

PATENT SPECIFICATION

814948



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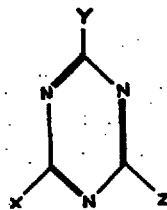
COMPLETE SPECIFICATION

Improvements in and relating to Plant Growth Influencing Compositions

We, J. R. GEIGY A.-G. a body corporate organised according to the laws of Switzerland, of 215, Schwarzwaldallee, Basle, Switzerland, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention is concerned with new compositions for influencing, and more particularly, inhibiting the growth of plants and with methods of applying these compositions for influencing the growth of plants.

The surprising observation has been made that s-triazine derivatives of the general formula:



wherein X represents hydrogen, a hydrocarbon radical bound either direct or by way of O, S, or NH or two hydrocarbon radicals bound by way of N, the hydrocarbon radical(s) possibly being substituted by chlorine or hydroxyl groups, and Y and Z represent the mercapto or amino group or a hydrocarbon radical bound by way of O, S or NH or two hydrocarbon radicals bound by way of N, the hydrocarbon radical(s) possibly being substituted by chlorine or hydroxyl groups, and wherein any aromatic rings in the radicals X, Y and Z should not be bound direct to the triazine ring or to the bridging atom, have an inhibitory influence on the growth of plants, or may even have a lethal action, even in very low concentrations.

According to the present invention therefore

[Price 3s. 6d.]

plants, especially for killing weeds, are provided comprising an s-triazine derivative of the above general formula and, as a carrier,
(a) a water-insoluble pulverulent solid, or
(b) a mineral oil fraction or chlorohydrocarbon boiling above 150° C., or
(c) an emulsifying agent together with a water-insoluble pulverulent solid or an organic solvent.

The preferred s-triazine derivatives are those in which two of the symbols X, Y and Z represent the same or different monoalkyl-amino, dialkyl amino, or monoalkenyl amino radical, the alkyl and alkenyl group having at most three carbon atoms. The greater part of such s-triazine derivatives are easily produced by reacting cyanuric chloride with 3 mols of suitable amines and/or alcohols and/or mercaptans. This reaction can be performed in steps. Compounds wherein X represents hydrogen are obtained for example by reacting cyanuric chloride with 2 mols of amines and/or alcohols and/or mercaptans, the remaining chlorine atom being removed by reduction. As compounds wherein X represents hydrogen or a hydrocarbon radical and Y and Z represents amino groups, acyloguanamines are produced for example, by heating the salts of biguanide or substituted biguanides and carboxylic acids.

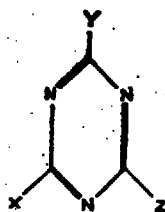
Compounds of the formula defined above are excellently suitable as active ingredients for weed killers, both for the killing of weeds among cultivated plants (selective herbicides) and for the total elimination or inhibition of undesired plant growth (overall toxic herbicides). The word "weeds" here also means undesired cultivated plants, e.g. those which have been previously planted or those which are planted in neighbouring areas. In addition, the compounds defined above also exert other inhibitory influences on the plant growth and may be used for example in particular for de-

iation, e.g. of cotton plants, acceleration of
ness by desiccation, e.g. of potato plants,
blossom thinning, retardation of blossoming,
prolongation of the harvesting period and
oring propensities. Also the use of herbicides
in be of interest in the long run if the selec-
tivity of the agent is insufficient, to exclude
reduction of the yield of the cultivated plants
t the time of the application.

The following triazine derivatives are ex-
amples of active ingredients which can be used.
The known compounds are shown under A;

compounds which have not been described up
to now are given under B together with their
melting or boiling points.

