AU9177309

(12) PATENT ABRIDGMENT (11) Document No. AU-B-77309/91
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 652935

(54) Title
HALOPROPARGYL COMPOUNDS AND THE USE THEREOF AS MICROBICIDES

(51)[5] International Patent Classification(s)
C07C 251/86 **A01N 035/10** **A01N 043/08** **C07D 307/71**
C07D 307/76

(21) Application No. : **77309/91** (22) Application Date : **23.05.91**

(30) Priority Data

(31) Number	(32) Date	(33) Country
528653	**24.05.90**	**US UNITED STATES OF AMERICA**

(43) Publication Date : **28.11.91**

(44) Publication Date of Accepted Application : **15.09.94**

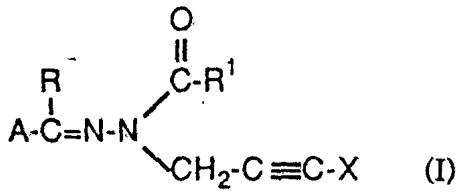
(71) Applicant(s)
ROHM AND HAAS COMPANY

(72) Inventor(s)
ADAM CHI-TUNG HSU

(74) Attorney or Agent
DAVIES COLLISON CAVE , 1 Little Collins Street, MELBOURNE VIC 3000

(57) Claim

1. A compound of the formula



(I)

wherein A is phenyl, naphthyl, phenyl substituted with one or more halo, cyano, (C_1-C_4)alkyl, nitro, (C_1-C_4)haloalkyl, and (C_1-C_4)thioalkyl, naphthyl substituted with one or more of halo, cyano, (C_1-C_4)alkyl, nitro, (C_1-C_4)haloalkyl, and (C_1-C_4)thioalkyl, thiophene, furan, thiophene substituted with one or more substituents selected from halo and nitro or furan substituted with one or more substituents selected from halo and nitro;

R is hydrogen, (C_1-C_4)alkyl or phenyl optionally substituted with one or more of halo, cyano, (C_1-C_4)alkyl, nitro, (C_1-C_4)haloalkyl, or (C_1-C_4)thioalkyl;

R^1 is (C_1-C_4) alkoxy; hydrogen; phenyl optionally substituted with one or more of halo, cyano, (C_1-

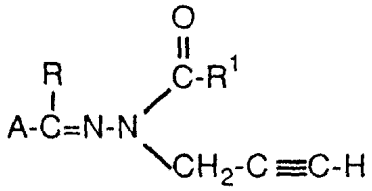
.../2

C_4)alkyl, nitro, (C_1-C_4)haloalkyl, or (C_1-C_4)thioalkyl; (C_1-C_8) alkyl; or heterocycles comprising thiophene, furan, imidazole, and triazole, each optionally substituted with one or more of (C_1-C_3)alkyl, halo, or nitro; and

X is I or Br.

9. Method of preventing or inhibiting the growth of bacteria, fungi or algae in a locus susceptible or subject to contamination thereby, comprising incorporating into or onto said locus a compound or composition according to any of claims 1 to 7, in an amount effective to adversely affect said growth.

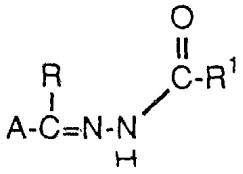
11. Method of preparing a compound as defined in any of claims 1 to 5, comprising reacting compound of the formula



(II)

with an iodinating or brominating agent.

12. Method according to claim 11 wherein compound (II) is made by reacting a compound of the formula



(III)

with propargyl bromide or iodide.

652935

AUSTRALIA
PATENTS ACT 1990
COMPLETE SPECIFICATION

NAME OF APPLICANT(S):

Rohm and Haas Company

ADDRESS FOR SERVICE:

DAVIES & COLLISON
Patent Attorneys
1 Little Collins Street, Melbourne, 3000.

INVENTION TITLE:

Halopropargyl compounds and the use thereof as microbicides

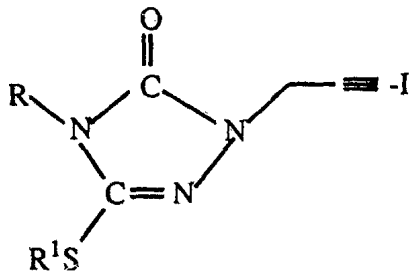
The following statement is a full description of this invention, including the best method of performing it known to me/us:-

This invention relates to control of microorganisms, and more specifically it concerns novel halopropargyl compounds and the use thereof as microbicides.

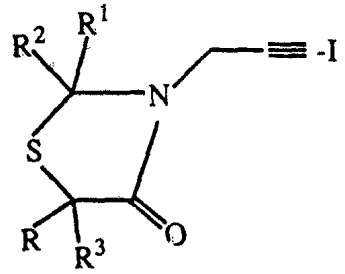
As used herein, the term 'microbicide' is intended to include, but is not restricted to, bactericides, fungicides and algicides, and 'microbicidal activity' refers to both the elimination of and the inhibition of growth of microbial organisms such as bacteria, fungi and algae.

