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(54) Titre : AGENTS HERBICIDES SYNERGIQUES CONTENANT DES HERBICIDES DU GROUPES DES BENZOPYRAZOLS

(54) Title: SYNERGISTIC HERBICIDAL COMPOSITIONS COMPRISING HERBICIDES FROM THE GROUP OF THE BENZOYLPYRAZOLES

(57) Abrégé/Abstract:
Herbicidal compositions comprising: A) at least one compound from the group of the benzoylpyrazoles; and B) at least one compound from the group of the herbicides active against monocotyledonous and/or dicotyledonous harmful plants are described. The activity of these compositions is superior to that of the herbicides applied individually.

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Abstract:

Herbicidal compositions comprising:

A) at least one compound from the group of the benzoylpyrazoles; and

B) at least one compound from the group of the herbicides active against monocotyledonous and/or dicotyledonous harmful plants are described. The activity of these compositions is superior to that of the herbicides applied individually.

Description

Synergistic herbicidal compositions comprising herbicides from the group of the benzoylpyrazoles

The invention relates to the technical field of crop protection agents which can be used against unwanted vegetation and comprise, as active compounds, a combination of at least two herbicides.

More specifically, it relates to herbicidal compositions which comprise, as active compound, a herbicide from the group of the benzoylpyrazoles in combination with at least one further herbicide.

Herbicides of the abovementioned group of the benzoylpyrazoles are known from numerous documents. Thus, EP-A0 203 428, US 4,643,757, WO 97/23135 and the German patent application DE 10016116.2, which is of earlier priority but not prior-published, describe a number of benzoylpyrazoles having herbicidal action.

However, the use of the benzoylpyrazoles derivatives known from these publications frequently entails disadvantages in practice. Thus, the herbicidal activity of the known compounds is not always sufficient, or, if the herbicidal activity is sufficient, then undesired damage to the useful plants is observed.

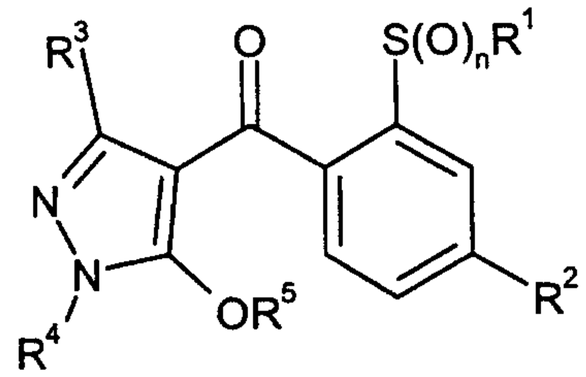
The effectiveness of herbicides depends inter alia on the type of herbicide used, its application rate, the formulation, the harmful plants to be controlled in each case, climatic and soil conditions, etc. A further criterion is the persistency or the rate at which the herbicide is degraded. Changes in the susceptibility of harmful plants to an active compound which may occur on prolonged use or in specific geographical areas may also have to be taken into account. Such changes manifest themselves by a more or less pronounced loss in activity and can only be compensated to a limited extent by higher herbicide application rates.

Owing to the large number of possible influencing factors, there is virtually no individual active compound which has all the desired properties for different requirements, in particular with respect to the species of harmful plants and the climatic zones. Furthermore, there is the permanent object to achieve the desired effect using more and more reduced herbicide application rates. A lower application rate reduces not only the amount of active compound required for the application, but generally also reduces the amount of formulation of auxiliaries required. Both reduce the economic expense and improve the ecological compatibility of the herbicide treatment.

A frequently used method for improving the use profile of a herbicide is the combination of the active compound with one or more other active compounds which contribute the desired additional properties. WO 01/28341 discloses combinations of herbicidally active benzoyl derivatives with other herbicides. Combinations of herbicidally active benzoylpyrazoles and a number of other herbicides are known from WO 97/31535, WO 98/68526, WO 98/54967, WO 00/02703 and WO 00/03591. However, when two or more active compounds are applied in combination, it is not uncommon for phenomena of physical and biological incompatibility to occur, for example insufficient stability of a joint formulation, decomposition of an active compound or antagonism of the active compounds. What is desired are, in contrast, active compound combinations having a favorable activity profile, high stability and, if possible, synergistically enhanced activity, thus permitting the application rate to be reduced, compared with the individual application of the active compounds to be combined.

