20 fluoxastrobin, picoxystrobin, pyraclostrobin, dimoxystrobin,
pyribencarb, metominostrobin, orysastrobin, enestrobin, and
the like;

(8) Phenyl amide fungicides:

metalaxyl, metalaxyl-M or mefenoxam, benalaxyl, benalaxyl-M
25 or kiralaxyl, and the like;

(9) Carboxylic acid amide fungicides:

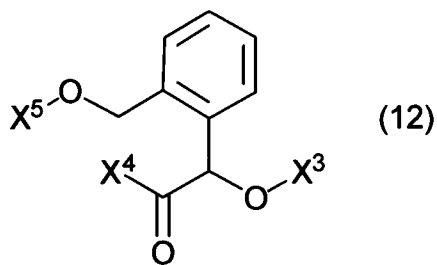
dimethomorph, iprovalicarb, benthiavalicarb-isopropyl,
mandipropamid, valiphenal;

(10) Carboxamide fungicides:

5 carboxin, mepronil, flutolanil, thifluzamide, furametpyr,
boscalid, penthiopyrad, fluopyram, bixafen, penflufen,
sedaxane, fluxapyroxad and isopyrazam;

(11) Other fungicides:

diethofencarb; thiuram; fluazinam; mancozeb;
10 chlorothalonil; captan; dichlofluanid; folpet; quinoxifen;
fenhexamid; famoxadone; fenamidone; zoxamide; ethaboxam;
amisulbrom; cyazofamid; metrafenone; cyflufenamid;
proquinazid; flusulfamide; fluopicolide; fosetyl;
cymoxanil; pencycuron; tolclofos-methyl; carpropamid;
15 diclocymet; fenoxanil; tricyclazole; pyroquilon;
probenazole; isotianil; tiadinil; tebufloquin; diclomezine;
kasugamycin; ferimzone; fthalide; validamycin;
hydroxyisoxazole; iminoctadine acetate; isoprothiolane;
oxolinic acid; oxytetracycline; streptomycin; basic copper
20 chloride; copper (II) hydroxide; basic copper sulfate;
organic copper; sulfur; ametoctradin; fenpyrazamine, and
the like;
an α -alkoxyphenylacetic acid compound represented by the
formula (12):



wherein X^3 represents a methyl group, a difluoromethyl group or an ethyl group; X^4 represents a methoxy group or a methylamino group; and X^5 represents a phenyl group, a 2-methylphenyl group or a 2,5-dimethylphenyl group.

Examples of the insecticides used with the present controlling agent include as follows.

(1) Organic phosphorus compounds:

acephate, Aluminium phosphide, butathiofos, cadusafos, chlorethoxyfos, chlorfenvinphos, chlorpyrifos, chlorpyrifos-methyl, cyanophos:CYAP, diazinon, DCIP(dichlorodiisopropyl ether), dichlofenthion:ECP, dichlorvos:DDVP, dimethoate, dimethylvinphos, disulfoton, EPN, ethion, ethoprophos, etrimfos, fenthion:MPP, fenitrothion:MEP, fosthiazate, formothion, Hydrogen phosphide, isofenphos, isoxathion, malathion, mesulfenfos, methidathion:DMTP, monocrotophos, naled:BRP, oxydeprofos:ESP, parathion, phosalone, phosmet:PMP, pirimiphos-methyl, pyridafenthion, quinalphos, phenthoate:PAP, profenofos, propaphos, prothiofos, pyraclorfos, salithion, sulprofos, tebupirimfos, temephos, tetrachlorvinphos, terbufos, thiometon, trichlorphon:DEP,

vamidothion, phorate, cadusafos, and the like;

(2) Carbamate compounds:

alanycarb, bendiocarb, benfuracarb, BPMC, carbaryl,
carbofuran, carbosulfan, cloethocarb, ethiofencarb,
5 fenobucarb, fenothiocarb, fenoxycarb, furathiocarb,
isoprocab:MIPC, metolcarb, methomyl, methiocarb, NAC,
oxamyl, pirimicarb, propoxur:PHC, XMC, thiodicarb,
xylylcarb, aldicarb, and the like;

(3) Synthetic pyrethroid compounds:

10 acrinathrin, allethrin, benfluthrin, beta-cyfluthrin,
bifenthrin, cycloprothrin, cyfluthrin, cyhalothrin,
cypermethrin, deltamethrin, esfenvalerate, ethofenprox,
fenpropathrin, fenvalerate, flucythrinate, flufenoprox,
flumethrin, fluvalinate, halfenprox, imiprothrin,
15 permethrin, prallethrin, pyrethrins, resmethrin, sigma-
cypermethrin, silafluofen, tefluthrin, tralomethrin,
transfluthrin, tetramethrin, phenothrin, cyphenothrin,
alpha-cypermethrin, zeta-cypermethrin, lambda-cyhalothrin,
furamethrin, tau-fluvalinate, 2,3,5,6-tetrafluoro-4-
20 (methoxymethyl)benzyl(EZ)-(1RS, 3RS;1RS, 3SR)-2,2-dimethyl-
3-prop-1-enylcyclopropanecarboxylate, 2,3,5,6-tetrafluoro-
4-methylbenzyl(EZ)-(1RS, 3RS;1RS, 3SR)-2,2-dimethyl-3-prop-
1-enylcyclopropanecarboxylate, 2,3,5,6-tetrafluoro-4-
(methoxymethyl)benzyl(1RS, 3RS;1RS, 3SR)-2,2-dimethyl-3-(2-
25 methyl-1-propenyl)cyclopropanecarboxylate, and the like;

(4) Nereistoxin compounds:

cartap, bensultap, thiocyclam, monosultap, bisultap,
and the like;

(5) Neonicotinoid compounds:

5 imidacloprid, nitenpyram, acetamiprid, thiamethoxam,
thiacloprid, dinotefuran, clothianidin, and the like;

(6) Benzoyl urea compounds:

chlorfluazuron, bistrifluron, diafenthiuron,
diflubenzuron, fluazuron, flucycloxuron, flufenoxuron,
10 hexaflumuron, lufenuron, novaluron, noviflumuron,
teflubenzuron, triflumuron, triazuron, and the like;

(7) Phenylpyrazole-based compounds:

acetoprole, ethiprole, fipronil, vaniliprole,
pyriprole, pyrafluprole, and the like;

15 (8) Bt toxin insecticides:

Living spores, produced crystalline toxins and the
mixtures thereof derived from *Bacillus thuringiensis*;

(9) Hydrazine compounds:

chromafenozide, halofenozide, methoxyfenozide,
20 tebufenozide, and the like;

(10) Organic chlorine compounds:

aldrin, dieldrin, dienochlor, endosulfan, methoxychlor,
and the like;

(11) Natural insecticides:

25 machine oil and nicotine-sulfate;

(12) Other insecticides:

avermectin-B, bromopropylate, buprofezin,
chlorphenapyr, cyromazine, D-D(1,3-Dichloropropene),
emamectin-benzoate, fenazaquin, flupyrzofos, hydroprene,
methoprene, indoxacarb, metoxadiazone, milbemycin-A,
pymetrozine, pyridalyl, pyriproxyfen, spinosad, sulfluramid,
tolfenpyrad, triazamate, flubendiamide, lepimectin, Arsenic
acid, benclonthiaz, Calcium cyanamide, Calcium polysulfide,
chlordane, DDT, DSP, flufenerim, flonicamid, flurimfen,
formetanate, metam-ammonium, metam-sodium, Methyl bromide,
nidinotefuran, Potassium oleate, protrifenbute,
spiromesifen, Sulfur, metaflumizone, spirotetramat,
pyrifluquinazone, spinetoram, chlorantraniliprole and
cyantrannileprole.

Examples of the acaricides (acaricidal active
ingredients) used with the present controlling agent
include such as acequinocyl, amitraz, benzoximate,
bifenazate, bromopropylate, chinomethionate,
chlorobenzilate, CPCBS(chlorfenson), clofentezine,
cyflumetofen, dicofol, etoxazole, fenbutatin oxide,
fenothiocarb, fenpyroximate, fluacrypyrim, fluproxyfen,
hexythiazox, propargite:BPPS, polynactins, pyridaben,
Pyrimidifen, tebufenpyrad, tetradifon, spiroidiclofen,
spiromesifen, spirotetramat, amidoflumet and cyenopyrafen.

Examples of the acaricides (acaricidal active ingredients) used with the present controlling agent include such as acequinocyl, amitraz, benzoximate, bifenazate, bromopropylate, chinomethionate, chlorobenzilate, CPCBS(chlorfenson), clofentezine, cyflumetofen, dicofol, etoxazole, fenbutatin oxide, fenothiocarb, fenpyroximate, fluacrypyrim, fluproxyfen, hexythiazox, propargite:BPPS, polynactins, pyridaben, Pyrimidifen, tebufenpyrad, tetradifon, spiroidiclofen, spiromesifen, spirotetramat, amidoflumet and cyenopyrafen.

Examples of the nematocides (nematocidal active ingredients) used with the present controlling agent include such as DCIP, fosthiazate, levamisol, methyisothiocyanate, morantel tartarate and imicyafos.

Although the applying dosage of the present controlling agent is varied depending on weather conditions, formulation forms, when, how and where the present controlling agent is applied, target diseases, target crops and the like, it is usually 1 to 500 g, preferably 2 to 200g, per 1000m² in terms of the present compound in the present controlling agent. When the present controlling agent takes a form of emulsifiers, wettable powders, suspensions or the like, it is usually applied after diluted with water. In this case, the concentration of the present compound after dilution is usually 0.0005 to 2% by

weight, preferably 0.005 to 1% by weight. When the present
controlling agent takes a form of powders, granules or the
like, it is applied as it is without dilution. In an
application to seeds, the applying dosage is usually in a
5 range from 0.001 to 100 g, preferably 0.01 to 50 g, per
kilogram of seed in terms of the present compound in the
present controlling agent.

The present controlling agent can be used as a
controlling composition for plant diseases in crop lands
10 such as upland field, paddy field, lawn and turf, orchard
and the like. The present controlling agent is able to
control plant diseases in the crop lands or the like where
the following "crops" and the like are cultivated.

Field crops: corn, rice, wheat, barley, rye, oat,
15 sorghum, cotton, soybean, peanut, buckwheat, sugar beet,
rape, sunflower, sugarcane, tobacco, etc.

Vegetables: solanaceae (e.g. eggplant, tomato, green
pepper, chili pepper and potato), Cucurbitaceae (e.g.
cucumber, pumpkin, zucchini, watermelon and melon),
20 Cruciferae (e.g. Japanese radish, turnip, horseradish,
kohlrabi, Chinese cabbage, cabbage, leaf mustard, broccoli
and cauliflower), Compositae (e.g. edible burdock, garland
chrysanthemum, globe artichoke and lettuce), Liliaceae
(e.g., Welsh onion, onion, garlic and asparagus),
25 Umbelliferae (e.g. carrot, parsley, celery and parsnip),

Chenopodiaceae (e.g. spinach and chard), Lamiaceae (e.g. perilla, mint and basil), strawberry, sweet potato, Chinese yam, taro, jatropha, etc.

Flowers and ornament plants.

5 Ornamental foliage plants.

Fruit trees: pomaceous fruits (e.g. apple, pear, Japanese pear, Chinese quince and quince), stone fruits (e.g. peach, plum, nectarine, Japanese apricot, yellow peach, apricot and prune), citrus fruits (e.g. satsuma
10 mandarin, orange, lemon, lime and grapefruit), nut trees (e.g. chestnut, walnut, hazel, almond, pistachio, cashew nut and macadamia nut), berries (blueberry, cranberry, blackberry and raspberry), grape, Japanese persimmon, olive, loquat, banana, coffee, date palm, coconut, etc.

15 Trees other than fruit trees: tea, mulberry, flowering trees and shrubs, street trees (e.g. Japanese ash, birch, flowering dogwood, blue gum, ginkgo, lilac, maple, oak, poplar, Chinese redbud, Formosa sweet gum, plane tree, zelkova, Japanese arborvitae, fir, Japanese hemlock, needle
20 juniper, pine, Japanese spruce and Japanese yew), etc.

The above-mentioned "crops" also include those imparted with resistance to herbicides, such as HPPD inhibitors (e.g., isoxaflutole), ALS inhibitors (e.g., imazethapyr and thifensulfuron-methyl), EPSP synthetase
25 inhibitors, glutamine synthetase inhibitors, bromoxynil and

dicamba, by way of a classic breeding method or genetic recombination technology.

Examples of the "crops" imparted with resistance by the classic breeding method include Clearfield® canola resistant to imidazolinone-based herbicides (e.g., imazethapyr), STS soybean resistant to sulfonylurea-based ALS inhibition type herbicides such as thifensulfuron-methyl, or the like. Further, examples of the crops imparted with resistance by the genetic recombination technology include corn cultivars resistant to glyphosate and gluphosinate, which have been already on the market under the trade name of RoundupReady®, RoundupReady 2® and LibertyLink®.

The above-mentioned "crops" also include plants in which the genetic recombination technology has enabled to synthesize, for example, a selective toxin known as genus *Bacillus*.