Certain classes of iodopropargyl compounds have been proposed as microbicides but no compound within those classes has yet achieved commercial success.

US-A-4,616,004 to Edwards discloses fungicidal activity for compounds of the formula



US-A-4,639,460 to Rose shows compounds of the formula

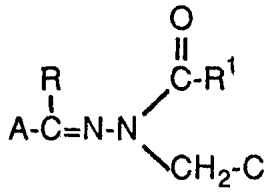


as fungicides.

US-A-4,520,023 to Schmitt shows 3-(3-iodopropargyl)-benzo-1,2,3-triazolin-4-ones and their use as microbicidal agents.

There was no suggestion in the prior art that compounds within the formula of the present invention would have utility in controlling microorganisms.

The present invention concerns a new class of halopropargyl compounds, and accordingly it provides in one aspect compounds of the formula



(I)

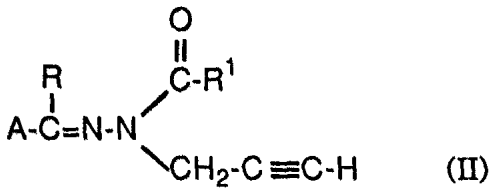
wherein A is phenyl, naphthyl, phenyl substituted with one or more halo, cyano, (C_1-C_4)alkyl, nitro, (C_1-C_4)haloalkyl, and (C_1-C_4)thioalkyl, naphthyl substituted with one or more of halo, cyano, (C_1-C_4)alkyl, nitro, (C_1-C_4)haloalkyl, and (C_1-C_4)thioalkyl, thiophene, furan, thiophene substituted with one or more substituents selected from halo and nitro or furan substituted with one or more substituents selected from halo and nitro;

R is hydrogen, (C_1-C_4)alkyl or phenyl optionally substituted with one or more of halo, cyano, (C_1-C_4)alkyl, nitro, (C_1-C_4)haloalkyl, or (C_1-C_4)thioalkyl;

R1 is (C_1-C_4) alkoxy; hydrogen; phenyl optionally substituted with one or more of halo, cyano, (C_1-C_4)alkyl, nitro, (C_1-C_4)haloalkyl, or (C_1-C_4)thioalkyl; (C_1-C_8) alkyl; or heterocycles comprising thiophene, furan, imidazole, and triazole, each optionally substituted with one or more of (C_1-C_3)alkyl, halo, or nitro.

In another aspect the invention provides a method of preparing said

compound comprising reacting a compound of the formula



(II)

with an iodinating or brominating agent.

A further aspect of the invention concerns the use of such compounds or compositions as microbidcides, and in a still further aspect there is provided a method of preventing or inhibiting the growth of bacteria, fungi or algae in a locus susceptible or subject to contamination thereby, comprising incorporating into or onto said locus a compound or composition according to any of claims 1 to 7, in an amount effective to adversely affect said growth.

The compounds of the invention are of formula I as set forth above. The iodopropargyl compounds, i.e., those wherein X is I, are generally preferred. Most preferred are the following compounds:

1. N'-Methoxycarbonyl-N'-3-bromopropargyl 4-chloro- benzaldehyde hydrazone
2. N'-Formyl-N'-3-bromopropargyl 4-chlorobenzaldehyde hydrazone
3. N'-Methoxycarbonyl-N'-3-iodopropargyl benzaldehyde hydrazone
4. N'-Methoxycarbonyl-N'-3-iodopropargyl 4-methylbenzaldehyde hydrazone
5. N'-Methoxycarbonyl-N'-3-iodopropargyl 4-chlorobenzaldehyde hydrazone
6. N'-Benzoyl-N'-3-iodopropargyl benzaldehyde hydrazone

7. N'-Methoxycarbonyl-N'-3-bromopropargyl 4-fluorobenzaldehyde hydrazone
8. N'-Methoxycarbonyl-N'-3-iodopropargyl 5-nitro-2-furancarboxaldehyde hydrazone
9. N'-Methoxycarbonyl-N'-3-iodopropargyl 4-cyanobenzaldehyde hydrazone
10. N'-Methoxycarbonyl-N'-3-iodopropargyl 4-fluorobenzaldehyde hydrazone
11. N'-Methoxycarbonyl-N'-3-iodopropargyl 3,4-dichlorobenzaldehyde hydrazone
12. N'-Benzoyl-N'-3-iodopropargyl 3-nitrobenzaldehyde hydrazone
13. N'-Ethoxycarbonyl-N'-3-iodopropargyl 3,4-dichlorobenzaldehyde hydrazone
14. N'-Ethoxycarbonyl-N'-3-bromopropargyl 3,4-dichlorobenzaldehyde hydrazone
15. N'-Methoxycarbonyl-N'-3-iodopropargyl 3,5-dichlorobenzaldehyde hydrazone
16. N'-Methoxycarbonyl-N'-3-bromopropargyl 3,5-dichloobenzaldehyde hydrazone

The iodopropargyl compounds, i.e., those wherein X is I, are generally preferred.