The invention provides selected herbicidal compositions, comprising an effective amount of

A) at least one compound of the formula (I) or an agriculturally suitable salt thereof (component A)



(I),

in which

R^1 is methyl or ethyl;

R^2 is trifluoromethyl, fluorine, chlorine or bromine;

R^3 is hydrogen or methyl;

R^4 is methyl or ethyl;

R^5 is hydrogen, methylsulfonyl, ethylsulfonyl, n-propylsulfonyl, phenylsulfonyl, 4-methylphenylsulfonyl, benzyl, benzoylmethyl, nitrobenzoylmethyl or 4-fluorobenzoylmethyl and

n is 0, 1, or 2, and

B) at least one compound (component B) from one of the following groups

B1 inhibitors of the biosynthesis of branched amino acids:
amidosulfuron (B1.1), bensulfuron (B1.2), ethoxysulfuron (B1.3), halosulfuron (B1.4), imazethapyr (B1.5), iodosulfuron-methyl-sodium (B1.6), metsulfuron (B1.7), nicosulfuron (B1.8), sulfosulfuron (B1.9), thifensulfuron-methyl (B1.10), tribenuron (B1.11), N-[(4,6-dimethoxypyrimidin-2-yl)aminocarbonyl]-2-methoxycarbonyl-5-methylsulfonylaminomethylbenzenesulfonamide (mesosulfuron) (B1.12) and N-[(4,6-dimethoxypyrimidin-2-yl)aminocarbonyl]-2-dimethylaminocarbonyl-5-formylamino-benzenesulfonamide (foramsulfuron) (B1.13), procarbazone sodium (MKH 6561) (B1.14), flucarbazone (MKH 6562) (B1.15), amicarbazone (MKH 31866) (B1.16), florasulam (B1.17), flupyrsulfuron-methyl-sodium (B1.18);

B2 inhibitors of the photosynthesis electron transport:

atrazine (B2.1), bromoxynil (B2.2), ioxynil (B2.3), isoproturon (B2.4), metribuzin (B2.5), propanil (B2.6);

B3 synthetic auxins:

MCPA (B3.1), 2,4-DP (B3.2), mecoprop (B3.3), dicamba (B3.4), diflufenzopyr (B3.5), fluroxypyr (B3.6), quinclorac (B3.7);

B4 inhibitors of fatty acid biosynthesis:

benthiocarb (B4.1), clodinafop-propargyl (B4.2), diclofop-methyl (B4.3), fenoxaprop-P-ethyl (B4.4), tralkoxydim (B4.5);

B5 inhibitors of cell division:

acetochlor (B5.1), alachlor (B5.2), anilofos (B5.3), flufenacet (B5.4), metolachlor (B5.5), thenylchlor (B5.6), flufenacet (B5.7), mefenacet (B5.8);

B6 inhibitors of fatty acid biosynthesis/carotinoid biosynthesis:

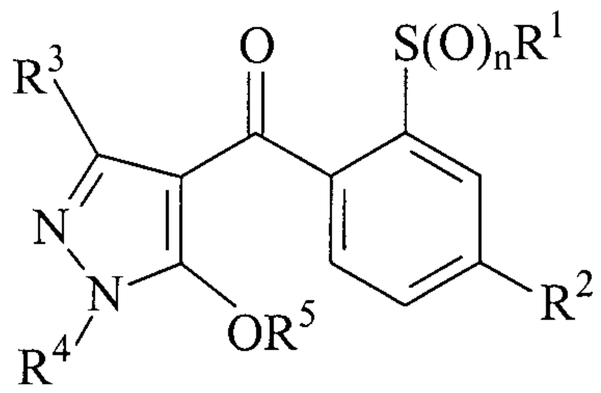
diflufenican (B6.1), clomazone (B6.2);

B7 glyphosate (B7.1) and

B8 glufosinate (B8.1),

where these compositions comprise the compounds of the formula (I) or salts thereof (component A) and the compounds of groups B1 to B8 (component B) in a weight ratio of from 1:2000 to 2000:1.