Examples of toxins produced in such genetically modified plants include insecticidal proteins derived from *Bacillus cereus* and *Bacillus popilliae*; insecticidal proteins such as δ -endotoxins (e.g. Cry1Ab, Cry1Ac, Cry1F, Cry1Fa2, Cry2Ab, Cry3A, Cry3Bb1 and Cry9C), VIP1, VIP2, VIP3 and VIP3A, which are derived from *Bacillus thuringiensis*; toxins derived from nematodes; toxins produced by animals, such as scorpion toxin, spider toxin,

bee toxin and insect-specific neurotoxins; filamentous
fungi toxins; plant lectins; agglutinin; protease
inhibitors such as trypsin inhibitors, serine protease
inhibitor, patatin, cystatin and papain inhibitors;
5 ribosome-inactivating proteins (RIP) such as ricin, corn-
RIP, abrin, rufin, sapolin and priodin; steroid metabolic
enzymes such as 3-hydroxysteroid oxidase, ecdysteroid-UDP-
glucosyltransferase and cholesterol oxidase; ecdysone
inhibitors; HMG-CoA reductase; ion channel inhibitors such
10 as a sodium channel inhibitors and calcium channel
inhibitors; juvenile hormone esterase; diuretic hormone
acceptors; stilbene synthetase; bibenzyl synthetase;
chitinase; and glucanase.

The toxins produced in such genetically modified crops
15 also include hybrid toxins, partially deficient toxins and
modified toxins of insecticidal proteins, such as δ -
endotoxin proteins (e.g. Cry1Ab, Cry1Ac, Cry1F, Cry1Fa2,
Cry2Ab, Cry3A, Cry3Bb1 and Cry9C), VIP1, VIP2, VIP3 and
VIP3A. The hybrid toxins are produced by a novel
20 combination of the different domains of such a protein by
adopting recombination technology. The known partially
deficient toxin is Cry1Ab, in which a part of amino acid
sequence is deficient. In the modified toxins, one or a
plurality of amino acids of a natural toxin are replaced.

25 Examples of such toxins and genetically modified

plants capable of synthesizing such toxins are described in EP-A-0 374 753, WO 93/07278, WO 95/34656, EP-A-0 427 529, EP-A-451 878, WO 03/052073, etc.

The toxins contained in such genetically modified plants impart resistance to insect pests of Coleoptera, insect pests of Diptera and insect pests of Lepidoptera to the plants.

Further, it has already been known that there are genetically modified plants containing one or a plurality of insecticidal pest-resistant genes and capable of producing one or a plurality of toxins. Some of them are commercially available. Examples of such genetically modified plants include such as YieldGard® (a corn cultivar capable of producing a Cry1Ab toxin), YieldGard Rootworm® (a corn cultivar capable of producing a Cry3Bb1 toxin), YieldGard Plus® (a corn cultivar capable of producing Cry1Ab and Cry3Bb1 toxins), Herculex I® (a corn cultivar capable of producing phosphinotrysin N-acetyltransferase (PAT) for imparting resistance to a Cry1Fa2 toxin and Glufosinate), NuCOTN33B (a cotton cultivar capable of producing a Cry1Ac toxin), Bollgard I® (a cotton cultivar capable of producing a Cry1Ac toxin), Bollgard II® (a cotton cultivar capable of producing Cry1Ab and Cry2Ab toxins), VIPCOT® (a cotton cultivar capable of producing a VIP toxin), NewLeaf® (a potato cultivar capable of

producing a Cry3A toxin), NatureGard® Agrisure® GT Advantage (GA21 Glyphosate resistant trait), Agrisure® CB Advantage (Bt11 corn borer (CB) trait), and Protecta®.

The above-mentioned "crops" also include those
5 imparted with an ability of producing an anti-pathogenic substance having selective action, by way of genetic recombination technology.

As examples of the anti-pathogenic substance, PR proteins and the like are known (PRPs, EP-A-0 392 225).

10 Such anti-pathogenic substances and genetically modified plants capable of producing them are described in EP-A-0 392 225, WO 95/33818, EP-A-0 353 191, etc.

Examples of such anti-pathogenic substances produced by the genetically modified plants include ion channel
15 inhibitors, such as sodium channel inhibitors and calcium channel inhibitors (for example, KP1, KP4 and KP6 toxins produced by viruses are known); stilbene synthases; bibenzyl synthases; chitinase; glucanase; PR proteins; and anti-pathogenic substances produced by microorganisms, such
20 as peptide antibiotics, antibiotics having a heterocyclic ring and protein factors involved in plant disease resistance (which are called as plant-disease-resistant genes and are described in WO 03/000906), etc.

Examples of plant diseases controllable by the present
25 invention include such as fungal diseases. More

specifically, the following plant diseases are listed, but the diseases are not limited thereto.

The present controlling method is usually practiced in the method, wherein the present controlling agent is applied in the above-mentioned manner.

Blast (*Magnaporthe grisea*), Brown spot (*Cochliobolus miyabeanus*), sheath blight (*Rhizoctonia solani*) and "Bakanae" disease (*Gibberella fujikuroi*) of rice;

powdery mildew (*Erysiphe graminis*), scab (*Fusarium graminearum*, *F. avenacerum*, *F. culmorum*, *Microdochium nivale*), rust (*Puccinia striiformis*, *P. graminis*, *P. recondita*), Snow mold (*Micronectriella nivale*), Typhula snow blight (*Typhula* sp.), loose smut (*Ustilago tritici*), bunt (*Tilletia caries*), eyespot (*Pseudocercosporella herpotrichoides*), leaf blotch (*Septoria tritici*), glume blotch (*Stagonospora nodorum*) and tan spot (*Pyrenophora tritici-repentis*) of wheat;

powdery mildew (*Erysiphe graminis*), scab (*Fusarium graminearum*, *F. avenacerum*, *F. culmorum*, *Microdochium nivale*), rust (*Puccinia striiformis*, *P. graminis*, *P. hordei*), loose smut (*Ustilago nuda*), scald (*Rhynchosporium secalis*), net blotch (*Pyrenophora teres*), spot blotch (*Cochliobolus sativus*), leaf stripe (*Pyrenophora graminea*) and seedling damping-off by *Rhizoctonia* genus (*Rhizoctonia solani*) of barley;

melanose (*Diaporthe citri*), scab (*Elsinoe fawcetti*) and *Penicillium* rot (*Penicillium digitatum*, *P. italicum*) of citrus;

blossom blight (*Monilinia mali*), canker (*Valsa ceratosperma*), powdery mildew (*Podosphaera leucotricha*), *Alternaria* leaf spot (*Alternaria alternata* apple pathotype), scab (*Venturia inaequalis*) and anthracnose (*Glomerella cingulata*) of apple;

scab (*Venturia nashicola*, *V. pirina*), black spot (*Alternaria alternata* Japanese pear pathotype) and rust (*Gymnosporangium haraeaeum*) of pear;

brown rot (*Monilinia fructicola*), scab (*Cladosporium carpophilum*) and *Phomopsis* rot (*Phomopsis* sp.) of peach;

anthracnose (*Elsinoe ampelina*), ripe rot (*Glomerella cingulata*), powdery mildew (*Uncinula necator*), rust (*Phakopsora ampelopsidis*), black rot (*Guignardia bidwellii*) and downy mildew (*Plasmopara viticola*) of grape;

anthracnose (*Gloeosporium kaki*) and leaf spot (*Cercospora kaki*, *Mycosphaerella nawae*) of Japanese persimmon;

anthracnose (*Colletotrichum lagenarium*), powdery mildew (*Sphaerotheca fuliginea*), gummy stem blight (*Mycosphaerella melonis*), stem rot (*Fusarium oxysporum*), downy mildew (*Pseudoperonospora cubensis*), *Phytophthora* rot (*Phytophthora* sp.) and seedling blight (*Pythium* sp.) of

melons and cucumber;

early blight (*Alternaria solani*), leaf mold
(*Cladosporium fulvum*) and leaf blight (*Phytophthora*
infestans) of tomato;

5 brown spot (*Phomopsis vexans*) and powdery mildew
(*Erysiphe cichoracearum*) of eggplant;

Alternaria leaf spot (*Alternaria japonica*), white spot
(*Cercospora brassicae*), clubroot (*Plasmodiophora*
brassicae) and downy mildew (*peronospora parasitica*) of
10 vegetables of Crusiferae;

Welsh onion rust (*Puccinia allii*);

purple stain (*Cercospora kikuchii*), *Sphaceloma scab*
(*Elsinoe glycines*), pod and stem blight (*Diaporthe*
phaseolorum var. *sojae*) and rust (*Phakopsora pachyrhizi*) of
15 soybean;

kidney bean anthracnose (*Colletotrichum*
lindemthianum);

leaf spot (*Cercospora personata*), leaf spot
(*Cercospora arachidicola*) and southern blight (*Sclerotium*
20 *rolfsii*) of peanut;

pea powdery mildew (*Erysiphe pisi*);

early blight (*Alternaria solani*), late blight
(*Phytophthora infestans*) and *Verticillium* wilt
(*Verticillium albo-atrum*, *V. dahliae*, *V. nigrescens*) of
25 potato;

strawberry powdery mildew (*Sphaerotheca humuli*);
net blister blight (*Exobasidium reticulatum*);
white scab (*Elsinoe leucospila*), zonate leaf spot
(*Pestalotiopsis* sp.) and anthracnose (*Colletotrichum theae-*
5 *sinensis*) of tea plant;

brown spot (*Alternaria longipes*), powdery mildew
(*Erysiphe cichoracearum*), anthracnose (*Colletotrichum*
tabacum), downy mildew (*Peronospora tabacina*) and
Phytophthora rot (*Phytophthora nicotianae*) of tobacco;

10 leaf spot (*Cercospora beticola*), foliage blight
(*Thanatephorus cucumeris*), root rot (*Thanatephorus*
cucumeris) and black root rot (*Aphanomyces cochlioides*) of
beet;

black spot (*Diplocarpon rosae*) and powdery mildew
15 (*Sphaerotheca pannosa*) of rose;

leaf blight (*Septoria chrysanthemi-indici*) and white
rust (*Puccinia horiana*) of chrysanthemum;

Botrytis diseases (*Botrytis cinerea*, *B. byssoidea*, *B.*
squamosa), gray mold neck rot (*Botrytis alli*) and Small
20 sclerotial neck rot (*Botrytis squamosa*) of onion;

gray mold (*Botrytis cinerea*) and stem rot (*Sclerotinia*
sclerotiorum) of various crops;

Alternaria leaf spot (*Alternaria brassicicola*) of
Japanese radish;

25 dollar spot (*Sclerotinia homeocarpa*), brown patch and large

patch (*Rhizoctonia solani*) of turf grass; and

Sigatoka diseases (*Mycosphaerella fijiensis*,
Mycosphaerella musicola, *Pseudocercospora musae*) of banana.

Examples

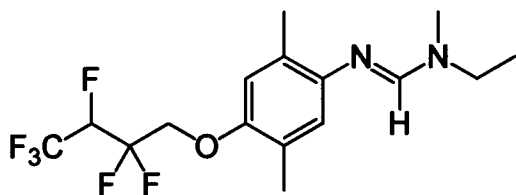
5 The present invention will be explained in more detail
by way of Preparation Examples, Formulation Examples and
Test Examples, which should not be construed as limiting
the present invention. All the "parts" are by weight.

Preparation Example 1 of the present compound

10 To 40 ml of chloroform, 5.6 g of 2,2,3,4,4,4-
hexafluorobutanol was added at room temperature, and to the
mixture, 3.0 ml of pyridine and 6.2 ml of
trifluoromethanesulfonic anhydride were added at 0°C, and
the mixture was stirred at room temperature for 1 hour and
15 30 minutes. To the reaction mixture, 1N of hydrochloric
acid was added, and extracted with diethyl ether. The
organic layer was washed successively with an aqueous
saturated sodium hydrogen carbonate and saturated brine,
and dried over magnesium sulfate, and concentrated under
20 reduced pressure. The resultant residue gave 4.15 g of
crude of 2,2,3,4,4,4-hexafluorobutyl
trifluoromethanesulfonate.

To 10 ml of DMF, 0.50 g of N-ethyl-N'-(4-hydroxy-2,5-
dimethylphenyl)-N-methylformamidine was added at room
25 temperature, then, to the mixture, 0.11 g of 60% sodium

hydride (oil dispersion) was added, and the mixture was stirred at room temperature for 20 minutes. Then, to the mixture, 0.92 g of crude of 2,2,3,4,4,4-hexafluorobutyl trifluoromethanesulfonate obtained above was added at room
5 temperature, and the mixture was stirred at room temperature for 2 hours and 30 minutes. To the reaction mixture, an aqueous saturated ammonium chloride solution was added, and extract with ethyl acetate. The organic layer was washed with saturated brine, then dried over
10 sodium sulfate, and concentrated under reduced pressure. The resultant residue was subjected to silica gel column chromatography to obtain 0.5 g of the formula:



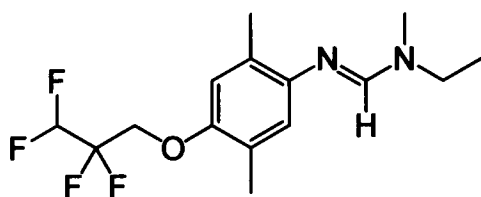
(hereinafter referred to as "the present compound 1").

15 $^1\text{H-NMR}$ (CDCl_3) δ : 1.20 (3H, t, $J = 7.2$ Hz), 2.17 (3H, s), 2.23 (3H, s), 2.98 (3H, s), 3.35 (2H, br s), 4.18–4.38 (2H, m), 5.11–5.28 (1H, m), 6.56 (1H, s), 6.63 (1H, s), 7.38 (1H, s).