The invention also covers, compositions comprising a compound according to formula I and either an agronomically acceptable carrier, a cosmetic agent, a cutting oil, a soap or synthetic detergent, a stabilizer, or a film-forming material or the like: such compositions have a wide range of utility for protecting against or controlling microorganisms from a wide variety of classes including fungus, bacteria, algae, viruses and yeasts. Such compositions generally contain from 0.001 to 99.99% by weight compound (I), preferably from 0.01 to 5%. The preferred utilities of the compositions are to protect wood, paint, adhesive, glue, paper, textile, leather, plastics, cardboard, lubricants, cosmetics, food, caulking, feed and industrial cooling water from microorganisms.

The following lists specific industries and applications of the compounds or compositions:

Industry	Application
Adhesives, sealants	adhesives caulks sealants
Agriculture/food chain	adjuvant preservation agricultural active ingredient agricultural chemical preservative agricultural formulations preservation animal feed preservation dairy chemicals fertilizer preservation food preservation food processing chemicals grain preservation post-harvest produce protection sugar processing tobacco
Construction products	asphalt / concrete cement modifiers construction products roof mastics synthetic stucco wall mastics joint cement
Cosmetics and toiletries	cosmetics raw materials for cosmetics, toiletries toiletries
Disinfectants, antiseptics	antiseptic disinfectant

Emulsions, dispersions	aqueous dispersions dispersed pigments latex photographic emulsions pigment slurries polymer latices
Formulated consumer & industrial products	air fresheners fabric softeners hand cleaners polishes, floor, furniture, shoe sponges & towelettes spray strach waxes
Industrial processing, misc	dry cleaning fluids preservation electrodeposition paint, baths, rinses. electrodeposition pre-treatment, post rinses industrial fluids preservation pasteurization baths process aid preservation
Industrial water treatment	air washers cooling towers cooling water water cooling
Laundry	household laundry products laundered goods laundry wash water pre-washers sanitizers-laundry removers, spot & stain
Leather, leather products	leather and hide leather and hide products

Lubricants, hydraulic aids	automotive lubricants and fluids conveyor lubricants greases hydraulic fluids hydraulic oils lubricants
Medical devices	diagnostic enzymes diagnostic kits medical devices
Metalworking & related app's	cutting fluids metal cleaning metalworking fluids
Odor control (active ingredient)	air conditioning animal bedding cat litter chemical toilet prep'ns deodorizers humidifiers industrial deodorants sanitary formulations toilet bowls
Paints and coatings	coating emulsions paints
Paper and wood pulp, their products	absorbant materials of paper and wood pulp packaging materials of paper and wood pulp paper paper products paper treatment soap wrap wood pulp wood pulp products
Paper mill	paper mill slimicides pulp and paper slurries

Petroleum refining, fuels	aviation fuels (jet fuel, aviation gas) burner, diesel and turbine fuel oils coal slurries diesel fuel additives diesel fuels fuels gasoline heating oils hydrocarbons kerosene liquefied petroleum gas petrochemical feedstocks petroleum products, storage, transportation and production recycled petroleum products residual fuel oils turbine oils
Photographic chemicals and process	photographic processing - wash water, rinses photoplate processing chemicals (developers, stabilizers etc)
Printing	fountain solutions (printing) ink components (pigments, resins, solvents, etc) inks
Sanitizers (active)	sanitizers sanitizers-dairy sanitizers-dental sanitizers-fermentation sanitizers-food preparation sanitizers-food processing sanitizers-medical sanitizers-rendering sanitizers-veterinary

Soaps, detergents, cleaners	cleaners detergents, hand automatic laundry, other household cleaners industrial cleaners liquid soaps, hand, dish, laundry oil and grease remover powdered soaps raw materials for cleaning products soaps surfactants
Textiles, textile products	bonded fabrics burlap canvas canvas goods carpet backing carpets clothing coated fabrics curtains draperies engineering textiles fibers geotextiles goods made of textiles knitted fabrics nets nonwoven fabrics rope rugs textile accessories textile products textiles upholstery woven fabrics yarn
Textile processing	dye fixatives dyes fiber lubricants hand modifiers

	sizes
	textile processing fluids
Therapeutic (active or preservative)	animal health/veterinary
	aquaculture
	dental
	human health
	pharmaceutical /therapeutic
Water purification	charcoal beds
	deionization resins
	filters
	membranes
	reverse osmosis membranes
	ultrafilters
	water purification
	water purification pipes, tubing
Wood applications	lazures (wood stains)
	wood
	wood products
Miscellaneous	alcohols
	bedding incorporating water or gels
	ceramic
	contact lens cases-leaching
	electronic circuitry
	electronics chemicals
	enzymes-food production
	enzymes-industrial
	gel cushions
	laboratory reagents
	marine antifoulants
	mildewcides
	mining applications
	natural rubber latex
	oil field applications
	pipes
	plastics
	polymer systems
	polymers and resins (synthetic and natural)
	reagent preservation

rubber
rubber products
skin remover
solid protective/decorative films
swimming pools
waste treatment
water beds

The amounts of the compound to be used depend on the application. The useful amounts for a particular application are similar to amounts used for other microbicide compounds.