In one aspect, the invention relates to a herbicidal composition, comprising: (A) at least one compound of the general formula (I), or an agriculturally acceptable salt, thereof:



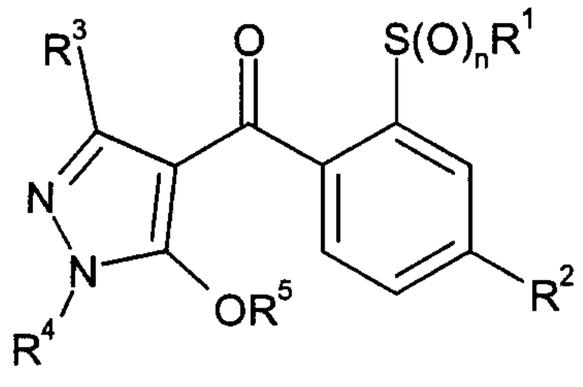
(I),

in which: R^1 is methyl or ethyl, R^2 is trifluoromethyl, F, Cl, or Br, R^3 is H or methyl, R^4 is methyl or ethyl, R^5 is H, methylsulfonyl, ethylsulfonyl, n-propylsulfonyl, phenylsulfonyl, 4-methylphenylsulfonyl, benzyl, benzoylmethyl, nitrobenzoylmethyl or 4-fluoro-benzoylmethyl, and n is 0, 1, or 2; and (B2) at least one compound which is an inhibitor of photosynthesis electron transport and is selected from the group consisting of atrazine (B2.1), bromoxynil (B2.2), isoproturon (B2.3), metribuzin (B2.4) and propanyl (B2.5); wherein the composition comprises (A) and (B2) in a weight ratio of from 1:2000 to 2000:1.

The compounds of the formula (I) are known from WO01/74785 and can be prepared, for example, by the processes described therein or the processes known from DE 25 13 750 and EP-A 0 186 117.

The chemical structures of the active compounds referred to above by their common names are known, for example, from "The Pesticide Manual", 12th edition, 2000, British Crop Protection Council. Foramsulfuron is known as a herbicide from WO 95/10507, for example, and mesosulfuron is known as a herbicide from WO 95/10507, for example.

Preference is given to herbicidal compositions which, as component (A), comprise a compound of the formula (I) which is as defined below:



(I)

Nr.	R^1	R^2	R^3	R^4	R^5	n
(A1)	CH_3	CF_3	H	CH_3	H	2
(A2)	CH_3	CF_3	CH_3	CH_3	H	2
(A3)	CH_3	CF_3	CH_3	CH_2CH_3	H	2
(A4)	CH_3	CF_3	H	CH_2CH_3	H	2

Of particular interest are herbicidal compositions comprising a synergistically effective amount of one or more of the following combinations of two compounds (A) + (B):

(A1)+(B1.1), (A1)+(B1.2), (A1)+(B1.3), (A1)+(B1.4), (A1)+(B1.5), (A1)+(B1.6), (A1)+(B1.7), (A1)+(B1.8), (A1)+(B1.9), (A1)+(B1.10), (A1)+(B1.11), (A1)+(B1.12), (A1)+(B1.13), (A1)+(B1.14), (A1)+(B1.15), (A1)+(B1.16), (A1)+(B1.17), (A1)+(B1.18);

(A2)+(B1.1), (A2)+(B1.2), (A2)+(B1.3), (A2)+(B1.4), (A2)+(B1.5), (A2)+(B1.6),

(A2)+(B1.7), (A2)+(B1.8), (A2)+(B1.9), (A2)+(B1.10), (A2)+(B1.11), (A2)+(B1.12), (A2)+(B1.13), (A2)+(B1.14), (A2)+(B1.15), (A2)+(B1.16), (A2)+(B1.17), (A2)+(B1.18);

(A3)+(B1.1), (A3)+(B1.2), (A3)+(B1.3), (A3)+(B1.4), (A3)+(B1.5), (A3)+(B1.6), (A3)+(B1.7), (A3)+(B1.8), (A3)+(B1.9), (A3)+(B1.10), (A3)+(B1.11), (A3)+(B1.12), (A3)+(B1.13), (A3)+(B1.14), (A3)+(B1.15), (A3)+(B1.16), (A3)+(B1.17), (A3)+(B1.18);