Preparation Example 2 of the present compound

20 To 3 ml of DMF, 0.20 g of N-ethyl-N'-(4-hydroxy-2,5-dimethylphenyl)-N-methylformamidine was added at room temperature, then, to the mixture, 0.26 g of 2,2,3,3-tetrafluoropropyl trifluoromethanesulfonate and 0.11 g of

60% sodium hydride (oil dispersion) were added successively at room temperature, and the mixture was stirred overnight. To the reaction mixture, an aqueous saturated ammonium chloride solution was added, and extracted with ethyl acetate. The organic layer was washed with saturated brine, then dried over sodium sulfate, and concentrated under reduced pressure. The resultant residue was subjected to silica gel column chromatography to obtain 0.20 g of the formula:



(hereinafter referred to as "the present compound 2").

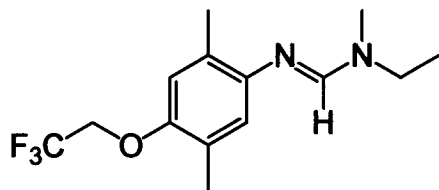
$^1\text{H-NMR}$ (CDCl_3) δ : 1.20 (3H, t, $J = 7.1$ Hz), 2.16 (3H, s), 2.23 (3H, s), 2.98 (3H, s), 3.35 (2H, br s), 4.28 (2H, t, $J = 11.8$ Hz), 6.08 (1H, tt, $J = 53.0, 5.2$ Hz), 6.56 (1H, s), 6.62 (1H, s), 7.38 (1H, s).

Preparation Example 3 of the present compound

To 20 ml of diethyl ether, 0.70 g of 2,2,2-trifluoroethanol was added at room temperature and to the mixture, 1.4 ml of trifluoromethanesulfonic anhydride and 1.0 ml of triethylamine were added at -50°C , and the mixture was stirred at 0°C for 30 minutes. To the reaction mixture, 1N hydrochloric acid was added, and extracted with diethyl ether. The organic layer was washed successively

with an aqueous saturated sodium hydrogen carbonate solution and saturated brine, then dried over magnesium sulfate, and concentrated under reduced pressure. The resultant residue gave crude of 0.46 g of 2,2,2-trifluoroethyl trifluoromethanesulfonate.

To the 4 ml of DMF, 0.22 g of N-ethyl-N'-(4-hydroxy-2,5-dimethylphenyl)-N-methylformamidine was added at room temperature, and to the mixture, 0.047 g of 60% sodium hydride (oil dispersion) was added at room temperature, and the mixture was stirred at room temperature for 15 minutes. Then, to the mixture, 0.30 g of crude of 2,2,2-trifluoroethyl trifluoromethanesulfonate obtained above was added at room temperature, and stirred at room temperature for 2 hours. To the reaction mixture, an aqueous saturated ammonium chloridesolution was added, and extracted with ethyl acetate. The organic layer was washed with saturated brine, then dried over sodium sulfate, and concentrated under reduced pressure. The resultant residue was subjected to silica gel column chromatography to obtain 0.15 g of formula:



(hereinafter referred to as "the present compound 3").

$^1\text{H-NMR}$ (CDCl_3) δ : 1.20 (3H, t, $J = 7.2$ Hz), 2.19 (3H, s),

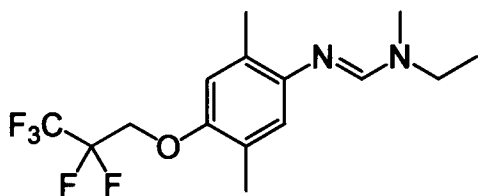
2.22 (3H, s), 2.98 (3H, s), 3.35 (2H, br s), 4.29 (2H, q, J = 8.3 Hz), 6.56 (1H, s), 6.62 (1H, s), 7.39 (1H, s).

Preparation Example 4 of the present compound

To 40 ml of diethyl ether, 1.5 g of 2,2,3,3,3-pentafluoropropanol was added at room temperature. To the
5 mixture, 2.0 ml of trifluoromethanesulfonic anhydride and 1.5 ml of triethylamine were successively added at -50°C , and the mixture was stirred at 0°C for 20 minutes. To the reaction mixture, 1N hydrochloric acid was added, and
10 extracted with diethyl ether. The organic layer was washed successively with an aqueous saturated sodium hydrogen carbonate solution and saturated brine, then dried over magnesium sulfate, and concentrated under reduced pressure. The resultant residue gave crude of 2,2,3,3,3-
15 pentafluoropropyl trifluoromethanesulfonate.

To 10 ml of DMF, 0.53 g of N-ethyl-N'-(4-hydroxy-2,5-dimethylphenyl)-N-methylformamidine was added at room temperature, and to the mixture, 0.15 g of 60% sodium hydride (oil dispersion) was added at room temperature,
20 then the mixture was stirred at room temperature for 20 minutes. Then to the mixture, whole amount of crude of 2,2,3,3,3-pentafluoropropyl trifluoromethanesulfonate obtained above was added at room temperature, and stirred at room temperature for 30 minutes. To the reaction
25 mixture, an aqueous saturated ammonium chloride solution

was added, and extracted with ethyl acetate. The organic layer was washed with saturated brine, then dried over sodium sulfate, and concentrated under reduced pressure. The resultant residue was subjected to silica gel column chromatography to obtain 0.094 g of formula:



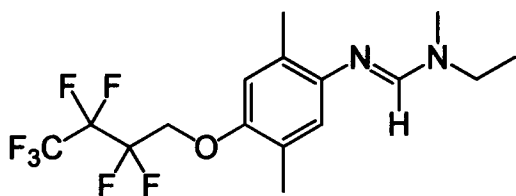
(hereinafter referred to as "the present compound 4").

$^1\text{H-NMR}$ (CDCl_3) δ : 1.20 (3H, t, $J = 7.2$ Hz), 2.17 (3H, s), 2.23 (3H, s), 2.98 (3H, s), 3.34 (2H, br s), 4.34–4.37 (2H, m), 6.56 (1H, s), 6.60 (1H, s), 7.38 (1H, s).

Preparation Example 5 of the present compound

To 30 ml of diethyl ether, 1.6 g of 2,2,3,3,4,4,4-heptafluorobutanol was added at room temperature, and to the mixture, 1.6 ml of trifluoromethanesulfonic anhydride and 1.1 ml of triethylamine were successively added at -50°C , and the mixture was stirred at 0°C for 30 minutes. To the reaction mixture, 1N hydrochloric acid was added, and extracted with diethyl ether. The organic layer was washed successively with saturated aqueous sodium hydrogen carbonate and saturated brine, then dried over magnesium sulfate, and concentrated under reduced pressure. The resultant residue gave a crude of 2,2,3,3,4,4,4-heptafluorobutyl trifluoromethanesulfonate.

To 10 ml of DMF, 0.48 g of N-ethyl-N'-(4-hydroxy-2,5-dimethylphenyl)-N-methylformamidine was added at room temperature, and to the mixture, 0.14 g of 60% sodium hydride (oil dispersion) was added at room temperature, then the mixture was stirred at room temperature for 20 minutes. To the mixture, whole amount of crude of 2,2,3,3,4,4,4-heptafluorobutyl trifluoromethanesulfonate obtained above was added at room temperature, and stirred at room temperature for 20 minutes. To the reaction mixture, an aqueous saturated ammonium chloride solution was added, and extracted with ethyl acetate. The organic layer was washed with saturated brine, then dried over sodium sulfate, and concentrated under reduced pressure. The resultant residue was subjected to silica gel column chromatography to obtain 0.059 g of formula:



(hereinafter referred to as "the present compound 5").

$^1\text{H-NMR}$ (CDCl_3) δ : 1.20 (3H, t, $J = 7.2$ Hz), 2.17 (3H, s), 2.23 (3H, s), 2.98 (3H, s), 3.35 (2H, br s), 4.39 (2H, t, $J = 12.9$ Hz), 6.56 (1H, s), 6.61 (1H, s), 7.38 (1H, s).

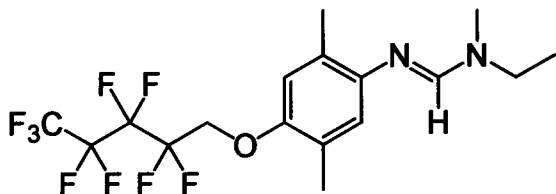
Preparation Example 6 of the present compound

To 25 ml of diethyl ether, 1.5 g of 2,2,3,3,4,4,5,5,5-nonafluoropentanol was added at room temperature, and to

the mixture, 1.2 ml of trifluoromethanesulfonic anhydride and 0.89 ml of triethylamine were successively added at -50°C, and the mixture was stirred at 0°C for 20 minutes. To the reaction mixture, 1N hydrochloric acid was added, and extracted with diethyl ether. The organic layer was washed successively with an aqueous saturated sodium hydrogen carbonate solution and saturated brine, then dried over magnesium sulfate, and concentrated under reduced pressure. The resultant residue gave a crude of 2,2,3,3,4,4,5,5,5-nonafluoropentyl trifluoromethanesulfonate.

To 3 ml of DMF, 0.20 g of N-ethyl-N'-(4-hydroxy-2,5-dimethylphenyl)-N-methylformamidine was added at room temperature, and to the mixture, 0.043 g of 60% sodium hydride (oil dispersion) was added at room temperature, then the mixture was stirred at room temperature for 15 minutes. To the mixture, whole amount of crude of 2,2,3,3,4,4,5,5,5-nonafluoropentyl trifluoromethanesulfonate obtained above was added at room temperature, and stirred at room temperature for 1 hour. To the reaction mixture, an aqueous saturated ammonium chloride solution was added, and extracted with ethyl acetate. The organic layer was washed with saturated brine, then dried over sodium sulfate, and concentrated under reduced pressure. The resultant residue was subjected to

silica gel column chromatography to obtain 0.045 g of formula:



(hereinafter referred to as "the present compound 6").

5 ¹H-NMR (CDCl₃) δ: 1.20 (3H, t, J = 7.2 Hz), 2.17 (3H, s), 2.23 (3H, s), 2.98 (3H, s), 3.35 (2H, br s), 4.40 (2H, t, J = 12.9 Hz), 6.57 (1H, s), 6.61 (1H, s), 7.38 (1H, s).

Preparation Example 7 of the present compound

To 20 ml of diethyl ether, 1.9 g of
10 2,2,3,3,4,4,5,5,6,6,6-undecafluorohexanol was added at room temperature, and to the mixture, 1.2 ml of trifluoromethanesulfonic anhydride and 0.91 ml of triethylamine were successively added at -50°C, and the mixture was stirred at 0°C for 30 minutes. To the reaction
15 mixture, 1N hydrochloric acid was added, and extracted with diethyl ether. The organic layer was washed successively with an aqueous saturated sodium hydrogen carbonate solution and saturated brine, then dried over magnesium sulfate, and concentrated under reduced pressure. The
20 resultant residue gave a crude of 2,2,3,3,4,4,5,5,6,6,6-undecafluorohexyl trifluoromethanesulfonate.

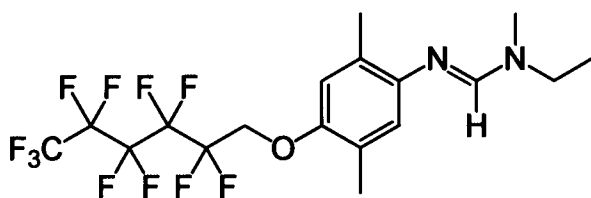
To 3 ml of DMF, 0.20 g of N-ethyl-N'-(4-hydroxy-2,5-dimethylphenyl)-N-methylformamidine was added at room

temperature, and to the mixture, 0.078 g of 60% sodium hydride (oil dispersion) was added at room temperature, then, the mixture was stirred at room temperature for 30 minutes. To the mixture, whole amount of crude of
5 2,2,3,3,4,4,5,5,6,6,6-undecafluorohexyl

trifluoromethanesulfonate obtained above was added at room temperature, and stirred at room temperature for 2 hours.

To the reaction mixture, an aqueous saturated ammonium chloride solution was added, and extracted with ethyl

10 acetate. The organic layer was washed with saturated brine, then dried over sodium sulfate, and concentrated under reduced pressure. The resultant residue was subjected to silica gel column chromatography to obtain 0.083 g of formula:



(hereinafter referred to as "the present compound 7").

^1H -NMR (CDCl_3) δ : 1.20 (3H, t, $J = 7.2$ Hz), 2.18 (3H, s), 2.23 (3H, s), 2.98 (3H, s), 3.35 (2H, br s), 4.40 (2H, t, $J = 12.9$ Hz), 6.56 (1H, s), 6.61 (1H, s), 7.38 (1H, s).

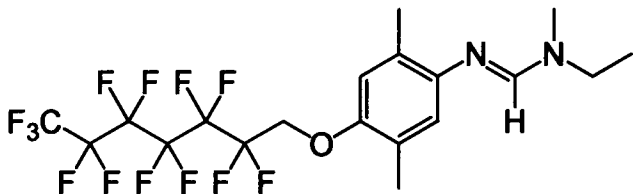
20 Preparation Example 8 of the present compound

To 20 ml of diethyl ether, 2.1 g of 2,2,3,3,4,4,5,5,6,6,7,7,7-tridecafluoroheptanol was added at room temperature. To the mixture, 1.2 ml of

trifluoromethanesulfonic anhydride and 0.89 ml of triethylamine were successively added at -50°C, and the mixture was stirred at 0°C for 20 minutes. To the reaction mixture, 1N hydrochloric acid was added, and extracted with diethyl ether. The organic layer was washed successively with an aqueous saturated sodium hydrogen carbonate solution and saturated brine, then dried over magnesium sulfate, and concentrated under reduced pressure. The resultant residue gave crude of 2,2,3,3,4,4,5,5,6,6,7,7,7-tridecafluoroheptyl trifluoromethanesulfonate.