The compound can be used in combination with other microbicides. The term "microbicide" is considered equivalent to "antimicrobial" as used herein.

Compounds of formula I can be prepared by a variety of methods. One suitable method comprises reacting a compound of formula II with an iodinating or brominating agent.

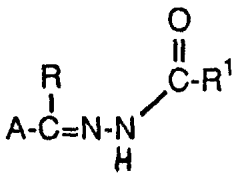
Suitable iodinating or brominating agents include, for example, iodine, bromine, an iodine-amino compound such as morpholine-iodine complex, morpholine-bromine complex, N-bromosuccinimide ("NBS") and N-iodosuccinimide ("NIS"), the latter being the most preferred.

When an iodine, bromine, or iodo-amino compound is used, base should also be used, preferably sodium or potassium hydroxide, and solvent such as methanol, ethanol, and aqueous ethanol should also be used.

When NIS or NBS is used, a catalyst such as, for example, silver nitrate, or the like, should be used in presence of solvent such as acetone, methyl ethyl ketone, tetrahydrofuran, and the like.

Reaction times of about 20 minutes to about 24 hours have been utilized successfully with reaction temperatures of about 0°C to about 25°C.

Preferably the compound of formula (II) is made by reacting a compound of formula (III)



(III)

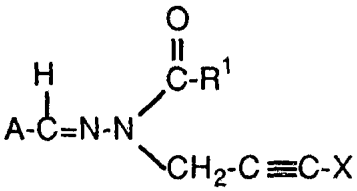
with a propargyl bromide or iodide.

Suitable methods of application of compounds of formula I to control fungi, bacteria, algae, viruses, yeasts, and the like are in amounts and with carriers, etc., as well known in the art.

The following examples are presented to illustrate a few embodiments of the invention. All parts and percentages are by weight unless otherwise indicated.

Table (1) shows the structures and the physical data of the preferred representative compounds.

Table 1 - Physical Data



No.	A	R'	X	Melting Point
1	4-Cl-Ph	OMe	Br	102-105°C
2	4-Cl-Ph	H	Br	135-140°C
3	Ph	OMe	I	149-151°C
4	4-Me-Ph	OME	I	112-116°C
5	4-Cl-Ph	OMe	I	143-146°C
6	Ph	Ph	I	109-111°C
7	4-F-Ph	OMe	Br	86-91°C
8	5-NO_2-furan	OMe	I	-
9	4-CN-Ph	OMe	I	126-132°C
10	4-F-Ph	OMe	I	-
11	3,4-Cl_2-Ph	OMe	I	110-118°C
12	3-NO_2-Ph	Ph	I	139-145°C

13	3,4-Cl_2-Ph	OEt	I	169-170°C
14	3,4-Cl_2-Ph	OEt	Br	148-149°C
15	3,5-Cl_2-Ph	OMe	I	183-184°C
16	3,5-Cl_2-Ph	OMe	Br	141-142°C

Example 1

Preparation of N'-methoxycarbonyl-N'-3-bromopropargyl 4-chlorobenzaldehyde hydrazone

To the suspension of N'-methoxycarbonyl 4-chlorobenzaldehyde hydrazone (4.0 g, 0.0188 mole) in dry acetone (50 ml) at room temperature under nitrogen was added potassium carbonate (3.9 g, 0.028 mole), followed by propargyl bromide (3.4 g, 0.028 mole) with magnetic stirring. The reaction mixture was refluxed for 24 hr. The reaction mixture was cooled down to room temperature and was poured into water (200 ml). The resultant precipitate was collected by suction-filtration affording 4.7 g (99% yield) of N'-methoxycarbonyl-N'-propargyl 4-chlorobenzaldehyde hydrazone, m.p. = 102-105°C. An NMR spectrum showed the desired compound.

This intermediate was used for the next step without further purification.

To the suspension of N'-methoxycarbonyl-N'-propargyl 4-chloro-benzaldehyde hydrazone (1.25 g, 0.005 mole) in dry acetone (40 ml) at room temperature with magnetic stirring was added N-bromo-succinimide (1.03 g, 0.0058 mole), followed by silver nitrate (0.011 g, 0.00065 mole). The reaction mixture was stirred at room temperature for 1 hr. The purple reaction mixture was poured into water and the resultant precipitate was collected by suction-filtration to give a crude product. The crude product was dissolved in ethyl acetate (50ml), dried over anhydrous sodium sulfate, and filtered to get a colorless solution. The solvent was evaporated on a rotary evaporator affording 1.10 g (67.1 % yield) of N'-methoxycarbonyl-N'-3-bromopropargyl 4-chloro-benzaldehyde hydrazone as a solid. m.p. = 102-105°C. An NMR spectrum showed the desired compound.

Example 2

Microbicidal Evaluations of Compounds

A minimum inhibitory concentration (MIC) value is obtained using a broth, two-fold serial dilution test performed as follows: A stock solution or dispersion of the test compound, typically at a concentration of 1%, is made in a 5:3:2 solvent solution of acetone, methanol, and water. A volume of the stock solution is dispensed into culture media to give an initial starting test concentration of 500 ppm compound.