General formula:



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A)

X	Y	Z
CH ₃ -O-	CH ₃ -O-	CH ₃ -O-
C ₂ H ₅ -O-	C ₂ H ₅ -O-	C ₂ H ₅ -O-
CH ₂ =CH-CH ₂ -O-	CH ₂ =CH-CH ₂ -O-	CH ₂ =CH-CH ₂ -O-
C ₂ H ₅ -S-	C ₂ H ₅ -S-	C ₂ H ₅ -S-
H ₂ N-	CH ₂ =CH-CH ₂ -NH-	CH ₂ =CH-CH ₂ -NH-
C ₂ H ₅ -NH-	C ₂ H ₅ -NH-	C ₂ H ₅ -NH-
H ₂ N-	(C ₂ H ₅) ₂ N-	(C ₂ H ₅) ₂ N-
C ₂ H ₅ -NH-	(C ₂ H ₅) ₂ N-	(C ₂ H ₅) ₂ N-
(C ₂ H ₅) ₂ N-	(C ₂ H ₅) ₂ N-	(C ₂ H ₅) ₂ N-
H-	H ₂ N-	H ₂ N-
CH ₃	H ₂ N-	H ₂ N-

B)	X	Y	Z	
	n-C ₃ H ₇ -O-	n-C ₃ H ₇ -O-	n-C ₃ H ₇ -O-	BPT 125-127° 0.9
	C ₂ H ₅ -O-	C ₂ H ₅ -O-	C ₂ H ₅ -NH	MPT 107-109°
	C ₂ H ₅ -O-	C ₂ H ₅ -O-	(C ₂ H ₅) ₂ N-	MPT 47.5-50.5°
	C ₂ H ₅ -O-	C ₂ H ₅ -NH-	C ₂ H ₅ -NH-	MPT 112-114°
	C ₂ H ₅ -O-	H ₂ N-	(C ₂ H ₅) ₂ N-	MPT 137-140°
	C ₂ H ₅ -O-	(C ₂ H ₅) ₂ N-	(C ₂ H ₅) ₂ N-	BPT 108-110° 0.27
	C ₂ H ₅ -NH-	C ₂ H ₅ -NH-	(C ₂ H ₅) ₂ N-	BPT 109-112° 0.005

The plant growth influencing compositions according to the invention are either solutions, emulsions, suspensions or dusts. All application forms, however, must contain the active substance in fine distribution. In particular when total destruction of plant growth, premature desiccation or defoliation are desired, the effect can be increased by the use of carriers which are phytotoxic themselves such as, e.g. high boiling i.e. having a boiling point about 150° C., mineral oil fractions such as kerosene or diesel oil or chlorohydrocarbons. On the other hand the selective inhibition of plant growth, e.g. selective weed killing in general may be better attained by the use of inert carriers.

Aqueous application forms are made from emulsion and dispersion concentrates by adding water. The substances as such or dissolved in a high boiling mineral oil fraction or chlorohydrocarbon or a lower boiling solvent such as, e.g. alcohols, e.g. ethyl alcohol, isopropyl alcohol or methyl cyclohexanol, ketones, e.g. acetone or cyclohexanone; hydrocarbons e.g. benzene, toluene or xylene; or chlorinated hydrocarbons e.g. tetrachloroethane, ethylene dichloride or trichlorethylene, are homogeneously incorporated into water, by means of wetting or dispersing agents. Examples of cation-active emulsifiers or dispersing agents are quaternary ammonium compounds; examples of anion-active emulsifying agents are soap, soft soap, aliphatic long chained sulphuric acid monoesters, aliphatic aromatic sulphonic acids, long chained alkoxyacetic acids; examples of non-ionic emulsifiers are polyethylene glycol ethers of fatty alcohols and polyethylene oxide condensation products. Also, concentrates can be produced consisting of active substances, emulsifier or dispersing agent and, if necessary, solvent. These latter are suitable for dilution with water.

Dusts can be produced by milling or blending active substance with a water-insoluble pulverulent solid carrier. Examples of such are: talcum, diatomaceous earth, kaolin, bentonite, calcium carbonate, tricalcium phosphate, sawdust, powdered cork, charcoal or other materials of vegetable origin. On the other hand, the carriers can be impregnated by means of a volatile solvent. Dusts and pastes can be suspended in water by the addition of wetting agents and protective colloids and so used as spraying agents.