(A4)+(B1.1), (A4)+(B1.2), (A4)+(B1.3), (A4)+(B1.4), (A4)+(B1.5), (A4)+(B1.6), (A4)+(B1.7), (A4)+(B1.8), (A4)+(B1.9), (A4)+(B1.10), (A4)+(B1.11), (A4)+(B1.12), (A4)+(B1.13), (A4)+(B1.14), (A4)+(B1.15), (A4)+(B1.16), (A4)+(B1.17), (A4)+(B1.18);

(A1)+(B2.1), (A1)+(B2.2), (A1)+(B2.3), (A1)+(B2.4), (A1)+(B2.5);

(A2)+(B2.1), (A2)+(B2.2), (A2)+(B2.3), (A2)+(B2.4), (A2)+(B2.5);

(A3)+(B2.1), (A3)+(B2.2), (A3)+(B2.3), (A3)+(B2.4), (A3)+(B2.5);

(A4)+(B2.1), (A4)+(B2.2), (A4)+(B2.3), (A4)+(B2.4), (A4)+(B2.5);

(A1)+(B3.1), (A1)+(B3.2), (A1)+(B3.3), (A1)+(B3.4), (A1)+(B3.5), (A1)+(B3.6), (A1)+(B3.7);

(A2)+(B3.1), (A2)+(B3.2), (A2)+(B3.3), (A2)+(B3.4), (A2)+(B3.5), (A2)+(B3.6), (A2)+(B3.7);

(A3)+(B3.1), (A3)+(B3.2), (A3)+(B3.3), (A3)+(B3.4), (A3)+(B3.5), (A3)+(B3.6), (A3)+(B3.7);

(A4)+(B3.1), (A4)+(B3.2), (A4)+(B3.3), (A4)+(B3.4), (A4)+(B3.5), (A4)+(B3.6), (A4)+(B3.7);

(A1)+(B4.1), (A1)+(B4.2), (A1)+(B4.3), (A1)+(B4.4), (A1)+(B4.5);

(A2)+(B4.1), (A2)+(B4.2), (A2)+(B4.3), (A2)+(B4.4), (A2)+(B4.5);

(A3)+(B4.1), (A3)+(B4.2), (A3)+(B4.3), (A3)+(B4.4), (A3)+(B4.5);

(A4)+(B4.1), (A4)+(B4.2), (A4)+(B4.3), (A4)+(B4.4), (A4)+(B4.5);

(A1)+(B5.1), (A1)+(B5.2), (A1)+(B5.3), (A1)+(B5.4), (A1)+(B5.5), (A1)+(B5.6), (A1)+(B5.7), (A1)+(B5.8);

(A2)+(B5.1), (A2)+(B5.2), (A2)+(B5.3), (A2)+(B5.4), (A2)+(B5.5), (A2)+(B5.6), (A2)+(B5.7), (A2)+(B5.8);

(A3)+(B5.1), (A3)+(B5.2), (A3)+(B5.3), (A3)+(B5.4), (A3)+(B5.5), (A3)+(B5.6), (A3)+(B5.7), (A3)+(B5.8);

(A4)+(B5.1), (A4)+(B5.2), (A4)+(B5.3), (A4)+(B5.4), (A4)+(B5.5), (A4)+(B5.6), (A4)+(B5.7), (A4)+(B5.8);

(A1)+(B6.1), (A1)+(B6.2), (A2)+(B6.1), (A2)+(B6.2), (A3)+(B6.1), (A3)+(B6.2), (A4)+(B6.1), (A4)+(B6.2);

(A1)+(B7.1), (A2)+(B7.1), (A3)+(B7.1), (A4)+(B7.1);

(A1)+(B8.1), (A2)+(B8.1), (A3)+(B8.1), (A4)+(B8.1).