The test is carried out by adding an equal volume of broth to each vessel in the dilution series, except for the first vessel. The first vessel contains twice the volume of broth plus the initial concentration of test compound. One half of the broth from the first vessel is transferred to the second vessel. After being mixed, one half the resulting volume is removed from the second vessel and transferred to the third vessel. The entire cycle is repeated sufficiently to give a series of concentrations amounting to 500, 250, 125, 63, 31, 16, 8, and 4 ppm (or 100, 50, 25, 12.5, 6.2, 3.1, 1.6, and 0.8), respectively.

Each vessel is then inoculated with a cell suspension of the appropriate test organism. Bacteria are grown in broth and fungi on agar slants for a time and at a temperature appropriate to the species being tested. At the end of the growth period, the broth is vortexed to disperse the cells. In the case of fungi, the spores are harvested by pipetting water onto the slant and dislodging the spores with a sterile loop. The cell/spore suspension is standardized by controlling incubation time, temperature, and the volume of the diluent. The suspension is then used to inoculate the vessels containing the broth compound. The vessels are then incubated at the appropriate temperature. After the incubation, the vessels are examined for growth/no growth. The minimum inhibitory concentration (MIC) is defined as the lowest concentration of compound that results in complete inhibition of growth of the test organism.

The organisms tested to demonstrate biocidal activity include:

BACTERIA:

Pseudomonas fluorescens (Psfl)

Pseudomonas aerugenosa (Psae)

Escherichia coli (Ecol)

Staphylococcus aureus (Saur)

FUNGI:

Aspergillus niger (Anig)

Aureobasidium pullulans (Apul)

Table 2: Microbicidal Evaluation

The Result of Minimum Inhibitory Concentration (MIC) Tests

	MIC(ppm)					
Compound #	Psfl	Psae	Ecol	Saur	Anig	Apul
1	>500	250	>500	>500	>500	63
2	>500	250	>500	>500	>500	63
3	>500	250	>500	125	<4	<4
4	125	125	250	16	<4	8
5	125	16	125	8	<4	<4
6	50	25	50	50	6	3
7	125	31	125	63	31	31
8	250	125	63	<4	<4	<4
9	>500	>500	>500	>500	>250	-
10	>500	>500	>500	<4	<4	<4
11	>500	>500	>500	8	<4	<4
12	>100	>100	>100	>100	>100	100
13	>100	>100	>100	>100	100	>100
14	>100	>100	>100	>100	>100	>100
15	>100	>100	>100	>100	>100	>100
16	>100	>100	>100	>100	>100	>100

Example 3
In-Vitro Plant Fungicide Tests of Compounds

The organisms employed in the test are:

PYU	Pythium ultimum (Oomycete)
PHY	Phytophthora capsici (Oomycete)
PIR	Piricularia oryzae (Ascomycete)
HEL	Cochliobolus sativus (Ascomycete)
BOC	Botrytis cinerea (Ascomycete)
FUS	Fusarium roseum (Ascomycete)
SEP	Septoria nodorum (Ascomycete)
RHI	Rhizoctonia solani (Basidiomycete)
XAN	Xanthomonas campestris (bacterium)

Methods:

1. Culture maintenance: Transfers in steps 1 and 2 are done in a laminar flow hood. All 8 fungi and the bacterium used in this test are transferred and maintained on potato dextrose agar plates each week (2 plates/organism). Organisms are used when they are the following ages: a. 1 week old: PYU, PHY, RHI; b. 2 weeks old: XAN, PIR, BOC, HEL, FUS, SEP. Pythium ultimum and Phytophthora capsici are transferred to asparagine-sucrose broth shake cultures (ASB). Rhizoctonia solani, Fusarium roseum, and Zanthomonas campestris are maintained in yeast extract-dextrose broth (YDB) on a shaker. Culture flasks are inoculated with 6 mycelial plugs each (except for Pythium which is inoculated with only 3 plugs) taken from PDA plates. All liquid shaker cultrues are used after 2 days growth.

2. Inoculum preparation. Conidia and mycelium from PIR, BOC,

HEL and SEP are lightly scraped off into YDB so that mostly conidia are used as inoculum. The conidial suspension is strained through a double layer of cheesecloth to remove mycelial clumps. One plate produces enough conidia or mycelium to inoculate 100 ml of YDB. XAN broth culture is poured (1ml culture/100 ml broth) into YDB. PYU, PHY, RHI and FUS cultures are ground up (2-3 5 second bursts in a blender) and all but Pythium and Phytophthora are filtered through a double layer of sterile cheesecloth to remove large mycelial clumps. Ten ml of the culture solutions of R. solani and F. roseum are added to 90 ml of YSB and 10 ml of the P. capsici is added to 90 ml ASB. Two ml of the culture solution of P. ultimum is added to 98 ml of ASB. Care must be made not to overinoculate (e.g. solutions should appear fairly clear to the eye, yet when held up to light a faint cloudiness should be visible) or standards will not behave properly. The inoculum mixtures are placed in microtiter plates using a 12-tipped pipet. 175 µl (single dose) or 100µl (dose-response test) of inoculum broth is placed in each well of the microtiter plates. The plates with inoculated media are placed in the refrigerator overnight. There are two replications per treatment.