To the 3 ml of DMF, 0.20 g of N-ethyl-N'-(4-hydroxy-2,5-dimethylphenyl)-N-methylformamidine was added at room temperature, and to the mixture, 0.078 g of 60% sodium hydride (oil dispersion) was added, then the mixture was stirred at room temperature for 30 minutes. Then to the mixture, whole amount of crude of 2,2,3,3,4,4,5,5,6,6,7,7,7-tridecafluoroheptyl trifluoromethanesulfonate obtained above was added at room temperature, and stirred at room temperature for 2 hours. To the reaction mixture, an aqueous saturated ammonium chloride solution was added, and extracted with ethyl acetate. The organic layer was washed with saturated brine, then dried over sodium sulfate, and concentrated under reduced pressure. The resultant residue was subjected to silica gel column chromatography to obtain 0.065 g of

formula:



(hereinafter referred to as "the present compound 8").

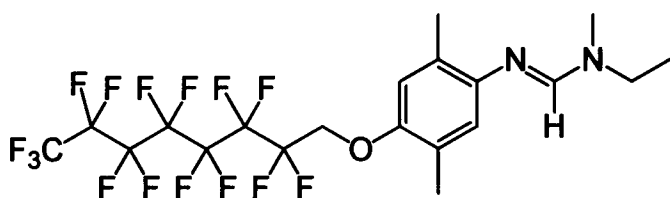
^1H -NMR (CDCl_3) δ : 1.20 (3H, t, $J = 7.2$ Hz), 2.17 (3H, s),
 5 2.23 (3H, s), 2.98 (3H, s), 3.35 (2H, br s), 4.40 (2H, t, J
 = 12.9 Hz), 6.57 (1H, s), 6.61 (1H, s), 7.38 (1H, s).

Preparation Example 9 of the present compound

To 30 ml of diethyl ether, 2.5 g of
 2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-pentadecafluorooctanol was
 10 added at room temperature, and to the mixture, 1.3 ml of
 trifluoromethanesulfonic anhydride and 0.92 ml of
 triethylamine were successively added at -50°C , and the
 mixture was stirred at 0°C for 20 minutes. To the reaction
 mixture, 1N hydrochloric acid was added, and extracted with
 15 diethyl ether. The organic layer was washed successively
 with an aqueous saturated sodium hydrogen carbonate
 solution and saturated brine, then dried over magnesium
 sulfate, and concentrated under reduced pressure. The
 resultant residue gave crude of
 20 2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-pentadefluorooctyl
 trifluoromethanesulfonate.

To the 10 ml of DMF, 0.50 g of N-ethyl-N'-(4-hydroxy-
 2,5-dimethylphenyl)-N-methylformamidine was added at room

temperature, and to the mixture, 0.16 g of 60% sodium hydride (oil dispersion) was added at room temperature, then the mixture was stirred at room temperature for 20 minutes. Then to the mixture, whole amount of crude of
5 2,2,3,3,4,4,5,5,6,6,7,7,8,8,8-pentadefluorooctyl trifluoromethanesulfonate obtained above was added at room temperature, and stirred at room temperature for 2 hours. To the reaction mixture, an aqueous saturated ammonium chloride solution was added, and extracted with ethyl
10 acetate. The organic layer was washed with saturated brine, then dried over sodium sulfate, and concentrated under reduced pressure. The resultant residue was subjected to silica gel column chromatography to obtain 0.082 g of formula:



(hereinafter referred to as "the present compound 9").

$^1\text{H-NMR}$ (CDCl_3) δ : 1.20 (3H, t, $J = 7.1$ Hz), 2.18 (3H, s), 2.23 (3H, s), 2.98 (3H, s), 3.35 (2H, br s), 4.40 (2H, t, $J = 12.8$ Hz), 6.57 (1H, s), 6.61 (1H, s), 7.38 (1H, s).

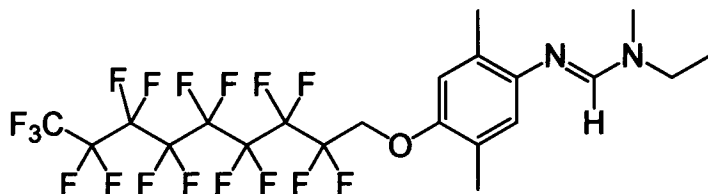
20 Preparation Example 10 of the present compound

To 30 ml of diethyl ether, 3.1 g of 2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,9-heptafluorononanol was added at room temperature, and to the mixture, 1.4 ml

of trifluoromethanesulfonic anhydride and 1.0 ml of triethylamine were successively added at -50°C , and the mixture was stirred at 0°C for 10 minutes. To the reaction mixture, 1N hydrochloric acid was added, and extracted with diethyl ether. The organic layer was washed successively with an aqueous saturated sodium hydrogen carbonate solution and saturated brine, then dried over magnesium sulfate, and concentrated under reduced pressure. The resultant residue gave crude of 2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,9-heptafluorononyl trifluoromethanesulfonate.

To the 3 ml of DMF, 0.20 g of N-ethyl-N'-(4-hydroxy-2,5-dimethylphenyl)-N-methylformamidine was added at room temperature, and to the mixture, 0.16 g of 60% sodium hydride (oil dispersion) was added at room temperature, then the mixture was stirred at room temperature for 15 minutes. To the mixture, whole amount of crude of 2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,9-heptafluorononyl trifluoromethanesulfonate obtained above was added at room temperature, and stirred at room temperature for 15 hours. To the reaction mixture, an aqueous saturated ammonium chloride solution was added, and extracted with ethyl acetate. The organic layer was washed with saturated brine, then dried over sodium sulfate, and concentrated under reduced pressure. The resultant residue was subjected to

silica gel column chromatography to obtain 0.094 g of formula:



(hereinafter referred to as "the present compound 10").

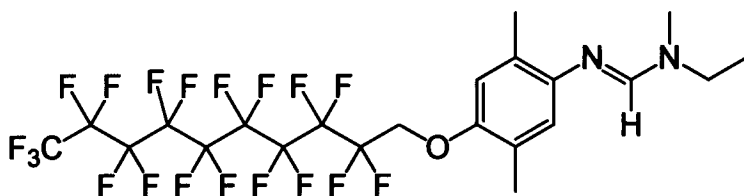
5 ^1H -NMR (CDCl_3) δ : 1.20 (3H, t, $J = 7.2$ Hz), 2.18 (3H, s), 2.23 (3H, s), 2.98 (3H, s), 3.35 (2H, br s), 4.40 (2H, t, $J = 12.8$ Hz), 6.57 (1H, s), 6.61 (1H, s), 7.38 (1H, s).

Preparation Example 11 of the present compound

To 20 ml of diethyl ether, 2.5 g of
 10 2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-nonafluorodecanol was added at room temperature, and to the mixture, 1.0 ml of trifluoromethanesulfonic anhydride and 0.74 ml of triethylamine were successively added at -50°C, and the mixture was stirred at 0°C for 20 minutes.
 15 To the reaction mixture, 1N hydrochloric acid was added, and extracted with diethyl ether. The organic layer was washed successively with an aqueous saturated sodium hydrogen carbonate solution and saturated brine, then dried over magnesium sulfate, and concentrated under reduced
 20 pressure. The resultant residue gave crude of 2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-nonafluorodecyl trifluoromethanesulfonate.

To the 10 ml of DMF, 0.51 g of N-ethyl-N'-(4-hydroxy-

2,5-dimethylphenyl)-N-methylformamidine was added at room temperature, and to the mixture, 0.20 g of 60% sodium hydride (oil dispersion) was added at room temperature, then the mixture was stirred at room temperature for 15 minutes. Then to the mixture, whole amount of crude of 2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-nonadecafluorodecyl trifluoromethanesulfonate obtained above was added at room temperature, and stirred at room temperature for 2 hours and 30 minutes. To the reaction mixture, an aqueous saturated ammonium chloride solution was added, and extracted with ethyl acetate. The organic layer was washed with saturated brine, then dried over sodium sulfate, and concentrated under reduced pressure. The resultant residue was subjected to silica gel column chromatography to obtain 0.12 g of formula:



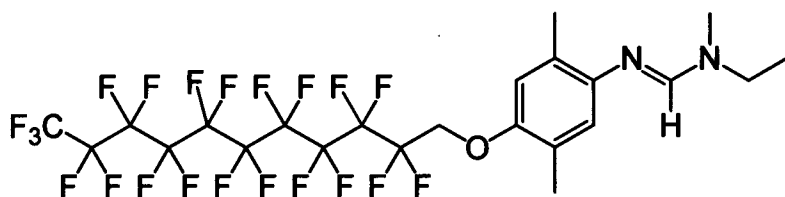
(hereinafter referred to as "the present compound 11").

$^1\text{H-NMR}$ (CDCl_3) δ : 1.20 (3H, t, $J = 7.2$ Hz), 2.18 (3H, s), 2.23 (3H, s), 2.98 (3H, s), 3.36 (2H, br s), 4.40 (2H, t, $J = 13.0$ Hz), 6.57 (1H, s), 6.61 (1H, s), 7.39 (1H, s).

Preparation Example 12 of the present compound

To the 6 ml of DMF, 0.26 g of N-ethyl-N'-(4-hydroxy-2,5-dimethylphenyl)-N-methylformamidine was added at room

temperature, and to the mixture, 0.055 g of 60% sodium hydride (oil dispersion) and 0.95 g of 2,2,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,11,11,11-henicosafluoroundecyl trifluoromethanesulfonate were
5 successtively added at 0°C, then the mixture was stirred at room temperature for 30 minutes. To the reaction mixture, an aqueous saturated ammonium chloride solution was added, and extracted with ethyl acetate. The organic layer was washed with saturated brine, then dried over sodium sulfate,
10 and concentrated under reduced pressure. The resultant residue was subjected to silica gel column chromatography to obtain 0.059 g of formula:



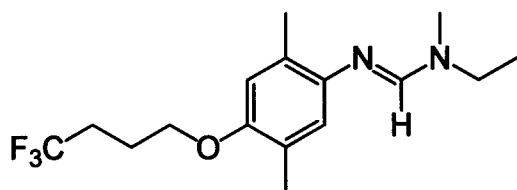
(hereinafter referred to as "the present compound 12").

15 ¹H-NMR (CDCl₃) δ: 1.20 (3H, t, J = 7.2 Hz), 2.18 (3H, s), 2.23 (3H, s), 2.98 (3H, s), 3.35 (2H, br s), 4.41 (2H, t, J = 12.8 Hz), 6.57 (1H, s), 6.61 (1H, s), 7.38 (1H, s).

Preparation Example 13 of the present compound

To 7 ml of DMF, 0.43 g of N-ethyl-N'-(4-hydroxy-2,5-
20 dimethylphenyl)-N-methylformamidine and 0.031 g of sodium iodide were added at room temperature, and to the mixture, 0.055 g of 60% sodium hydride (oil dispersion) was added at room temperature, then stirred at room temperature for 30

minutes. To the mixture, 0.59 g of 1-bromo-4,4,4-trifluorobutane was added at room temperature, then the mixture was stirred at room temperature for 30 minutes. To the reaction mixture, an aqueous saturated ammonium
5 chloride solution was added, and extracted with ethyl acetate. The organic layer was washed with saturated brine, then dried over sodium sulfate, and concentrated under reduced pressure. The resultant residue was subjected to silica gel column chromatography to obtain 0.11 g of
10 formula:



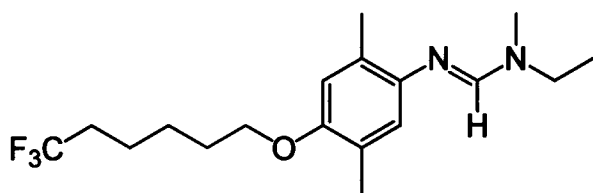
(hereinafter referred to as "the present compound 13").

¹H-NMR (CDCl₃) δ: 1.20 (3H, t, J = 7.0 Hz), 2.02-2.05 (2H, m), 2.15 (3H, s), 2.23 (3H, s), 2.30-2.33 (2H, m), 2.97 (3H, s),
15 3.35 (2H, br s), 3.97 (2H, t, J = 5.9 Hz), 6.55 (1H, s), 6.61 (1H, s), 7.39 (1H, s).

Preparation Example 14 of the present compound

To 7 ml of DMF, 0.44 g of N-ethyl-N'-(4-hydroxy-2,5-dimethylphenyl)-N-methylformamidine and 0.032 g of sodium
20 iodide were added at room temperature, and to the mixture, 0.093 g of 60% sodium hydride (oil dispersion) was added at room temperature, then stirred at room temperature for 30 minutes. To the mixture, 0.59 g of 1-bromo-6,6,6-

trifluorohexane was added at room temperature, then the mixture was stirred at room temperature for 30 minutes. To the reaction mixture, an aqueous saturated ammonium chloride solution was added, and extracted with ethyl acetate. The organic layer was washed with saturated brine, then dried over sodium sulfate, and concentrated under reduced pressure. The resultant residue was subjected to silica gel column chromatography to obtain 0.16 g of formula:



(hereinafter referred to as "the present compound 14").

