

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization

International Bureau

(43) International Publication Date
16 April 2020 (16.04.2020)



(10) International Publication Number
WO 2020/074489 A1

(51) International Patent Classification:

C07D 205/04 (2006.01) C07D 403/10 (2006.01)
C07D 401/06 (2006.01) C07D 405/06 (2006.01)
C07D 401/10 (2006.01) C07D 413/06 (2006.01)
C07D 401/14 (2006.01) C07D 417/06 (2006.01)
C07D 403/06 (2006.01) A01N 35/06 (2006.01)

(21) International Application Number:

PCT/EP2019/077185

(22) International Filing Date:

08 October 2019 (08.10.2019)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

1816459.0 09 October 2018 (09.10.2018) GB

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ,

CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

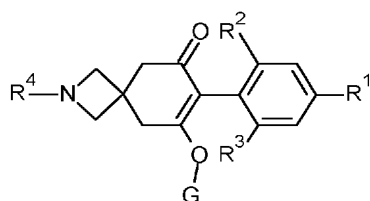
Declarations under Rule 4.17:

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

Published:

- with international search report (Art. 21(3))

(54) Title: HERBICIDAL 2-AZASPIRO[3-5]NONANE COMPOUNDS



(57) Abstract: The present invention relates to compounds of Formula (I), wherein R¹, R², R³, R⁴ and G are as defined herein. The invention further relates to herbicidal compositions which comprise a compound of Formula (I), to their use for controlling weeds, in particular in crops of useful plants.



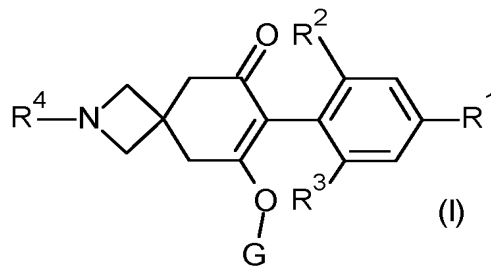
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HERBICIDAL 2-AZASPIRO[3-5]NONANE COMPOUNDS

The present invention relates to novel herbicidal cyclohexanedione compounds, to processes for their preparation, to herbicidal compositions which
5 comprise the novel compounds, and to their use for controlling weeds.

Herbicidal cyclic dione compounds substituted by a phenyl which has an
alkynyl-containing substituent are disclosed in, for example, WO2014/096289 and
WO2015/197468. The present invention relates to novel herbicidal cyclohexanedione
10 derivatives with improved properties.

Thus, according to the present invention there is provided a compound of
Formula (I)



15

wherein

R¹ is selected from the group consisting of methyl, ethynyl, 1-propynyl, phenyl
20 and a 5 or 6 membered heteroaryl which comprises one or two nitrogen
heteroatoms, said phenyl and heteroaryl optionally substituted by one or two
R¹⁵ substituents;

R² is selected from the group consisting of methyl, ethyl, methoxy and chloro;

25

R³ is selected from the group consisting of methyl, ethyl, methoxy and chloro;

R⁴ is selected from the group consisting of C₁-C₄alkyl, C₁-C₄alkoxy-, C₁-
30 C₄haloalkyl, -C(O)C₁-C₄alkyl, -C(O)C₁-C₄haloalkyl, -S(O)_nC₁-C₆alkyl, -S(O)_nC₁-
C₆haloalkyl, -S(O)_n-(CH₂)_n-C₃-C₆cycloalkyl, -S(O)_nC(R¹¹)R¹²R¹³, -C(O)H, -C(O)-
(CH₂)_n-C₃-C₆cycloalkyl, -C(O)C(R¹¹)R¹²R¹³, -C(O)C₂-C₄alkenyl, -
C(O)(CR⁹R¹⁰)CN, -C(O)(CR⁹R¹⁰)(CR⁹R¹⁰)CN, -C(O)CH₂C(O)-C₁-C₆alkyl, -