3. Addition of compounds. This operation is carried out in a chemistry hood. Six microtiter plates have 245 microliters of sterile water added to their wells ahead of time. 10 Mg a.i. of the compounds are placed in 1 ml 1:1 acetone:methanol. 5 Microliters of this solution is pipetted into the microtiter plates containing the sterile water according to the grid. There are 45 compounds and 3 scattered control treatments per plate. There are 2 replicates per treatment. 25 Microliters of solution is transferred to the inoculated plates with a 96 well replicator. The replicator is flame sterilized with alcohol, rinsed with sterile water, and blotted on sterile paper towells between each transfer.

Table 3

The Results of In-Vitro Plant Fungicide Tests

Compound	Rate (PPM)	% Control								
		BOC	FUS	HEL	PHY	PIR	PYU	RHI	SEP	XAN
1	25	0	0	0	0	0	0	0	-	0
2	25	0	0	0	75	50	0	0	-	0
3	25	0	75	0	75	0	75	100	-	0
	50	0	100	0	100	95	100	100	75	0
4	-	-	-	-	-	-	-	-	-	-
5	25	0	95	100	50	100	50	75	-	0
6	25	0	0	0	100	100	100	0	100	0
7	25	0	0	0	0	0	0	0	100	0
	50	0	0	0	90	90	100	0	0	0
8	50	0	100	100	100	100	100	100	100	0
	50	0	100	100	0	100	-	100	100	0
9	50	50	100	100	95	100	100	100	100	0
10	50	0	100	100	100	100	100	100	100	0
11	50	50	100	100	90	100	0	100	90	0
12	50	0	0	0	0	100	0	95	0	0
13	25	0	75	50	0	100	0	90	50	0
14	25	0	0	0	0	0	0	50	0	0
15	25	0	75	50	0	100	0	75	0	0
16	25	0	0	0	0	0	0	0	0	0

Example 6

Agricultural Fungicide Evaluations of Compounds

The compounds of this invention were tested for fungicidal activity in vivo against cucumber downy mildew (CDM), rice blast (RB), septoria glume blotch of wheat (SNW), tomato late blight (TLB), wheat powdery mildew (WPM) and wheat leaf rust (WLR) and the results are shown in Table 4. In tests on cereals (except for rice plants used for testing rice blast), the plants were trimmed about 24 hours prior to the application of the fungicide compound to provide a uniform plant height and to facilitate uniform application of the compound and inoculation with the fungus. The

compounds were dissolved in a 2:1:1 mixture of water, acetone, and methanol, sprayed onto the plants, allowed to dry (four to six hours), and then the plants were inoculated with the fungus. Each test utilized control plants which were sprayed with the water, acetone, and methanol mixture and inoculated with the fungus. The remainder of the technique of each of the tests is given below and the results are reported as percent disease control (percentages of plants treated with the compounds of the present invention lacking disease signs or symptoms compared to the untreated control plants).

Cucumber Downy Mildew (CDM):

Pseudoperonospora cubensis was maintained on leaves of live Marketer cucumber plants in a constant temperature room at 65°F to 75°F (18-24°C) in humid air with moderate light intensity for 7 to 8 days. A water suspension of the spores from infested leaves was obtained and the spore concentration was adjusted to about 100,000 per ml of water.

Marketer cucumber seedlings were inoculated by spraying the underside of the leaves with a DeVilbiss atomizer until small droplets were observed on the leaves. The inoculated plants were incubated in a mist chamber for 24 hours at about 70°F and then subsequently incubated for 6 to 7 days in a controlled temperature room under mist at 65°F to 75°F. Seven days after inoculation, the percent disease control was determined.

Rice Blast (RB):

Nato rice plants were inoculated with Piricularia oryzae (about 20,000 conidia per ml) by spraying the leaves and stems with an airbrush until a uniform film of inoculum was observed on the leaves. The inoculated plants were incubated in a humid environment (75°F to 85°F) (24-29°C) for about 24 hours, then placed in a greenhouse environment (70°F to 75°F) (21-24°C). Seven to eight days after inoculation, the percent disease control was determined.

Tomato Late Blight (TLB)

Phytophthora infestans was cultured on four week old Pixie tomato plants in a controlled environment room (65°F to 70°F and 100% relative humidity). After storage, the spores were washed from the leaves with water and dispersed by DeVilbiss atomizer over three week old Pixie tomato plants which had been sprayed previously with experimental fungicides. The inoculated plants were placed in a humidity cabinet at 70°F (21°C) and constant mist for 24 hours for infection. The plants were then moved to the controlled environment room as above and scored after three more days incubation. Disease control levels were recorded as percent control four days after inoculation and five days after spraying the compounds.