In the combinations according to the invention, application rates in the range from 1 to 2000 g, preferably from 10 to 500 g, particularly preferably from 10 to 250 g, of active ingredient per hectare (ai/ha) of the component A) and from 1 to 2000 g, preferably from 1 to 500 g, particularly preferably from 5 to 250 g, of the component B) are generally required.

The weight ratios of the components A) to B) to be used can be varied within wide ranges. The ratio is preferably in the range from 1:50 to 50:1, in particular in the range from 1:20 to 20:1. Optimum weight ratios may depend on the particular field of application, on the weed spectrum and the active compound combination used and can be determined in preliminary experiments.

The compositions according to the invention can be employed for the selective control of annual and perennial monocotyledonous and dicotyledonous harmful plants in crops of cereals (for example barley, oats, rye, wheat), corn and rice and in crops of transgenic useful plants or crops of useful plants selected by classical means which are resistant to active compounds A) and B). Likewise, they can be employed for controlling undesirable harmful plants in plantation crops such as oil palm, coconut palm, Indian-rubber tree, citrus, pineapple, cotton, coffee, cocoa and the like, and also in fruit production and viticulture. Owing to their good compatibility, they are particularly suitable for use in cereals and corn, especially cereals.

The compositions according to the invention act against a broad spectrum of weeds. They are suitable, for example, for controlling annual and perennial harmful plants such as, for example, from the species Abutilon, Alopecurus, Avena, Chenopodium, Cynoden, Cyperus, Digitaria, Echinochloa, Elymus, Galium, Ipomoea, Kochia, Lamium, Matricaria, Polygonum, Scirpus, Setaria, Sorghum, Veronica, Viola and Xanthium.

A further advantage of the compositions according to the invention is their excellent action against many harmful plants which have now become resistant to sulfonylureas, such as, for example, Kochia.

The herbicidal compositions according to the invention are also distinguished by the fact that the effective dosages of the components A) and B) used in the combinations are reduced with respect to an individual dosage, so that it is possible to reduce the required active compound application rates (synergistic effect).

The invention also provides a method for controlling unwanted vegetation, which comprises applying one or more herbicides A) and one or more herbicides B) to the harmful plants, to parts of the harmful plants or to the area under cultivation.

When herbicides of type A) and B) are applied jointly, superadditive (= synergistic) effects are observed. The activity in the combinations is more pronounced than the expected sum of the activities of the individual herbicides employed and the activity of the particular individual herbicide A) and B). The synergistic effects permit the application rate to be reduced, a broader spectrum of broad-leaved weeds and weed grasses to be controlled, more rapid onset of the herbicidal action, a more prolonged action, better control of the harmful plants by only one application, or few applications, and widening of the period of time within which the product can be used. These properties are required in weed control practice to keep agricultural crops free from undesirable competing plants and thus to ensure and/or to increase quality and quantity of the yields. These novel combinations markedly surpass the prior art with respect to the described properties.

The active compound combinations according to the invention can either be present as mixed formulations of the components A) and B), if appropriate together with other customary formulation auxiliaries, which mixed formulations are then applied in the usual manner in the form of a dilution with water, or else they can be prepared in the form of so-called tank mixes by joint dilution with water of the components which are formulated separately, or partly separately.

The components A) and B) can be formulated in various ways, depending on the prevailing biological and/or physicochemical parameters. Suitable general possibilities for formulations are, for example: wettable powders (WP), emulsifiable concentrates (EC), aqueous solutions (SL), emulsions (EW) such as oil-in-water and water-in-oil emulsions, sprayable solutions or emulsions, oil- or water-based dispersions, suspoemulsions, dusts (DP), seed dressing products, granules for soil application or for broadcasting or water-dispersible granules (WG), ULV formulations, microcapsules or waxes.