5 C(O)CH₂OC(O)-C₁-C₆alkyl, -C(O)OC₁-C₆alkyl, -C(O)OC₁-C₆haloalkyl, -
C(O)(CH₂)_nS(O)_nC₁-C₆alkyl, -C(O)C₁-C₃alkoxyC₁-C₆alkyl, -C(O)C₁-C₃alkoxyC₂-
C₆alkenyl, -C(O)C₁-C₃alkoxyC₂-C₆alkynyl, -C(O)C₁-C₃alkoxyC₁-C₆haloalkyl, -
C(O)C₁-C₃alkoxyC₃-C₆cycloalkyl, -C(O)OC₁-C₃alkoxyC₁-C₆alkyl, -C(O)C₁-
C₃alkoxyC₁-C₃alkoxyC₁-C₆alkyl, -C(O)(CH₂)_nNR⁵R⁶, -C(O)-(CH₂)_n-NR⁷C(O)R⁸,
-C(O)-(CH₂)_n-O-N=CR⁵R⁵, -CN, -S(O)₂NR¹⁶R¹⁷, -S(O)(=NR¹⁸)R¹⁹, -
C(O)C(O)R²⁰, -C(O)C(R²³)=N-O-R²⁴, -C(O)C(R²³)=N-NR²⁵R²⁶, -(CH₂)_n-phenyl,
-C(O)-(CH₂)_n-phenyl, -S(O)_n-(CH₂)_n-phenyl, -heterocyclyl, -C(O)-(CH₂)_n-
heterocyclyl, -S(O)_n-(CH₂)_n-heterocyclyl, wherein each heterocyclyl is a 5- or 6-
10 membered heterocyclyl which may be aromatic, saturated or partially saturated
and can contain from 1 to 4 heteroatoms each independently selected from the
group consisting of oxygen, nitrogen and sulphur, and wherein said
heterocyclyl or phenyl groups are optionally substituted by one, two or three
substituents independently selected from the group consisting of C₁-C₃alkyl,
15 C₁-C₃haloalkyl, C₁-C₃alkoxy, C₂-C₃alkenyl, C₂-C₃alkynyl, halogen, cyano and
nitro;

R⁵ is selected from the group consisting of hydrogen and C₁-C₆ alkyl;

20 R⁶ is selected from the group consisting of hydrogen, C₁-C₆alkyl, C₂-C₆alkenyl,
C₂-C₆alkynyl, C₁-C₆haloalkyl, hydroxyl-, C₁-C₆alkoxy, C₃-C₆ cycloalkyl, , -C₁-
C₄alkoxyC₁-C₆alkyl, -C₁-C₃alkoxyC₁-C₆haloalkyl, -(CR⁹R¹⁰)C₁-C₆haloalkyl, -
(CR⁹R¹⁰)C(O)NR⁵R⁵, phenyl, -pyridyl, wherein the phenyl and pyridyl are
optionally substituted by one, two or three substituents independently selected
25 from the group consisting of C₁-C₃ alkyl, C₁-C₃ haloalkyl, C₁-C₃ alkoxy, C₂-C₃
alkenyl, C₂-C₃ alkynyl, halogen, cyano and nitro; or

R⁵ and R⁶ together form -CH₂CH₂OCH₂CH₂-; and

30 R⁷ is selected from the group consisting of hydrogen and C₁-C₆ alkyl;

R⁸ is selected from the group consisting of hydrogen, C₁-C₆ alkyl, C₁-C₆ alkoxy,
C₃-C₆ cycloalkyl, phenyl, -pyridyl, wherein the phenyl and pyridyl are optionally
substituted by one, two or three substituents independently selected from the
35 group consisting of C₁-C₃ alkyl, C₁-C₃ haloalkyl, C₁-C₃ alkoxy, C₂-C₃ alkenyl,
C₂-C₃ alkynyl, halogen, cyano and nitro;

R⁹ is hydrogen or methyl;

R¹⁰ is hydrogen or methyl; or

5 R⁹ and R¹⁰ together form –CH₂CH₂–; and

R¹¹ is hydrogen or methyl;

10 R¹² is selected from the group consisting of hydrogen, C₁-C₆ alkyl, hydroxyl and C₁-C₆ alkoxy-;

R¹³ is selected from the group consisting of hydrogen, C₁-C₆ alkyl, hydroxyl and C₁-C₆ alkoxy; or