Wheat Powdery Mildew (WPM):

Erysiphe graminis (f. sp. tritici) was cultured on Pennol wheat seedlings in a controlled temperature room at 65°F to 75°F. Mildew spores were shaken from the culture plants onto Pennol wheat seedlings which had been sprayed previously with the fungicide compound. The inoculated seedlings were kept in a controlled temperature room at 65°F to 75°F and subirrigated. The percent disease control was rated 8 to 10 days after the inoculation.

Wheat Leaf Rust (WLR):

Puccinia recondita (f. sp. tritici Races PKB and PLD) was cultured on seven day old wheat (cultivar Fielder) over a 14 day period in the greenhouse. Spores were collected from the leaves with a cyclone vacuum or by settling on aluminum foil. The spores were cleaned by sieving through a 250 micron opening screen and stored or used fresh. Storage employed sealed bags in an Ultralow freezer. When stored, spores must be heat shocked for two minutes at 40°F (5°C) before use. A spore suspension is prepared from dry uredia by adding 20 mg (9.5 million) per ml of Soltrol oil. The suspension is dispensed into gelatin capsules (0.7 ml capacity) which attach to the oil atomizers. One

capsule is used per flat of twenty of the two inch square pots of seven day old Fielder wheat. After waiting for at least 15 minutes for the oil to evaporate from the wheat leaves, the plants are placed in a dark mist chamber (18-20°C and 100% relative humidity) for 24 hours. The plants are then put in the greenhouse for the latent period and scored after 10 days for disease levels. Protective and curative tests were inoculated one day after and two days, respectively, before spraying the plants with the test chemicals.

Table 4

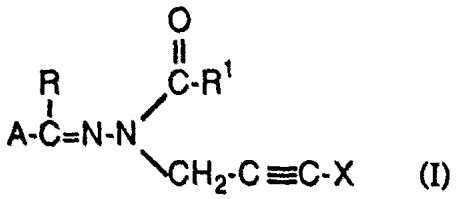
Green House Test Results of Plant Diseases Control

Compound	Rate (ppm)	% Control					
		CDM	RB	SNW	TLB	WLR	WPM
1	-	-	-	-	-	-	-
2	600	-	-	-	50	0	0
3	200	99	90	-	80	50	50
4	200	95	90	50	80	50	0
5	200	99	95	0	90	80	0
6	-	-	-	-	-	-	-
7	200	0	0	0	0	0	0
8	200	0	90	0	0	0	0
9	200	85	0	0	0	0	0
10	200	50	50	0	0	0	50
11	200	95	90	0	80	-	0
12	-	-	-	-	-	-	-
13	200	85	0	0	0	50	50
14	200	0	0	0	0	0	85
15	200	0	0	0	0	0	0
16	200	0	0	0	0	0	0

Throughout this specification and the claims which follow, unless the context requires otherwise, the word "comprise", or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated integer or group of integers but not the exclusion of any other integer or group of integers.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A compound of the formula



(I)

wherein A is phenyl, naphthyl, phenyl substituted with one or more halo, cyano, (C_1-C_4)alkyl, nitro, (C_1-C_4)haloalkyl, and (C_1-C_4)thioalkyl, naphthyl substituted with one or more of halo, cyano, (C_1-C_4)alkyl, nitro, (C_1-C_4)haloalkyl, and (C_1-C_4)thioalkyl, thiophene, furan, thiophene substituted with one or more substituents selected from halo and nitro or furan substituted with one or more substituents selected from halo and nitro;

R is hydrogen, (C_1-C_4)alkyl or phenyl optionally substituted with one or more of halo, cyano, (C_1-C_4)alkyl, nitro, (C_1-C_4)haloalkyl, or (C_1-C_4)thioalkyl;

R^1 is (C_1-C_4) alkoxy; hydrogen; phenyl optionally substituted with one or more of halo, cyano, (C_1-C_4)alkyl, nitro, (C_1-C_4)haloalkyl, or (C_1-C_4)thioalkyl; (C_1-C_8) alkyl; or heterocycles comprising thiophene, furan, imidazole, and triazole, each optionally substituted with one or more of (C_1-C_3)alkyl, halo, or nitro; and

X is I or Br.

2. Compound according to claim 1 wherein A is phenyl, phenyl substituted with halo or nitro, or furan substituted with nitro.