As there exist both liquid and solid active compounds of almost the same herbicidal activity, both liquid concentrates for aqueous emulsions and wettable concentrates for aqueous suspensions with a high concentration of the active ingredient can easily be prepared. The various forms of application can be adapted to the intended use in the usual way by the addition of substances which improve the distribution, the adhesive properties, resistance to rain and, possibly the resorption. Such substances are: e.g. fatty acids,

resins, wetting agents, glue, casein, or alginates. In the same way, the biological activity can be increased or amplified by the addition of substances which have a bactericidal or fungicidal action or of substances which also influence the growth of plants, as well as by combination with fertilisers.

The invention will be more clearly understood by reference to the following Examples in which:

Examples 1 to 3 illustrate suitable compositions and Examples 4 to 7 illustrate the range of application mentioned in the description being chosen examples of laboratory and field tests and the results obtained.

EXAMPLE 1.

20 Parts of 2:4:6 - tri - *n* - propoxy - s - triazine are dissolved in a mixture of 48 parts of diacetonolcohol, 16 parts of xylene and 16 parts of an anhydrous high molecular condensation product of ethylene oxide with high fatty acids. This concentrate can be diluted with water to give emulsions of any concentration desired.

EXAMPLE 2.

80 Parts of 2 - ethoxy - 4:6 - bis - ethylamino - s - triazine are mixed with 2-4 parts of a wetting agent, e.g. a sulphuric acid ester of an alkyl polyglycol ether, 1-3 parts of a protective colloid, e.g. sulphite waste liquor, and 15 parts of an inert solid carrier such as, e.g. kaolin, bentonite, chalk or kieselguhr. The mixture is then ground very finely in a suitable mill. The wettable powder obtained can be added to water and gives very stable suspensions.

EXAMPLE 3.

10 Parts of 2:4 - bis - ethylamino - 6 - diethyl - amino - s - triazine are dissolved in 90 parts of high boiling liquid such as, e.g. coal tar oil, Diesel oil or spindle oil.

EXAMPLE 4.

For each compound to be tested and for control, a seed box was prepared as follows: in one half of the box 10 seeds of wheat, of mustard, of lucerne and of carrot were sown 3 cms deep and in the other half 10 seeds of each of the above types of plants were sown 1 cm deep. All the seed boxes were lightly watered. They were then sprayed with 0.1 litre per sq. m. of 2% emulsions or suspensions of the compounds to be tested (according to the state of aggregation), which corresponds to 2g of active ingredient per sq. m.

After 21 days, the lucerne in the seed boxes treated with 2:4 - diethoxy - 6 - diethylamino - s - triazine or 2 - methyl - 4:6 - diamino - s - triazine had died whilst the other plants were uninjured.

In the seed boxes treated with 2:4 - 6 - triethoxy - s - triazine, 2:4:6 - tri - *n* - propoxys - triazine, 2:4:6 - tri - allyloxy - s - triazine, 2 - ethoxy - 4:6 - bis - diethylamino - s - triazine, 2 - amino - 4:6 - bis - diethylamino - s - triazine, 2 - amino - 4:6 -

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bis - allylamino - s - triazine or 2:4:6 - tris-diethylamino - s - triazine, the mustard and lucerne had died whilst the wheat and carrots remained uninjured.

- 5 In the seed boxes treated with 2 - ethylamino - 4:6 - bis - diethylamino - s - triazine, or 2:4 - bis - ethylamino - 6 - diethylamino - s - triazine, the mustard and lucerne died, the wheat was injured and the carrots grew normally and in the seed box treated with 2-ethoxy-4:6-bis-ethylamino-s-triazine the mustard and lucerne died and the wheat and carrot was injured.

EXAMPLE 5.

- 15 0.5% emulsions of 2:4:6-tri-*n*-propoxy-s - triazine, 2:4 - diethoxy - 6 - diethylamino - s - triazine, 2 - ethylamino - 4:6 - bis - diethylamino - s - triazine, 2 - amino - 4:6 - bis - diethylamino - s - triazine, 2:4:6 - tris-ethylamino - s - triazine or 2:4 - bis-ethylamino - 6 - diethylamino - s - triazine, sprayed on to oats and mustard plants about 10 cms in height caused severe leaf burns.
- 20 0.5% emulsions of 2 - methyl - 4:6 - diamino - s - triazine or 2 - amino - 4:6 - bis-

allylamino - s - triazine also caused leaf burns on mustard plants.