The individual types of formulation are known in principle and are described, for example, in: Winnacker-Küchler, "Chemische Technologie" [Chemical Technology], Vol. 7, C. Hauser Verlag Munich, 4th Ed. 1986; van Valkenburg, "Pesticides Formulations", Marcel Dekker N.Y., 1973; K. Martens, "Spray Drying Handbook", 3rd Ed. 1979, G. Goodwin Ltd. London. The formulation auxiliaries required, such as inert materials, surfactants, solvents and other additives, are also known and are described, for example, in: Watkins, "Handbook of Insecticide Dust Diluents and Carriers", 2nd Ed., Darland Books, Caldwell N.J.; H.v. Olphen, "Introduction to Clay Colloid Chemistry"; 2nd Ed., J. Wiley & Sons, N.Y.; Marsden, "Solvents Guide", 2nd Ed., Interscience, N.Y. 1950; McCutcheon's, "Detergents and Emulsifiers Annual", MC Publ. Corp., Ridgewood N.J.; Sisley and Wood, "Encyclopedia of Surface Active Agents", Chem. Publ. Co. Inc., N.Y. 1964; Schönfeldt, "Grenzflächenaktive Äthylenoxidaddukte" [Surface-active ethylene oxide adducts], Wiss. Verlagsgesellschaft, Stuttgart 1976; Winnacker-Küchler, "Chemische Technologie" [Chemical Technology], Vol. 7, C. Hauser Verlag Munich, 4th Ed. 1986.

Based on these formulations, it is also possible to prepare combinations with other pesticidally active substances, such as other herbicides, fungicides or insecticides, and also safeners, fertilizers and/or growth regulators, for example in the form of a ready mix or tank mix.

Wettable powders are preparations which are uniformly dispersible in water and which, besides the active compound, also comprise ionic or nonionic surfactants (wetting agents, dispersants), for example polyethoxylated alkylphenols, polyethoxylated fatty alcohols or fatty amines, alkanesulfonates or alkylbenzenesulfonates, sodium lignosulfonate, sodium 2,2'-dinaphthylmethane-6,6'-disulfonate, sodium dibutylnaphthalenesulfonate or else sodium oleoylmethyltaurinate, in addition to a diluent or an inert substance.

Emulsifiable concentrates are prepared by dissolving the active compound in an organic solvent, for example butanol, cyclohexanone, dimethylformamide, xylene or

else higher-boiling aromatics or hydrocarbons, with the addition of one or more ionic or nonionic surfactants (emulsifiers). Examples of emulsifiers which can be used are: calcium alkylarylsulfonates, such as calcium dodecylbenzenesulfonate, or nonionic emulsifiers, such as fatty acid polyglycol esters, alkylaryl polyglycol ethers, fatty alcohol polyglycol ethers, propylene oxide/ethylene oxide condensates, alkyl polyethers, sorbitan fatty acid esters, polyoxyethylene sorbitan fatty acid esters or polyoxyethylene sorbitol esters.

Dusts are obtained by grinding the active compound with finely divided solid materials, for example talc, natural clays, such as kaolin, bentonite and pyrophyllite, or diatomaceous earth.

Granules can be prepared either by spraying the active compound onto absorptive, granulated inert material, or by applying active compound concentrates to the surface of carriers, such as sand, kaolinite or granulated inert material, with the aid of binders, for example polyvinyl alcohol, sodium polyacrylate or else mineral oils. Suitable active compounds can also be granulated in the manner customary for the preparation of fertilizer granules, if desired as a mixture with fertilizers. Water-dispersible granules are, in general, prepared by processes such as spray-drying, fluidized-bed granulation, disk granulation, mixing using high-speed mixers, and extrusion without solid inert material.

The agrochemical preparations generally comprise from 0.1 to 99 percent by weight, in particular from 0.2 to 95% by weight, of active compounds of types A) and B), the following concentrations being customary, depending on the type of formulation: In wettable powders, the active compound concentration is, for example, approximately 10 to 95% by weight, the remainder to 100% by weight being composed of customary formulation components. In the case of emulsifiable concentrates, the active compound concentration can be, for example, from 5 to 80% by weight. Formulations in the form of dusts in most cases comprise from 5 to 20% by weight of active compound, sprayable solutions approximately 0.2 to 25% by weight of active compound. In the case of granules, such as dispersible granules, the active

compound content depends partly on whether the active compound is in liquid or solid form and on which granulation auxiliaries and fillers are used. In general, the content in the water-dispersible granules amounts to between 10 and 90% by weight. In addition, the active compound formulations mentioned comprise, if appropriate, the tackifiers, wetting agents, dispersants, emulsifiers, preservatives, antifreeze agents, solvents, fillers, colorants, carriers, antifoams, evaporation inhibitors and pH or viscosity regulators which are customary in each case.