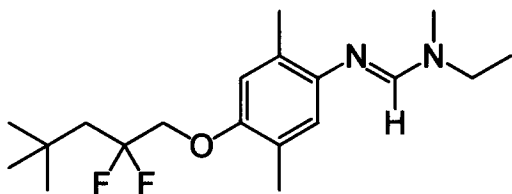
¹H-NMR (CDCl₃) δ: 1.19 (3H, t, *J* = 7.2 Hz), 1.60-1.64 (4H, m), 1.76-1.83 (2H, m), 2.08-2.11 (2H, m), 2.15 (3H, s), 2.23 (3H, s), 2.97 (3H, s), 3.34 (2H, br s), 3.92 (2H, t, *J* = 6.1 Hz), 6.55 (1H, s), 6.62 (1H, s), 7.39 (1H, s).

Preparation Example 15 of the present compound

To 0.26 g of 2,2-difluoro-4,4-dimethyl-(4-amino-2,5-dimethylphenoxy)pentane, 4 ml of trimethyl orthoformate and 0.018 g of para-toluenesulfonic acid monohydrate were added at room temperature, and the mixture was refluxed for 1 hour. The reaction mixture was allowed to stand and cooled to about room temperature. To the reaction mixture, an aqueous saturated sodium hydrogen carbonate solution was

added, and extracted with MTBE. The organic layer was washed with saturated brine, then dried over sodium sulfate, and concentrated under reduced pressure. The resultant residue gave a crude of Methyl N-{4-(2,2-difluoro-4,4-dimethylpentylloxy)-2,5-dimethyl}phenylformimidate.

To 4 ml of 1,4-dioxane, whole amount of crude of Methyl N-{4-(2,2-difluoro-4,4-dimethylpentylloxy)-2,5-dimethyl}phenylformimidate obtained above was added at room temperature. To the mixture, 0.12 ml of ethylmethylaniline was added at room temperature, and stirred at 80° for 3 hours. The reaction mixture was allowed to stand and cooled to about room temperature, then, the reaction mixture was concentrated under reduced pressure. The resultant residue was subjected to silica gel column chromatography to obtain 0.22 g of formula:



(hereinafter referred to as "the present compound 15").

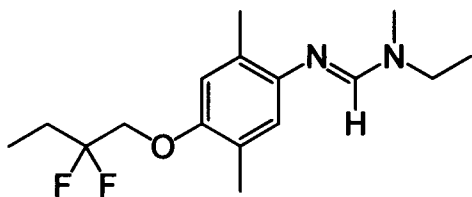
¹H-NMR (CDCl₃) δ: 1.09 (9H, s), 1.19 (3H, t, J = 7.2 Hz), 2.01 (2H, t, J = 20.0 Hz), 2.20 (3H, s), 2.22 (3H, s), 2.97 (3H, s), 3.34 (2H, br s), 4.00 (2H, t, J = 12.0 Hz), 6.55 (1H, s), 6.59 (1H, s), 7.38 (1H, s).

Preparation Example 16 of the present compound

To 0.25 g of 2,2-difluoro-(4-amino-2,5-

dimethylphenoxy)butane, 4 ml of trimethyl orthoformate and 0.021 g of para-toluenesulfonic acid monohydrate were added at room temperature, and the mixture was refluxed for 1 hour and 40 minutes. The reaction mixture was allowed to stand and cooled to about room temperature. To the reaction mixture, an aqueous saturated sodium hydrogen carbonate solution was added, and extracted with MTBE. The organic layer was washed with saturated brine, then dried over sodium sulfate, and concentrated under reduced pressure. The resultant residue gave a crude of Methyl N-{4-(2,2-difluorobutoxy)-2,5-dimethyl}phenylformimide.

To 4 ml of 1,4-dioxane, whole amount of crude of Methyl N-{4-(2,2-difluorobutoxy)-2,5-dimethyl}phenylformimide obtained above was added. To the mixture, 0.14 ml of ethylmethylamine was added at room temperature, and stirred at 80°C for 40 minutes. The reaction mixture was allowed to stand and cooled to about room temperature, then the reaction mixture was concentrated under reduced pressure. The resultant residue was subjected to silica gel column chromatography to obtain 0.25 g of formula:



(hereinafter referred to as "the present compound 16").

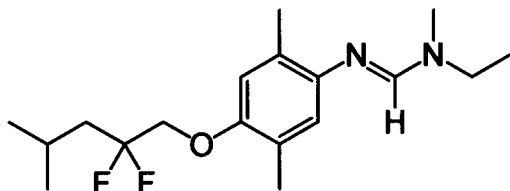
¹H-NMR (CDCl₃) δ: 1.08 (3H, t, *J* = 7.6 Hz), 1.19 (3H, t, *J* = 7.1 Hz), 2.04-2.15 (2H, m), 2.17 (3H, s), 2.23 (3H, s), 2.98 (3H, s), 3.34 (2H, br s), 4.07 (2H, t, *J* = 11.7 Hz), 6.56 (1H, s), 6.61 (1H, s), 7.38 (1H, s).

5 Preparation Example 17 of the present compound

To 0.28 g of 2,2-difluoro-4-methyl-(4-amino-2,5-dimethylphenoxy)pentane, 4 ml of trimethyl orthoformate and 0.020 g of para-toluenesulfonic acid monohydrate were added at room temperature, and the mixture was refluxed for 1
10 hour and 40 minutes. The reaction mixture was allowed to stand and cooled to about room temperature. To the reaction mixture, an aqueous saturated sodium hydrogen carbonate solution was added, and extracted with MTBE. The organic layer was washed with saturated brine, then dried
15 over sodium sulfate, and concentrated under reduced pressure. The resultant residue gave a crude of Methyl N-{4-(2,2-difluoro-4-methylpentyloxy)-2,5-dimethylphenyl}formimide.

To 4 ml of 1,4-dioxane, whole amount of crude of
20 Methyl N-{4-(2,2-difluoro-4-methylpentyloxy)-2,5-dimethylphenyl}formimide obtained above was added. To the mixture, 0.14 ml of ethylmethylaniline was added at room temperature, and stirred at 80°C for 40 minutes. The reaction mixture was allowed to stand and cooled to about
25 room temperature, then the reaction mixture was

concentrated under reduced pressure. The resultant residue was subjected to silica gel column chromatography to obtain 0.28 g of formula:



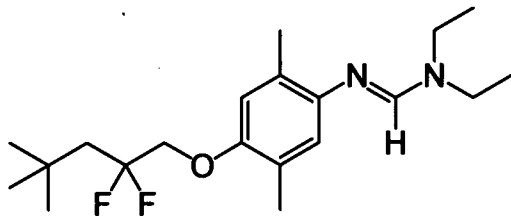
5 (hereinafter referred to as "the present compound 17").

$^1\text{H-NMR}$ (CDCl_3) δ : 1.01 (6H, d, $J = 6.3$ Hz), 1.19 (3H, t, $J = 7.0$ Hz), 1.95-1.99 (3H, m), 2.18 (3H, s), 2.23 (3H, s), 2.97 (3H, s), 3.34 (2H, br s), 4.05 (2H, t, $J = 11.8$ Hz), 6.56 (1H, s), 6.61 (1H, s), 7.39 (1H, s).

10 Preparation Example 18 of the present compound

To 0.30 g of 2,2-difluoro-4,4-dimethyl-(4-amino-2,5-dimethylphenoxy)pentane, 5 ml of trimethyl orthoformate and 0.021 g of para-toluenesulfonic acid monohydrate were added at room temperature, and the mixture was refluxed for 1
15 hour. The reaction mixture was allowed to stand and cooled to about room temperature and concentrated under reduced pressure. To the resultant residue, 5 ml of 1,4-dioxane and 0.23 ml of diethylamine were added at room temperature, then the mixture was stirred at 80°C for 3 hours. The
20 reaction mixture was allowed to stand and cooled to about room temperature, then the reaction mixture was concentrated under reduced pressure. The resultant residue was subjected to silica gel column chromatography to obtain

0.20 g of formula:

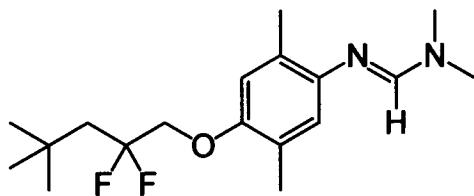


(hereinafter referred to as "the present compound 18").

¹H-NMR (CDCl₃) δ: 1.09 (9H, s), 1.20 (6H, t, *J* = 7.1 Hz),
 5 2.01 (2H, t, *J* = 20.2 Hz), 2.19 (3H, s), 2.22 (3H, s), 3.37
 (4H, br s), 4.00 (2H, t, *J* = 12.0 Hz), 6.55 (1H, s), 6.59
 (1H, s), 7.36 (1H, s).

Preparation Example 19 of the present compound

To 0.30 g of 2,2-difluoro-4,4-dimethyl-(4-amino-2,5-
 10 dimethylphenoxy)pentane, 5 ml of N,N-dimethylformamide
 dimethyl acetal was added at room temperature, and the
 mixture was stirred at 100°C for 3 hours. The reaction
 mixture was allowed to stand and cooled to about room
 temperature, then the reaction mixture was concentrated
 15 under reduced pressure. The resultant residue was
 subjected to silica gel column chromatography to obtain
 0.22 g of formula:



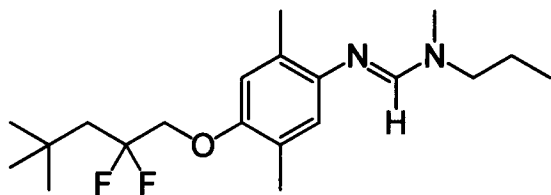
(hereinafter referred to as "the present compound 19").

20 ¹H-NMR (CDCl₃) δ: 1.09 (9H, s), 2.01 (2H, t, *J* = 20.0 Hz),

2.19 (3H, s), 2.23 (3H, s), 2.99 (6H, s), 4.00 (2H, t, $J = 12.0$ Hz), 6.56 (1H, s), 6.59 (1H, s), 7.37 (1H, s).

Preparation Example 20 of the present compound

To 0.30 g of 2,2-difluoro-4,4-dimethyl-(4-amino-2,5-dimethylphenoxy)pentane, 5 ml of trimethyl orthoformate and 0.021 g of para-toluenesulfonic acid monohydrate were added at room temperature, and the mixture was refluxed for 1 hour. The reaction mixture was allowed to stand and cooled to about room temperature and concentrated under reduced pressure. To the resultant residue, 5 ml of 1,4-dioxane and 0.23 ml of N-methylpropylamine were added at room temperature, then the mixture was stirred at 80°C for 3 hours. The reaction mixture was allowed to stand and cooled to about room temperature, then the reaction mixture was concentrated under reduced pressure. The resultant residue was subjected to silica gel column chromatography to obtain 0.19 g of formula:

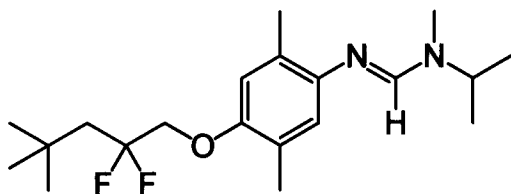


(hereinafter referred to as "the present compound 20").

$^1\text{H-NMR}$ (CDCl_3) δ : 0.92 (3H, t, $J = 7.4$ Hz), 1.09 (9H, s), 1.62 (2H, m), 2.01 (2H, t, $J = 20.2$ Hz), 2.19 (3H, s), 2.22 (3H, s), 2.97 (3H, s), 3.22 (2H, br s), 4.00 (2H, t, $J = 12.0$ Hz), 6.55 (1H, s), 6.59 (1H, s), 7.39 (1H, s).

Preparation Example 21 of the present compound

To 0.30 g of 2,2-difluoro-4,4-dimethyl-(4-amino-2,5-dimethylphenoxy)pentane, 5 ml of trimethyl orthoformate and 0.021 g of para-toluenesulfonic acid monohydrate were added at room temperature, and the mixture was refluxed for 2 hours. The reaction mixture was allowed to stand and cooled to about room temperature and concentrated under reduced pressure. To the resultant residue, 5 ml of 1,4-dioxane and 0.23 ml of N-methylisopropylamine were added at room temperature, then the mixture was stirred at 80°C for 3 hours. The reaction mixture was allowed to stand and cooled to about room temperature, then the reaction mixture was concentrated under reduced pressure. The resultant residue was subjected to silica gel column chromatography to obtain 0.17 g of formula:



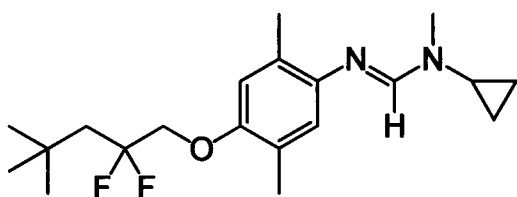
(hereinafter referred to as "the present compound 21").

¹H-NMR (CDCl₃) δ: 1.09 (9H, s), 1.22 (6H, d, *J* = 6.8 Hz), 2.01 (2H, t, *J* = 20.0 Hz), 2.19 (3H, s), 2.22 (3H, s), 2.88 (3H, s), 3.36 (1H, br s), 4.00 (2H, t, *J* = 12.0 Hz), 6.56 (1H, s), 6.59 (1H, s), 7.45 (1H, s).