EXAMPLE 6.

A dust produced from 10 parts of 2:4:6-triethoxy - s - triazine and 90 parts of talcum as carrier applied to 3—4 week old cotton plants caused severe leaf burn within 1—3 days after application. 2:4:6 - Tri - *n* - propoxy - s - triazine, 2:4 - bis - ethylamino - 6 - diethylamino - s - triazine and 2-ethylamino-4:6 - bis - diethylamino - s - triazine had similar effects.

EXAMPLE 7.

Consecutive rows of wheat, oats, mustard, lucerne, radish, spinach and peas, are planted in a field and immediately after the sowing the rows of seeds are divided into squares of an area of 6 sq. m. Each square is sprayed at a rate of 200 ccms per sq. m. with a 0.5% emulsion or suspension of the compound to be tested, which corresponds to an application of 1g per sq. m. The growth was controlled weekly and was evaluated according to a scale wherein 10 corresponds to normal growth and 0 to complete destruction. After 4 weeks, the following results were obtained:

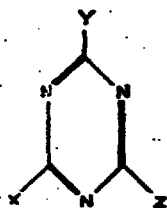
Substance used	wheat	oats	mustard	lucerne	radish	spinach	peas
I	0	0	0	0	0	0	10
II	10	10	10	0	10	7	10
III	0	0	0	0	0	0	0

I 2-ethoxy-4:6-bis-ethylamino-s-triazine;

II 2-ethoxy-4:6-bis-diethylamino-s-triazine.

WHAT WE CLAIM IS:—

- 55 1. Composition for influencing the growth of plants, especially for killing weeds, comprising an s-triazine derivative of the general formula:



- 60 wherein X represents hydrogen, a hydrocarbon radical bound either direct or by way of O, S or NH or two hydrocarbon radicals bound by way of N, the hydrocarbon radical(s) possibly being substituted by chlorine or hydroxyl groups, and Y and Z represent mercapto or amino group or a hydrocarbon radical bound

by way of O, S or NH, or two hydrocarbon radicals bound by way of N, the hydrocarbon radical(s) possibly being substituted by chlorine or hydroxyl groups and where any aromatic rings in the radicals X, Y and Z should not be bound direct to the triazine ring or to the bridging atom and as a carrier,

- a) a water-insoluble pulverulent solid, or
b) a mineral oil fraction or chlorohydrocarbon boiling above 150° C, or
c) an emulsifying agent together with a water-insoluble pulverulent solid or an organic solvent.

2. Composition as claimed in claim 1 in which two of the symbols X, Y and Z represent the same or different monoalkylamino, dialkylamino or monoalkenylamino radical, the alkyl and alkenyl group having at most three carbon atoms.

3. Composition as claimed in claim 1 in which the s-triazine is 2:4 - bis - ethoxy - 6-ethylamino - s - triazine.

bis - allylamino - s - triazine or 2:4:6 - tris-diethylamino - s - triazine, the mustard and lucerne had died whilst the wheat and carrots remained uninjured.

In the seed boxes treated with 2 - ethylamino - 4:6 - bis - diethylamino - s - triazine, or 2:4 - bis - ethylamino - 6 - diethylamino - s - triazine, the mustard and lucerne died, the wheat was injured and the carrots grew normally and in the seed box treated with 2-ethoxy-4:6-bis-ethylamino-s-triazine the mustard and lucerne died and the wheat and carrot was injured.

EXAMPLE 5.