For use, the formulations, which are in commercially available form, are, if appropriate, diluted in a customary manner, for example using water in the case of wettable powders, emulsifiable concentrates, dispersions and water-dispersible granules. Preparations in the form of dusts, soil granules, granules for spreading and sprayable solutions, are conventionally not diluted any further with other inert substances prior to use.

The active compounds can be applied to the plants, parts of the plants, seeds of the plants or the area under cultivation (tilled soil), preferably to the green plants and parts of the plants and, if desired, additionally to the tilled soil.

A possible use is the joint application of the active compounds in the form of tank mixes, where the concentrated formulations of the individual active substances, in the form of their optimal formulations, are mixed jointly with water in the tank, and the spray mixture obtained is applied.

A joint herbicidal formulation of the combination according to the invention of the components A) and B) has the advantage that it can be applied more easily because the amounts of the components have already been adjusted with respect to one another to the correct ratio. Moreover, the auxiliaries of the formulation can be selected to suit each other in the best possible way, while a tank mix of various formulations may result in undesirable combinations of auxiliaries.

A. Formulation examples

a) A dust (WP) is obtained by mixing 10 parts by weight of an active compound/active compound mixture and 90 parts by weight of talc as inert substance and comminuting the mixture in a hammer mill.

b) A wettable powder (WG) which is readily dispersible in water is obtained by mixing 25 parts by weight of an active compound/active compound mixture, 64 parts by weight of kaolin-containing quartz as inert substance, 10 parts by weight of potassium lignosulfonate and 1 part by weight of sodium oleoylmethyltaurinate as wetting agent and dispersant, and grinding the mixture in a pinned-disk mill.

c) A dispersion concentrate which is readily dispersible in water is obtained by mixing 20 parts by weight of an active compound/active compound mixture with 6 parts by weight of alkylphenol polyglycol ether (Triton™ X 207), 3 parts by weight of isotridecanol polyglycol ether (8 EO) and 71 parts by weight of paraffinic mineral oil (boiling range for example approximately 255 to 277°C) and grinding the mixture in a ball mill to a fineness of below 5 microns.

d) An emulsifiable concentrate (EC) is obtained from 15 parts by weight of an active compound/active compound mixture, 75 parts by weight of cyclohexanone as solvent and 10 parts by weight of ethoxylated nonylphenol as emulsifier.

e) Water-dispersible granules are obtained by mixing
75 parts by weight of an active compound/active compound mixture,
10 parts by weight of calcium lignosulfonate,
5 parts by weight of sodium lauryl sulfate,
3 parts by weight of polyvinyl alcohol and
7 parts by weight of kaolin
grinding the mixture in a pinned-disk mill and granulating the powder in a fluidized bed by spraying on water as granulation liquid.

f) Water-dispersible granules are also obtained by homogenizing and precomminuting, in a colloid mill,

25 parts by weight of an active compound/active compound mixture,
5 parts by weight of sodium 2,2'-dinaphthylmethane-6,6'-disulfonate,
2 parts by weight of sodium oleoylmethyltaurinate,
1 part by weight of polyvinyl alcohol,
17 parts by weight of calcium carbonate and
50 parts by weight of water,
subsequently grinding the mixture in a bead mill and atomizing and drying the resulting suspension in a spray tower by means of a single-substance nozzle.

B. Biological Examples

Outdoors, crop plants were grown on plots of a size of from 5 to 10 m^2 on various soils and under various climatic conditions, and the natural presence of harmful plants and/or their seeds in the soil was utilized for the experiments. The treatment with the compositions according to the invention or the herbicides A) and B) applied individually was carried out after emergence of the harmful and the crop plants, in general at the 2- to 4-leaf stage. The active compounds or active compound combinations, formulated as WG, WP or EC, was carried out by the post-emergence method. After 2 to 8 weeks, visual evaluation was carried out in comparison with an untreated comparative group. It was found that the compositions according to the invention have synergistic herbicidal action against economically important mono- and dicotyledonous harmful plants, i.e. that most of the compositions according to the invention have higher, some considerably higher, herbicidal activity than the sum of the activities of the individual herbicides. In addition, the herbicidal activities of the compositions according to the invention exceed the expected values according to Colby. In contrast, the treatment caused insignificant, if any, damage to the crop plants.