Preparation Example 22 of the present compound

To 0.30 g of 2,2-difluoro-4,4-dimethyl-(4-amino-2,5-

dimethylphenoxy)pentane, 5 ml of trimethyl orthoformate and 0.021 g of para-toluenesulfonic acid monohydrate were added at room temperature, and the mixture was refluxed for 2.5 hours. The reaction mixture was allowed to stand and cooled to about room temperature and concentrated under reduced pressure. To the resultant residue, 5 ml of 1,4-dioxane, 0.24 g of N-methylcyclopropylamine hydrochloride and 1 ml of triethylamine were added at room temperature, then, the mixture was stirred at 80°C for 3 hours. The reaction mixture was allowed to stand and cooled to about room temperature. To the reaction mixture, 5% hydrochloric acid was added, and extracted with ethyl acetate. The organic layer was successively washed with water, an aqueous saturated sodium hydrogen carbonate solution and saturated brine, then dried over sodium sulfate, and concentrated under reduced pressure. The resultant residue was subjected to silica gel column chromatography to obtain 0.16 g of formula:



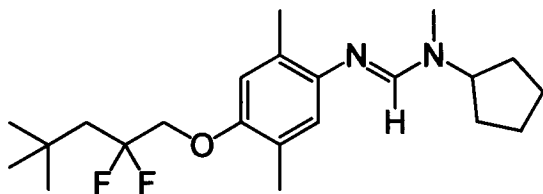
(hereinafter referred to as "the present compound 22").

$^1\text{H-NMR}$ (CDCl_3) δ : 0.69-0.75 (4H, m), 1.09 (9H, s), 2.01 (2H, t, $J = 20.0$ Hz), 2.19 (3H, s), 2.22 (3H, s), 2.66 (1H, m), 3.01 (3H, s), 4.01 (2H, t, $J = 12.0$ Hz), 6.55 (1H, s), 6.59

(1H, s), 7.57 (1H, s).

Preparation Example 23 of the present compound

To 0.30 g of 2,2-difluoro-4,4-dimethyl-(4-amino-2,5-dimethylphenoxy)pentane, 5 ml of trimethyl orthoformate and
5 0.021 g of para-toluenesulfonic acid monohydrate were added at room temperature, and the mixture was refluxed for 2 hours. The reaction mixture was allowed to stand and cooled to about room temperature and concentrated under reduced pressure. To the resultant residue, 5 ml of 1,4-dioxane and 0.22 g of N-methylcyclopentylamine were added
10 at room temperature, then the mixture was stirred at 80°C for 2 hours. The reaction mixture was allowed to stand and cooled to about room temperature, then, the reaction mixture was concentrated under reduced pressure. The
15 resultant residue was subjected to silica gel column chromatography to obtain 0.26 g of formula:

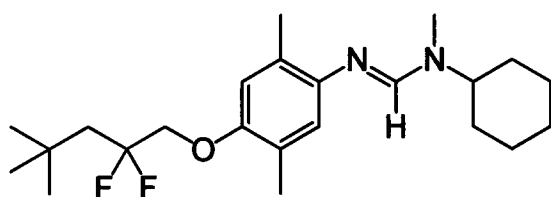


(hereinafter referred to as "the present compound 23").

¹H-NMR (CDCl₃) δ: 1.09 (9H, s), 1.59-1.74 (6H, m), 1.86-
20 1.90 (2H, m), 2.01 (2H, t, J = 20.2 Hz), 2.19 (3H, s), 2.23 (3H, s), 2.90-2.93 (4H, m), 4.00 (2H, t, J = 12.0 Hz), 6.56 (1H, s), 6.59 (1H, s), 7.48 (1H, s).

Preparation Example 24 of the present compound

To 0.30 g of 2,2-difluoro-4,4-dimethyl-(4-amino-2,5-dimethylphenoxy)pentane, 5 ml of trimethyl orthoformate and 0.021 g of para-toluenesulfonic acid monohydrate were added at room temperature, and the mixture was refluxed for 2 hours. The reaction mixture was allowed to stand and cooled to about room temperature and concentrated under reduced pressure. To the resultant residue, 5 ml of 1,4-dioxane and 0.25 g of N-methylcyclohexylamine were added at room temperature, then the mixture was stirred at 80°C for 2 hours. The reaction mixture was allowed to stand and cooled to about room temperature, then, the reaction mixture was concentrated under reduced pressure. The resultant residue was subjected to silica gel column chromatography to obtain 0.26 g of formula:



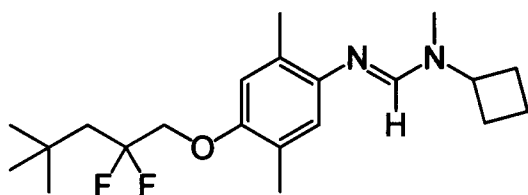
(hereinafter referred to as "the present compound 24").

$^1\text{H-NMR}$ (CDCl_3) δ : 1.09 (9H, s), 1.23-1.40 (4H, m), 1.44-1.57 (2H, m), 1.83 (4H, m), 2.01 (2H, t, $J = 20.2$ Hz), 2.19 (3H, s), 2.22 (3H, s), 2.92 (3H, s), 3.12 (1H, br s), 4.00 (2H, t, $J = 12.0$ Hz), 6.56 (1H, s), 6.59 (1H, s), 7.47 (1H, s).

Preparation Example 25 of the present compound

To 0.30 g of 2,2-difluoro-4,4-dimethyl-(4-amino-2,5-

dimethylphenoxy)pentane, 5 ml of trimethyl orthoformate and 0.021 g of para-toluenesulfonic acid monohydrate were added at room temperature, and the mixture was refluxed for 2 hours. The reaction mixture was allowed to stand and cooled to about room temperature and concentrated under reduced pressure. To the resultant residue, 5 ml of 1,4-dioxane, 1 ml of triethylamine and 0.27 g of N-methylcyclobutylamine were added at room temperature, then the mixture was stirred at 80°C for 2 hours. The reaction mixture was allowed to stand and cooled to about room temperature, then, the reaction mixture was concentrated under reduced pressure. The resultant residue was subjected to silica gel column chromatography to obtain 0.23 g of formula:



(hereinafter referred to as "the present compound 25").

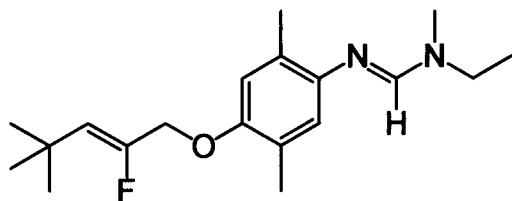
¹H-NMR (CDCl₃) δ: 1.09 (9H, s), 1.62-1.77 (2H, m), 2.01 (2H, t, J = 20.0 Hz), 2.19-2.22 (10H, m), 2.94-2.96 (4H, m), 4.01 (2H, t, J = 12.0 Hz), 6.55 (1H, s), 6.59 (1H, s), 7.44 (1H, s).

Preparation Example 26 of the present compound

To 0.51 g of (Z)-2-fluoro-4,4-dimethyl-(4-amino-2,5-dimethylphenoxy)penta-2-ene, 8 ml of trimethyl orthoformate

and 0.038 g of para-toluenesulfonic acid monohydrate were added at room temperature, and the mixture was refluxed for 1 hour. The reaction mixture was allowed to stand and cooled to about room temperature. To the reaction mixture, an aqueous saturated sodium hydrogen carbonate was added, then extract with MTBE. The organic layer was washed with saturated brine, and concentrated under reduced pressure. The resultant residue gave a crude of Methyl N-[(Z)-{2-fluoro-4,4-dimethylpent-2-enyloxy}-2,5-dimethyl]phenylformimidate

To 8 ml of 1,4-dioxane, whole amount of the crude of Methyl N-[(Z)-{2-fluoro-4,4-dimethylpent-2-enyloxy}-2,5-dimethyl]phenylformimidate obtained above was added at room temperature. Then, to the mixture, 0.26 ml of ethylmethylaniline was added at room temperature, and the mixture was stirred at 80°C for 2 hours. The reaction mixture was allowed to stand and cooled to about room temperature, then, the reaction mixture was concentrated under reduced pressure. The resultant residue was subjected to silica gel column chromatography to obtain 0.31 g of formula:

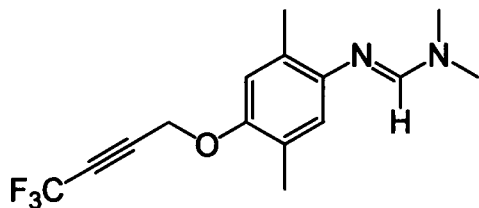


(hereinafter referred to as "the present compound 26").

¹H-NMR (CDCl₃) δ: 1.01 (9H, s), 1.20 (3H, t, *J* = 7.0 Hz), 2.05 (2H, d, *J* = 25.1 Hz), 2.22 (6H, s), 2.98 (3H, s), 3.35 (2H, br s), 5.79 (1H, d, *J* = 21.0 Hz), 6.55 (1H, s), 6.73 (1H, s), 7.39 (1H, s).

Preparation Example 27 of the present compound

5 To 0.38 g of 4,4,4-trifluoro-(4-amino-2,5-dimethylphenoxy)but-2-yne, 5 ml of N,N-dimethylformamide dimethylacetal was added at room temperature. The mixture was stirred at 90°C for 1 hour. The reaction mixture was allowed to stand and cooled to about room temperature, then
10 the reaction mixture was concentrated under reduced pressure. The resultant residue was subjected to silica gel column chromatography to obtain 0.22 g of formula:



(hereinafter referred to as "the present compound 27").

15 ¹H-NMR (CDCl₃) δ: 2.18 (3H, s), 2.24 (3H, s), 2.99 (6H, s), 4.73 (2H, q, *J* = 3.1 Hz), 6.56 (1H, s), 6.69 (1H, s), 7.38 (1H, s).

Next, reference production examples will be shown for illustrating production of a production intermediate of the present compound.

20 Reference production example 1

To 10 g of 4-hydroxy-2,5-dimethylaniline, 60 ml of trimethyl orthoformate and 1.4 g of para-toluenesulfonic acid monohydrate were added, and the mixture was refluxed

for 1 hour. The reaction mixture was allowed to stand and cooled to about room temperature, then, to the reaction mixture, an aqueous saturated sodium hydrogen carbonate solution was added. The mixture was concentrated under reduced pressure. The resultant residue was washed with an aqueous saturated sodium hydrogen carbonate solution and mixed solvent of hexane and MTBE successively, and gave 13 g of Methyl N-(4-hydroxy-2,5-dimethylphenyl)formimidate.

Methyl N-(4-hydroxy-2,5-dimethylphenyl)formimidate

¹H-NMR (CDCl₃) δ: 2.17 (3H, s), 2.19 (3H, s), 3.87 (3H, s), 6.55 (1H, s), 6.61 (1H, s), 7.64 (1H, s).

To 13 g of Methyl N-(4-hydroxy-2,5-dimethylphenyl)formimidate, 200 ml of 1,4-dioxane was added at room temperature. To the mixture, 12 ml of ethylmethanamine was added at room temperature, and the mixture was stirred at 80°C for 2 hours. The reaction mixture was allowed to stand and cooled to about room temperature, and concentrated under reduced pressure. The resulting solid was collected by filtration and washed with MTBE to obtain 8.1 g of N-ethyl-N'-(4-hydroxy-2,5-dimethylphenyl)-N-methylmethanamine.

N-ethyl-N'-(4-hydroxy-2,5-dimethylphenyl)-N-methylmethanamine

¹H-NMR (CDCl₃) δ: 1.19 (3H, t, J = 7.2 Hz), 2.18 (3H, s), 2.19 (3H, s), 2.97 (3H, s), 3.34 (2H, br s), 6.51 (1H, s),

6.58 (1H, s), 7.38 (1H, s).

Reference production example 2

To 1.0 litre of acetonitrile, 2,5-dimethyl-4-hydroxybenzene and 44 g of potassium carbonate were added at room temperature. To the mixture, 56 g of bromomethyl (2,2-dimethylpropyl)ketone was added at room temperature, then the mixture was refluxed for 1 hour. The reaction mixture was allowed to stand and cooled to about room temperature, then filtered through Celite®, and the filtrate was concentrated under reduced pressure. To the resultant residue, water was added, and extracted with MTBE. The organic layer was successively washed with 1% aqueous sodium hydroxide solution and saturated brine, then dried over sodium sulfate, and concentrated under reduced pressure. The resultant residue was subjected to silica gel column chromatography to obtain 72 g of 4,4-dimethyl-(2,5-dimethyl-4-nitrophenoxy)pentan-2-one.

4,4-dimethyl-(2,5-dimethyl-4-nitrophenoxy)pentan-2-one
¹H-NMR (CDCl₃) δ: 1.07 (9H, s), 2.32 (3H, s), 2.48 (2H, s), 2.59 (3H, s), 4.59 (2H, s), 6.47 (1H, s), 7.95 (1H, s).

To 22 g of 4,4-dimethyl-(2,5-dimethyl-4-nitrophenoxy)pentan-2-one, 52 g of bis(2-methoxyethyl)aminosulfur trifluoride was added, and the mixture was stirred at 70°C for 5 hours and 30 minutes. The reaction mixture was allowed to stand and cooled to

about room temperature, diluted with MTBE. The obtained dilution was poured into water, and extracted with MTBE. The organic layer was washed with an aqueous saturated sodium hydrogen carbonate solution and saturated brine successively, then dried over sodium sulfate, and concentrated under reduced pressure. The resultant residue was subjected to silica gel column chromatography to obtain 13 g of 2,2-difluoro-4,4-dimethyl-(2,5-dimethyl-4-nitrophenoxy)pentane.