0.5% emulsions of 2:4:6-tri-*n*-propoxy-s-triazine, 2:4 - diethoxy - 6 - diethylamino-s-triazine, 2 - ethylamino - 4:6 - bis - diethylamino - s - triazine, 2 - amino-4:6 - bis - diethylamino - s - triazine, 2:4:6-tris-ethylamino - s - triazine or 2:4 - bis-ethylamino - 6 - diethylamino - s - triazine, sprayed on to oats and mustard plants about 10 cms in height caused severe leaf burns. 0.5% emulsions of 2 - methyl - 4:6 - diamino-s-triazine or 2 - amino - 4:6 - bis-

allylamino - s - triazine also caused leaf burns on mustard plants.

EXAMPLE 6.

A dust produced from 10 parts of 2:4:6-triethoxy - s - triazine and 90 parts of talcum as carrier applied to 3—4 week old cotton plants caused severe leaf burn within 1—3 days after application. 2:4:6 - Tri - *n* - propoxy - s - triazine, 2:4 - bis - ethylamino - 6 - diethylamino - s - triazine and 2-ethylamino-4:6 - bis - diethylamino - s - triazine had similar effects.

EXAMPLE 7.

Consecutive rows of wheat, oats, mustard, lucerne, radish, spinach and peas, are planted in a field and immediately after the sowing the rows of seeds are divided into squares of an area of 6 sq. m. Each square is sprayed at a rate of 200 ccms per sq. m. with a 0.5% emulsion or suspension of the compound to be tested, which corresponds to an application of 1g per sq. m. The growth was controlled weekly and was evaluated according to a scale wherein 10 corresponds to normal growth and 0 to complete destruction. After 4 weeks, the following results were obtained:

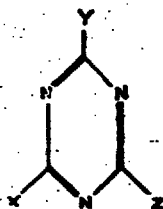
Substance used	wheat	oats	mustard	lucerne	radish	spinach	peas
I	0	0	0	0	0	0	10
II	10	10	10	0	10	7	10
III	0	0	0	0	0	0	0

I 2-ethoxy-4:6-bis-ethylamino-s-triazine;

II 2-ethoxy-4:6-bis-diethylamino-s-triazine.

WHAT WE CLAIM IS:—

1. Composition for influencing the growth of plants, especially for killing weeds, comprising an s-triazine derivative of the general formula:



wherein X represents hydrogen, a hydrocarbon radical bound either direct or by way of O, S or NH or two hydrocarbon radicals bound by way of N, the hydrocarbon radical(s) possibly being substituted by chlorine or hydroxyl groups, and Y and Z represent mercapto or amino group or a hydrocarbon radical bound

by way of O, S or NH, or two hydrocarbon radicals bound by way of N, the hydrocarbon radical(s) possibly being substituted by chlorine or hydroxyl groups and where any aromatic rings in the radicals X, Y and Z should not be bound direct to the triazine ring or to the bridging atom and as a carrier,

- a water-insoluble pulverulent solid, or
- a mineral oil fraction or chlorohydrocarbon boiling above 150° C, or
- an emulsifying agent together with a water-insoluble pulverulent solid or an organic solvent.

2. Composition as claimed in claim 1 in which two of the symbols X, Y and Z represent the same or different monoalkylamino, dialkylamino or monoalkenylamino radical, the alkyl and alkenyl group having at most three carbon atoms.

3. Composition as claimed in claim 1 in which the s-triazine is 2:4 - bis - ethoxy - 6-ethylamino - s - triazine.



4. Composition as claimed in claim 1 in which the s - triazine is 2:4 - bis - ethoxy-6 - diethylamino - s - triazine.
5. Composition as claimed 1 in which the s-triazine is 2 - ethoxy - 4 - diethylamino - 6-amino - s - triazine.
6. Composition as claimed in claim 1 in which the s-triazine is 2 - ethoxy - 4:6 - bis-ethylamino - s - triazine.
- 10 7. Composition as claimed in claim 1 in which the s-triazine is 2 - methoxy - 4:6-bis - ethylamino - s - triazine.
8. Composition as claimed in any of claims 1 to 7 in which the carrier is phytotoxic.
9. Composition as claimed in any of claims 1 to 7 in which the carrier is inert.
10. Composition for influencing the growth of plants substantially as herein described with reference to and as illustrated in any of the foregoing Examples.
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