15 R¹² and R¹³ together form –CH₂-X-CH₂–; and

X is selected from the group consisting of O, S and N-R¹⁴;

20 R¹⁴ is selected from the group consisting of hydrogen, C₁-C₃alkyl and C₁-C₃ alkoxy-;

R¹⁵ is independently selected from the group consisting of C₁-C₄ alkyl, C₁-C₄ haloalkyl, cyano and halogen;

25 R¹⁶ is hydrogen or C₁-C₆alkyl; and

R¹⁷ is selected from the group consisting of hydrogen, C₁-C₆alkyl, C₃-C₆cycloalkyl, C₁-C₆ alkoxy-C₁-C₃alkyl-, -C(O)C₁-C₆alkyl, -C(O)OC₁-C₆alkyl and CH₂CN; or

30 R¹⁶ and R¹⁷ together form –CH₂CH₂OCH₂CH₂–, –CH₂CH₂S(O)₂CH₂CH₂–;

R¹⁸ is hydrogen or C₁-C₆alkyl;

35 R¹⁹ is selected from the group consisting of hydrogen, C₁-C₆ alkyl, C₁-C₆ alkoxy, C₃-C₆cycloalkyl, phenyl, -pyridyl, wherein the phenyl and pyridyl are optionally substituted by one, two or three substituents independently selected from the

group consisting of C₁-C₃ alkyl, C₁-C₃ haloalkyl, C₁-C₃ alkoxy, C₂-C₃ alkenyl, C₂-C₃ alkynyl, halogen, cyano and nitro;

5 R²⁰ is selected from the group consisting of C₁-C₆alkyl, C₁-C₆haloalkyl, C₁-C₆alkoxy-, C₁-C₆haloalkoxy-, -NR²¹R²², phenyl and -pyridyl, wherein the phenyl and pyridyl are optionally substituted by one, two or three substituents independently selected from the group consisting of C₁-C₃ alkyl, C₁-C₃ haloalkyl, C₁-C₃ alkoxy, C₂-C₃ alkenyl, C₂-C₃ alkynyl, halogen, cyano and nitro;

10 R²¹ is selected from the group consisting of hydrogen, C₁-C₆ alkyl, C₁-C₆ alkoxy, C₁-C₆alkoxyC₁-C₃alkyl-, C₃-C₆ cycloalkyl, C₁-C₆haloalkyl- and C₁-C₆haloalkoxy-, -C(O)C₁-C₆alkyl, phenyl, -pyridyl, wherein the phenyl and pyridyl are optionally substituted by one, two or three substituents independently selected from the group consisting of C₁-C₃ alkyl, C₁-C₃ haloalkyl, C₁-C₃ alkoxy, C₂-C₃ alkenyl, 15 C₂-C₃ alkynyl, halogen, cyano and nitro;

R²² is hydrogen or C₁-C₆alkyl; or

R²¹ and R²² together form -CH₂CH₂OCH₂CH₂-;

20

R²³ is selected from the group consisting of hydrogen, C₁-C₆alkyl, C₁-C₆haloalkyl, C₁-C₆alkoxy- and C₁-C₆haloalkoxy-;

25

R²⁴ is selected from the group consisting of hydrogen, C₁-C₆alkyl, C₁-C₆alkoxyC₁-C₃alkyl-, C₃-C₆cycloalkyl, -CH₂CN, tetrahydropyranyl-, phenyl and -pyridyl, wherein the phenyl and pyridyl are optionally substituted by one, two or three substituents independently selected from the group consisting of C₁-C₃alkyl, C₁-C₃haloalkyl, C₁-C₃alkoxy, C₂-C₃alkenyl, C₂-C₃alkynyl, halogen, cyano and nitro;

30

R²⁵ is hydrogen or C₁-C₆ alkyl;

R²⁶ is hydrogen or C₁-C₆ alkyl;

35

G is selected from the group consisting of hydrogen, -(CH₂)_n-R^a, -C(O)-R^a, -C(O)-(CR^cR^d)_n-O-R^b, -C(O)NR^aR^a, -S(O)₂-R^a and C₁-C₈alkoxy-C₁-C₃alkyl-;

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