To 13 g of 2,2-difluoro-4,4-dimethyl-(2,5-dimethyl-4-nitrophenoxy)pentane, 450 ml of chloroform and 200 ml of methanol were added at room temperature. An ozone gas was blown into the mixture with stirring at the range of -40°C to -35°C for 1 hour. A nitrogen gas was blown into the mixture with stirring at the range of -40°C to -35°C for 30 minutes. To the mixture, 8.8 g of sodium borohydride was added at the range of -40°C to -35°C, and the mixture was stirred at 0°C for 30 minutes. To the reaction mixture, conc. HCl was added until pH value of the mixture had reached to more than 10, and concentrated under reduced pressure. To the resultant residue, water was added, and extracted with MTBE. The organic layer was washed with an aqueous saturated sodium hydrogen carbonate solution and saturated brine successively, then dried over sodium sulfate, and concentrated under reduced pressure. The

resultant residue was subjected to silica gel column chromatography to obtain 13 g of 2,2-difluoro-4,4-dimethyl-(2,5-dimethyl-4-nitrophenoxy)pentane.

2,2-difluoro-4,4-dimethyl-(2,5-dimethyl-4-nitrophenoxy)pentane.

$^1\text{H-NMR}$ (CDCl_3) δ : 1.10 (9H, s), 2.01 (2H, t, $J = 20.0$ Hz), 2.27 (3H, s), 2.62 (3H, s), 4.13 (2H, t, $J = 11.6$ Hz), 6.63 (1H, s), 7.94 (1H, s).

13 g of 2,2-difluoro-4,4-dimethyl-(2,5-dimethyl-4-nitrophenoxy)pentane, 0.9 g of 10% paradium carbon was added, then to the mixture, 150 ml of ethanol was added. The mixture was stirred under 0.40 Mpa of hydrogen gas atomosphere for 3 hours. The reaction mixture was filtered through Celite®, and the filtrate was concentrated under reduced pressure to obtain 11 g of 2,2-difluoro-(4-amino-2,5-dimethylphenoxy)pentane.

2,2-difluoro-(4-amino-2,5-dimethylphenoxy)pentane

$^1\text{H-NMR}$ (CDCl_3) δ : 1.09 (9H, s), 2.00 (2H, t, $J = 20.1$ Hz), 2.14 (3H, s), 2.16 (3H, s), 3.97 (2H, t, $J = 12.0$ Hz), 6.52 (1H, s), 6.54 (1H, s).

Reference prodution example 3

To 10 ml of DMF, 1.0 g of 2,5-dimethyl-4-hydroxybromobenzene and 0.69 g of pottasium carbonate were added. To the mixture, 0.72 g of bromomethyl ethyl ketone was added at room temperature, and the mixture was stirred

at room temperature for 4 hours. To the reaction mixture, water was added and extracted with MTBE. The organic layer was washed with an aqueous 1% sodium hydroxide solution and a saturated brine, then dried over sodium sulfate, and concentrated under reduced pressure. The resultant residue was washed with mixed-solvent of hexane and MTBE to obtain 0.78 g of (4-bromo-2,5-dimethylphenoxy)butan-2-one.

(4-bromo-2,5-dimethylphenoxy)butan-2-one

¹H-NMR (CDCl₃) δ: 1.12 (3H, t, J = 7.2 Hz), 2.24 (3H, s), 2.33 (3H, s), 2.66 (2H, q, J = 14.1 Hz), 4.51 (2H, s), 6.53 (1H, s), 7.31 (1H, s).

To 10 ml of chloroform, 0.52 g of (4-bromo-2,5-dimethylphenoxy)butan-2-one was added. To the mixture, 0.40 ml of diethylaminosulfur trifluoride was added at 0°C, and stirred at room temperature for 13 hours and 30 minutes. To the reaction mixture, an aqueous saturated sodium hydrogen carbonate solution was added, and extracted with chloroform. The organic layer was washed with saturated brine, then dried over sodium sulfate, and concentrated under reduced pressure. The resultant residue was subjected to silica gel column chromatography to obtain 0.38 g of 2,2-difluoro-(4-bromo-2,5-dimethylphenoxy)butane.

2,2-difluoro-(4-bromo-2,5-dimethylphenoxy)butane

¹H-NMR (CDCl₃) δ: 1.08 (3H, t, J = 7.6 Hz), 2.05-2.12 (2H, m), 2.17 (3H, s), 2.35 (3H, s), 4.08 (2H, t, J = 11.5 Hz),

6.66 (1H, s), 7.29 (1H, s).

To 0.56 g of 2,2-difluoro-(4-bromo-2,5-dimethylphenoxy)butane, 0.088 g of tris(dibenzylideneacetone)dipalladium, 0.63 g of triphenylsilylamine and 0.080 g of 2-(dicyclohexylphosphino)biphenyl were added at room temperature. To the mixture, 2.5 ml of 1N solution in toluene of lithium hexamethyldisilazide was added, and the mixture was stirred at 100°C for 9 hours. The reaction mixture was allowed to stand and cooled to about room temperature. To the reaction mixture, 10 ml of 1N hydrochloric acid was added, and the mixture was stirred at room temperature for 30 minutes. To the reaction mixture, an aqueous saturated sodium hydrogen carbonate solution was added until pH value of the mixture had reached to less than 10, then, extracted with ethyl acetate. The organic layer was washed with saturated brine, then dried over sodium sulfate, and concentrated under reduced pressure. The resultant residue was subjected to silica gel column chromatography to obtain 0.34 g of 2,2-difluoro-(4-amino-2,5-dimethylphenoxy)butane.

2,2-difluoro-(4-amino-2,5-dimethylphenoxy)butane.

¹H-NMR (CDCl₃) δ: 1.07 (3H, t, *J* = 7.6 Hz), 2.03-2.12 (2H, m), 2.13 (3H, s), 2.15 (3H, s), 3.34 (2H, br s), 4.03 (2H, t, *J* = 11.7 Hz), 6.51 (1H, s), 6.56 (1H, s).

Reference production example 4

To 30 ml of DMF, 2.0 g of 2,5-dimethyl-4-hydroxybromobenzene and 1.4 g of potassium carbonate were added. To the mixture, 1.7 g of bromomethyl 2-methylpropyl ketone was added at room temperature, then the mixture was stirred at room temperature for 2 hours. To the reaction mixture, water was added, then extracted with MTBE. The organic layer was washed with an aqueous 1% sodium hydroxide solution and saturated brine successively, then dried over sodium sulfate, and concentrated under reduced pressure. The resultant residue was washed with mixed-solvent of hexane and MTBE to obtain 1.7 g of 4-methyl-2,5-dimethyl-4-bromophenoxy)pentan-2-one.

4-methyl-2,5-dimethyl-4-bromophenoxy)pentan-2-one.

$^1\text{H-NMR}$ (CDCl_3) δ : 0.96 (6H, d, $J = 6.8$ Hz), 2.22-2.25 (4H, m), 2.32 (3H, s), 2.48 (2H, d, $J = 6.8$ Hz), 4.48 (2H, s), 6.51 (1H, s), 7.31 (1H, s).

To 15 ml of chloroform, 1.2 g of 4-methyl-2,5-dimethyl-4-bromophenoxy)pentan-2-one was added at room temperature. To the mixture, 0.45 ml of diethylaminosulfur trifluoride was added at 0°C , the mixture was stirred at room temperature for 15 hours and 30 minutes. To the reaction mixture, an aqueous saturated sodium hydrogen carbonate solution was added, then extracted with

chloroform. The organic layer was washed with saturated brine, then dried over sodium sulfate, and concentrated under reduced pressure. The resultant residue was subjected to silica gel column chromatography to obtain
5 0.62 g of 2,2-difluoro-4-methyl-(2,5-dimethyl-4-bromophenoxy)pentane.

2,2-difluoro-4-methyl-(2,5-dimethyl-4-bromophenoxy)pentane

¹H-NMR (CDCl₃) δ: 1.02 (6H, d, *J* = 5.9 Hz), 1.94-1.98 (3H, m), 2.18 (3H, s), 2.35 (3H, s), 4.06 (2H, t, *J* = 11.6 Hz),
10 6.65 (1H, s), 7.29 (1H, s).

To 0.56 g of 2,2-difluoro-4-methyl-(2,5-dimethyl-4-bromophenoxy)pentane, 0.080 g of tris(dibenzilideneacetone)dipalladium, 0.58 g of
15 triphenylsilylamine and 0.074 g of 2-(dicyclohexylphosphino)biphenyl were added at room temperature. To the mixture, 2.3 ml of 1N toluene solution of lithium hexamethyldisilazide was added, and stirred at 100°C for 8 hours and 30 minutes. The reaction mixture was
20 allowed to stand and cooled to about room temperature. To the reaction mixture, 10 ml of 1N hydrochloric acid was added, then, the mixture was stirred at room temperature for 1 hour and 30 minutes. To the reaction mixture, an aqueous saturated sodium hydrogen carbonate solution was
25 added until pH value of the mixture had reached to less

than 10, then, extracted with ethyl acetate. The organic layer was washed with saturated brine, then dried over sodium sulfate, and concentrated under reduced pressure. The resultant residue was subjected to silica gel column chromatography to obtain 0.33 g of 2,2-difluoro-4-methyl-(2,5-dimethyl-4-aminophenoxy)pentane.

2,2-difluoro-4-methyl-(2,5-dimethyl-4-aminophenoxy)pentane

¹H-NMR (CDCl₃) δ: 1.01 (6H, d, *J* = 6.1 Hz), 1.90-2.01 (3H, m), 2.13 (3H, s), 2.16 (3H, s), 3.34 (2H, br s), 4.01 (2H, t, *J* = 11.8 Hz), 6.51 (1H, s), 6.55 (1H, s).

Reference production example 5

To 20 ml of 1,4-dioxane, 1.2 g of 2,2-difluoro-4,4-dimethyl-(4-amino-2,5-dimethylphenoxy)pentane was added. To the mixture, 3.1 g of potassium tert-butoxide was added, then the mixture was refluxed for 7 hours. The reaction mixture was allowed to stand and cooled to about room temperature. To the reaction mixture, water was added, and extracted with ethyl acetate. The organic layer was washed with saturated brine, then dried over sodium sulfate, and concentrated under reduced pressure. The resultant residue was subjected to silica gel column chromatography to obtain 0.51 g of (Z)-2-fluoro-4,4-dimethyl-(4-amino-2,5-dimethylphenoxy)pentan-2-ene.

(Z)-2-fluoro-4,4-dimethyl-(4-amino-2,5-

dimethylphenoxy)pentan-2-ene.

¹H-NMR (CDCl₃) δ: 1.00 (9H, s), 2.12 (3H, s), 2.20 (3H, s), 3.38 (2H, br s), 4.55 (2H, s), 5.72 (1H, d, *J* = 21.3 Hz), 6.50 (1H, s), 6.68 (1H, s).

5 Reference production example 6

To 200 ml of toluene, 10 g of 2,5-dimethyl-4-hydroxynitrobenzene, 7.5 g of 4,4,4-trifluorobutan-2-ol and 16 g of triphenylphosphine were added at room temperature. To the mixture, 27 ml of 2.2 M toluene solution of diethyl
10 azodicarboxylate was added at 0°C, then, the mixture was stirred at room temperature for 1 hour. The reaction mixture was concentrated under reduced pressure, then the resultant residue was subjected to silica gel column chromatography and recrystallization from mixed solvent of
15 hexane and chloroform to obtain 1.5 g of 4,4-dimethyl-(2,5-dimethyl-4-nitrophenoxy)pentan-2-one. Then, the mother liquid obtained by the recrystallization was concentrated. The resulting residue was subjected to silica gel column chromatography and recrystallization from mixed solvent of
20 hexane and chloroform to obtain 0.8 g of 4,4-dimethyl-(2,5-dimethyl-4-nitrophenoxy)pentan-2-one.

4,4-dimethyl-(2,5-dimethyl-4-nitrophenoxy)pentan-2-one

¹H-NMR (CDCl₃) δ: 2.26 (3H, s), 2.64 (3H, s), 4.90 (2H, q, *J* = 3.0 Hz), 6.71 (1H, s), 7.94 (1H, s).

To 4 ml of water, 2.0 g of iron powder, 1.9 g of 4,4-dimethyl-(2,5-dimethyl-4-nitrophenoxy)pentan-2-one and 28 ml of acetic acid were added at room temperature, and stirred at 80°C for 1 hour and 30 minutes. The reaction mixture was allowed to stand and cooled to about room temperature, then filtered through Celite®. The filtrate was concentrated under reduced pressure. The resulting residue was subjected to silica gel column chromatography and high performance liquid chromatography successively to obtain 0.38 g of 4,4,4-trifluoro-(4-amino-2,5-dimethylphenoxy)butan-2-yne.

4,4,4-trifluoro-(4-amino-2,5-dimethylphenoxy)butan-2-yne

¹H-NMR (CDCl₃) δ: 2.14 (3H, s), 2.15 (3H, s), 3.37 (2H, br s), 4.67 (2H, q, *J* = 3.1 Hz), 6.50 (1H, s), 6.64 (1H, s).

Formulation Example 1

Fifty parts of any one of the present compounds 1-27, 3 parts of calcium ligninsulfonate, 2 parts of magnesium laurylsulfate, and 45 parts of synthetic hydrous silicon oxide are thoroughly ground and mixed to obtain a formulation.