3. Compound according to claim 1 or 2 wherein X is I.

4. Compound according to any preceding claim wherein R is hydrogen and R^1 is hydrogen, (C_1-C_4)alkoxy, or phenyl.

5. Compound according to any preceding claim, which is N'-methoxycarbonyl-N'-3-bromopropargyl 4-chloro benzaldehyde hydrazone; N'-formyl-N'-3-bromopropargyl 4-chlorobenzaldehyde hydrazone; N'-methoxycarbonyl-N'-3-iodopropargyl benzaldehyde hydrazone; N'-methoxycarbonyl-N'-3-iodopropargyl 4-methylbenzaldehyde hydrazone; N'-methoxycarbonyl-N'-3-iodopropargyl 4-chlorobenzaldehyde hydrazone; N'-benzoyl-N'-3-iodopropargyl benzaldehyde hydrazone; N'-methoxycarbonyl-N'-3-bromopropargyl 4-fluorobenzaldehyde hydrazone; N'-methoxycarbonyl-N'-3-iodopropargyl 5-nitro-2-furancarboxaldehyde hydrazone; N'-methoxycarbonyl-N'-3-iodopropargyl 4-cyanobenzaldehyde hydrazone; N'-methoxycarbonyl-N'-3-iodopropargyl 4-fluorobenzaldehyde hydrazone; N'-methoxycarbonyl-N'-3-iodopropargyl 3,4-dichlorobenzaldehyde hydrazone; N'-benzoyl-N'-3-iodopropargyl 3-nitrobenzaldehyde hydrazone; N'-ethoxycarbonyl-N'-3-iodopropargyl 3,4-dichlorobenzaldehyde hydrazone; N'-ethoxycarbonyl-N'-3-bromopropargyl 3,4-dichlorobenzaldehyde hydrazone; N'-methoxycarbonyl-N'-3-iodopropargyl 3,5-dichlorobenzaldehyde hydrazone; or N'-methoxycarbonyl-N'-3-bromopropargyl 3,5-dichlorobenzaldehyde hydrazone.

6. Composition comprising a compound according to claim 1 and an agronomically acceptable carrier, a cosmetic agent, a cutting oil, a soap or synthetic detergent, a stabilizer or a film-forming material.

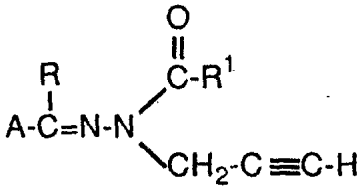
7. Composition according to claim 6, wherein said compound is present in an amount of from 0.001 to 99.99% by weight, preferably from 0.01 to 5% by weight.

8. The use of a compound or composition according to any preceding claim as a microbicide.

9. Method of preventing or inhibiting the growth of bacteria, fungi or algae in a locus susceptible or subject to contamination thereby, comprising incorporating into or onto said locus a compound or composition according to any of claims 1 to 7, in an amount effective to adversely affect said growth.

10. Method according to claim 9, wherein said locus is wood, paint, adhesive, glue, paper, textile, leather, plastics, cardboard, lubricants, cosmetics, food, caulking, feed or industrial cooling water.

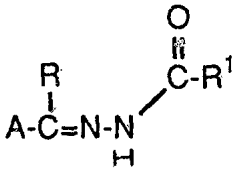
11. Method of preparing a compound as defined in any of claims 1 to 5, comprising reacting compound of the formula



(II)

with an iodinating or brominating agent.

12. Method according to claim 11 wherein compound (II) is made by reacting a compound of the formula



(III)

with propargyl bromide or iodide.

13. A compound according to claim 1, a composition comprising a said compound, or a method of preparation or use thereof, substantially as hereinbefore described with reference to the Examples.

~~14. The steps, features, compositions and compounds~~ disclosed herein or referred to or ~~indicated~~ in the specification and/or claims ~~of~~ this application, individually ~~or collectively~~, and any and all combinations ~~of any two or more of said steps or features.~~

DATED this TWENTY THIRD day of MAY 1991

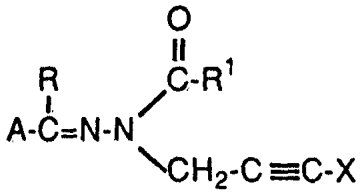
Rohm and Haas Company

by DAVIES & COLLISON
Patent Attorneys for the applicant(s)

HALOPROPARGYL COMPOUNDS AND THE USE THEREOF AS MICROBICIDES

ABSTRACT

Compounds of the formula



wherein A is selected from the group consisting of (1) phenyl, (2) naphthyl, (3) phenyl substituted with one or more halo, cyano, (C_1-C_4)alkyl, nitro, (C_1-C_4)haloalkyl, and (C_1-C_4)thioalkyl, (4) naphthyl substituted with one or more halo, cyano, (C_1-C_4)alkyl,nitro, (C_1-C_4)haloalkyl, and (C_1-C_4)thioalkyl, (5) thiophene, (6) furan, (7) thiophene substituted with one or more substituents selected from halo and nitro, and (8) furan substituted with one or more substituents selected from halo and nitro;

R is selected from the group consisting of hydrogen, (C_1-C_4)alkyl and substituted or unsubstituted phenyl wherein the substituents are selected from one or more halo, cyano, (C_1-C_4)alkyl, nitro, (C_1-C_4)haloalkyl, and (C_1-C_4)thioalkyl and

R1 is selected from the group consisting of (C_1-C_4) alkoxy; hydrogen; optionally substituted phenyl wherein the phenyl substitutents are selected from the group consisting of halo, cyano, (C_1-C_4)alkyl; nitro, (C_1-

C_4)haloalkyl, and (C_1-C_4)thioalkyl; (C_1-C_8) alkyl; and optionally substituted heterocycles wherein said heterocycles are selected from the group consisting of thiophene, furan, imidazole, and triazole, which are optionally substituted with (C_1-C_3)alkyl, halo, and nitro; and

X is selected from the group consisting of I and Br.