Formulation Example 2

Twenty parts of any one of the present compounds 1-27 and 1.5 parts of sorbitan trioleate are mixed with 28.5 parts of an aqueous solution containing 2 parts of

polyvinyl alcohol, and the mixture is pulverized by wet pulverizing method. Then, 40 parts of an aqueous solution containing 0.05 parts of xanthan gum and 0.1 parts of aluminum magnesium silicate are added thereto, and further
5 added 10 parts of propylene glycol, followed by stirring and mixing to obtain a formulation.

Formulation Example 3

Two parts of any one of the present compounds 1-27, 88 parts of kaolin clay and 10 parts of talc are thoroughly
10 ground and mixed to obtain a formulation.

Formulation Example 4

Five parts of any one of the present compounds 1-27, 14 parts of polyoxyethylenestyrylphenyl ether, 6 parts of calcium dodecylbenzenesulfonate, and 75 parts of xylene are
15 thoroughly mixed to obtain a formulation.

Formulation Example 5

Two parts of any one of the present compound 1-27, 1 part of synthetic hydrous silicon oxide, 2 parts of calcium ligninsulfonate, 30 parts of bentonite and 65 parts of
20 kaolin clay are thoroughly ground and mixed, then water is added thereto, followed by thoroughly kneading and granulation drying to obtain a formulation.

Formulation Example 6

Ten parts of any one of the present compound 1-27, 35
25 parts of white carbon containing 50 parts of

polyoxyethylene alkyl ether sulfate ammonium salt, and 55 parts of water are mixed, and the mixture is pulverized by wet pulverizing method to obtain a formulation.

Hereinafter, usefulness of the present compounds for
5 controlling plant diseases is shown by test examples.

Here, the controlling effect was evaluated by comparing the area of lesions on test plants treated with the present compound with that on untreated plants through visual observation of the area of lesion on the test plant
10 at testing.

Test Example 1

A Plastic pot was stuffed with soil, then, rice plant (plant variety; Nihonbare) was sowed on this, and allowed to grow in a greenhouse for 20 days. Each of the present
15 compounds 1, 15 and 22 was formulated according to Formulation Example 2, and the formulation was diluted with water so that the concentration of active ingredients was 200 ppm. Then, the dilution was carried out so that the dilution might adhere sufficiently to the surfaces of
20 leaves of the grown rice. After the foliage application, the plant was air-dried and then grown in contact with a rice seedling (plant variety; Nihonbare) infected with blast fungus (*Magnaporthe grisea*), for 6 days at 24°C and a high humidity in the daytime and at 20°C and a high
25 humidity in the nighttime. Then, the area of lesions was

investigated. As a result, it was found that the area of lesions on the plant treated with each of the present compounds 1, 15 and 22 was 30% or less of the area of lesions on an untreated plant.

5 Test Example 2

A plastic pot was stuffed with soil, then, wheat (variety; Shirogane) was sown on this, and allowed to grow in a greenhouse for 9 days. Then the plant was inoculated with spores of leaf rust (*Puccinia recondita*) by sprinkling.

10 After inoculation the plant was allowed to stand under dark and highly humid condition at 23°C for one day, then, the plant was air-dried. Each of the present compounds 1 and 2 was formulated according to Formulation Example 2, and the formulation was diluted with water so that the

15 concentration of active ingredients was 200 ppm. Then, the dilution was carried out so that the dilution might adhere sufficiently to the surfaces of leaves of grown wheat. After completion of the foliar application, the plant was air-dried, and allowed to stand for 7 days under

20 illumination, then, the lesion area was investigated. As a result, it was found that the area of lesions on the plant treated with each of the present compounds 1 and 2 was 30% or less of the area of lesions on an untreated plant.

Test Example 3

25 A Plastic pot was stuffed with soil, then, wheat

(variety; Shirogane) was sowed on this, and allowed to grow in a greenhouse for 9 days. Each of the present compounds 1, 2, 3, 4, 5, 8, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25 and 26 was formulated according to

5 Formulation Example 2, and the formulation was diluted with water so that the concentration of active ingredients was 200 ppm. Then, the dilution was carried out so that the dilution might adhere sufficiently to the surfaces of leaves of the grown rice. After the foliage application,
10 the plant was air-dried and allowed to stand at 18°C for 5 days under illumination. Then the plant was inoculated with spores of leaf rust (*Puccinia recondita*) by sprinkling. After inoculation the plant was first allowed to stand under dark for one day, further, allowed to stand at 18°C
15 under illumination for 8 days, then, the area of lesions was investigated. As a result, it was found that the area of lesions on the plant treated with each of the present compounds 1, 2, 3, 4, 5, 8, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25 and 26 was 30% or less of the area
20 of lesions on an untreated plant.

Test Example 4

A Plastic pot was stuffed with soil, then, cucumber (plant variety; Sagamihanjiro) was sowed on this, and allowed to grow in a greenhouse for 12 days. Each of the
25 present compounds 1, 2, 3, 4, 5, 8, 9, 10, 11, 12, 13, 14,

15, 17, 18, 19, 20, 21, 22 and 26 was formulated according to Formulation Example 2, and the formulation was diluted with water so that the concentration of active ingredients was 200 ppm. Then, the dilution was carried out so that
5 the dilution might adhere sufficiently to the surfaces of leaves of the grown cucumber. After completion of the foliar application, the plant was air-dried, and inoculated with spores of powdery mildew (*Sphaerotheca fuliginea*) by sprinkling. After inoculation the plant was placed in a
10 greenhouse for 11 days at 24°C in the daytime and at 20°C in the nighttime. Then, the area of lesions was investigated. As a result, it was found that the area of lesions on the plant treated with each of the present compounds 1, 2, 3, 4, 5, 8, 9, 10, 11, 12, 13, 14, 15, 17,
15 18, 19, 20, 21, 22 and 26 was 30% or less of the area of lesions on an untreated plant.

Test Example 5

A Plastic pot was stuffed with soil, then, wheat (variety: Apogee) was sowed on this, and allowed to grow in
20 a greenhouse for 10 days. Each of the present compounds 1, 8, 15, 16, 18, 19, 20, 21, 22, 24 and 25 was formulated according to Formulation Example 2, and the formulation was diluted with water so that the concentration of active ingredients was 200 ppm. Then, the dilution was carried
25 out so that the dilution might adhere sufficiently to the

surfaces of leaves of the grown wheat. After completion of the foliar application, the plant was air-dried, and two days after, inoculated with an aqueous suspension of *Septoria tritici* spores by spraying. After inoculation, the plant was first allowed to stand at 18°C and a high humidity for 3 days, further, allowed to stand for 14 to 18 days under illumination, then, the lesion area was investigated. As a result, the lesion area on the plant treated with each of the present compounds 1, 8, 15, 16, 18, 19, 20, 21, 22, 24 and 25 was 30% or less of the area of lesions on an untreated plant.

Test Example 6

A Plastic pot was stuffed with soil, then, barley (variety; Nishinohoshi) was sown on this, and allowed to grow in a greenhouse for 7 days. Each of the present compounds 1, 2, 8, 13, 14, 15, 16, 17, 20, 21, 22, 23 and 25 was formulated according to Formulation Example 2, and the formulation was diluted with water so that the concentration of active ingredients was 200 ppm. Then, the dilution was carried out so that the dilution might adhere sufficiently to the surfaces of leaves of the grown barley. After completion of the foliar application, the plant was air-dried, and two days after, inoculated with an aqueous suspension of *Pyrenophora teres* spores by spraying. After inoculation, the plant was first allowed to be placed in a

greenhouse for 3 days at 23°C and a high humidity in the daytime and at 20°C and a high humidity in the nighttime, further, allowed to stand for 7 days in greenhouse, then the lesion area was investigated. As a result, the lesion area on the plant treated with each of the present compounds 1, 2, 8, 13, 14, 15, 16, 17, 20, 21, 22, 23 and 25 was 30% or less of the area of lesions on an untreated plant.

Test Example 7

A Plastic pot was stuffed with soil, then, cucumber (plant variety; Sagamihanjiro) was sowed on this, and allowed to grow in a greenhouse for 12 days. Each of the present compounds 6 and 7 was formulated according to Formulation Example 2, and the formulation was diluted with water so that the concentration of active ingredients was 50 ppm. Then, the dilution was carried out so that the dilution might adhere sufficiently to the surfaces of leaves of the grown cucumber. After completion of the foliar application, the plant was air-dried, and inoculated with spores of powdery mildew (*Sphaerotheca fuliginea*) by sprinkling. After inoculation the plant was placed in a greenhouse for 11 days at 24°C in the daytime and at 20°C in the nighttime. Then, the area of lesions was investigated. As a result, it was found that the area of lesions on the plant treated with each of the present

compounds 6 and 7 was 30% or less of the area of lesions on an untreated plant.

Test Example 8

A Plastic pot was stuffed with soil, then, barley
5 (variety; Nishinohoshi) was sown on this, and allowed to grow in a greenhouse for 7 days. The present compound 7 was formulated according to Formulation Example 2, and the formulation was diluted with water so that the concentration of active ingredients was 50 ppm. Then, the
10 dilution was carried out so that the dilution might adhere sufficiently to the surfaces of leaves of the grown barley. After completion of the foliar application, the plant was air-dried, and two days after, inoculated with an aqueous suspension of *Pyrenophora teres* spores by spraying. After
15 inoculation, the plant was first allowed to be placed in a greenhouse for 3 days at 23°C and a high humidity in the daytime and at 20°C and a high humidity in the nighttime, further, allowed to stand for 7 days in greenhouse, then, the lesion area was investigated. As a result, the lesion
20 area on the plant treated with the present compound 7 was 30% or less of the area of lesions on an untreated plant.

Test Example 9

A plastic pot was stuffed with soil, then, wheat
(variety; Shirogane) was sown on this, and allowed to grow
25 in a greenhouse for 9 days. Then the plant was inoculated

with spores of leaf rust (*Puccinia recondita*) by sprinkling. After inoculation the plant was allowed to stand under dark and highly humid condition at 23°C for one day, then, the plant was air-dried. Each of the present compounds 6 and 7
5 was formulated according to Formulation Example 2, and the formulation was diluted with water so that the concentration of active ingredients was 50 ppm. Then, the dilution was carried out so that the dilution might adhere sufficiently to the surfaces of leaves of grown wheat.

10 After completion of the foliar application, the plant was air-dried, and allowed to stand for 7 days under illumination, then, the lesion area was investigated. As a result, it was found that the area of lesions on the plant treated with each of the present compounds 6 and 7 was 30%
15 or less of the area of lesions on an untreated plant.

Test Example 10

A Plastic pot was stuffed with soil, then, soybean (variety; Kurosengoku) was sown on this, and allowed to grow in a greenhouse for 13 days. Then the plant was
20 inoculated with an aqueous suspension of *Phakopsora pachyrhizi* spores by spraying. After inoculation the plant was allowed to stand under dark and highly humid condition at 23°C for one day, then, the plant was air-dried. Each of the present compounds 15, 26 and 27 was formulated
25 according to Formulation Example 2, and the formulation was

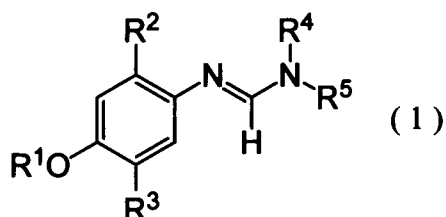
diluted with water so that the concentration of active ingredients was 200 ppm. Then, the dilution was carried out so that the dilution might adhere sufficiently to the surfaces of leaves of the grown soybean. After completion of the foliar application, the plant was air-dried, and allowed to stand for 14 days under illumination, then, the lesion area was investigated. As a result, the lesion area on the plant treated with each of the present compounds 15, 26 and 27 was 30% or less of the area of lesions on an untreated plant.

Industrial Applicability

As described hereinabove, the present compound has excellent plant disease controlling effect and hence is useful as an active ingredient of plant disease controlling agents.

CLAIMS

1. An amidine compound represented by the formula (1):



- 5 wherein R¹ represent a C1-C11 fluoroalkyl group, a C3-C11 fluoroalkenyl group or a C3-C11 fluoroalkynyl group;
 R² represent a C1-C3 alkyl group;
 R³ represent a C1-C3 alkyl group;
 R⁴ represent a C3-C6 cycloalkyl group or a C1-C6 alkyl
 10 group optionally having one or more halogens and R⁵
 represent a C3-C6 cycloalkyl group or a C1-C6 alkyl group
 optionally having one or more halogens.
2. The amidine compound according to claim 1, wherein R⁴
 is a C1-C6 alkyl group optionally having one or more
 15 halogens and R⁵ is a C1-C6 alkyl group having one or more
 halogens.
3. The amidine compound according to claim 1, wherein R⁴
 is a C1-C6 alkyl group and R⁵ is a C1-C6 alkyl group.
4. A plant disease controlling agent, which comprises the
 20 amidine compound according to claim 1 as an active
 ingredient.
5. A method for controlling plant diseases, which

comprises the step of applying an effective amount of the amidine compound according to claim 1 to plants or soils.

6. Use of the amidine compound according to claim 1 for controlling plant diseases.

INTERNATIONAL SEARCH REPORT

International application No

PCT/JP2011/080136

A. CLASSIFICATION OF SUBJECT MATTER

INV. C07C257/14 A01N37/52
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 C07C

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, WPI Data, CHEM ABS Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 03/093224 A1 (DU PONT [US]; TSENG CHI-PING [US]) 13 November 2003 (2003-11-13) page 1, line 5 page 4, line 8 page 11, lines 30,33 page 114; table A (index); compounds 16,17 page 132 - page 133; table A claims 1-3, 8, 10 -----	1-6



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/JP2011/080136

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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