If the observed activity values of the mixtures already exceed the formal sum of the values for the trials with individual applications, they also exceed the expected value according to Colby which is calculated using the following formula (cf. S. R. Colby; in Weeds 15 (1967) pp. 20 to 22):

$$E = A + B - \frac{A \times B}{100}$$

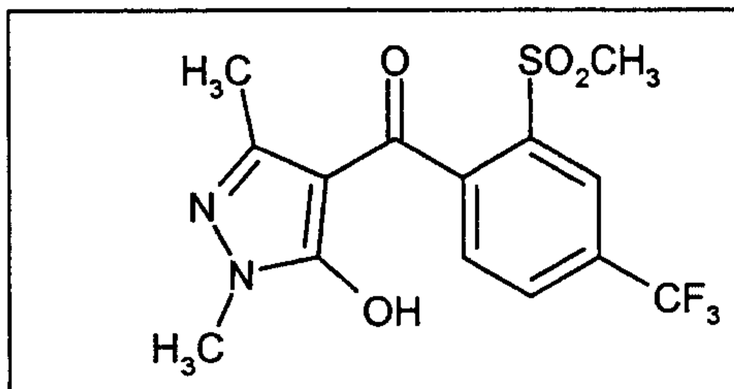
The figures denote:

A, B = Activity of components A and B in percent, at a dosage of a and b gram of ai/ha, respectively.

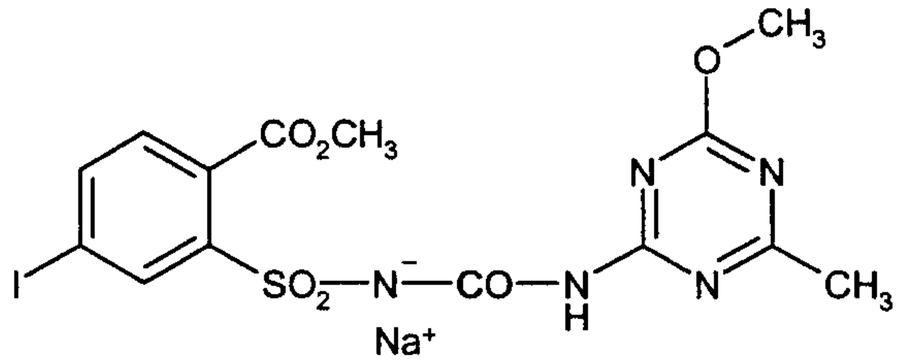
E = Expected value in % at a dosage of a+b gram of ai/ha.

The values observed in the experimental examples below exceed the expected values according Colby. Table 1 shows the components (A) and (B) used in the experiments. Tables 2 to 4 show the herbicidal actions of the individual components (A) and (B), that of the mixtures according to the invention and the theoretical value according to Colby.

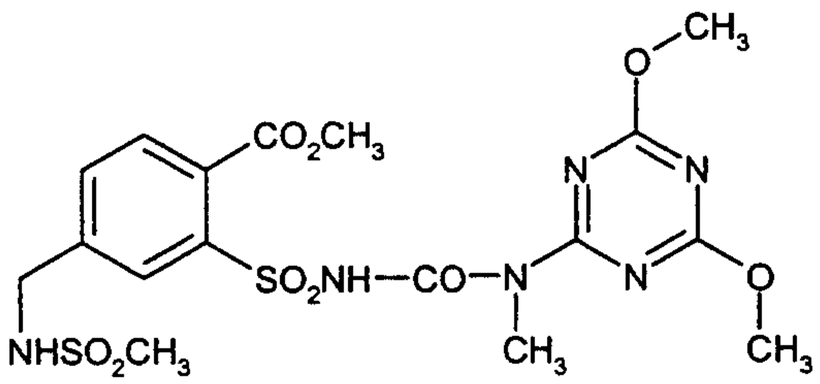
Table 1:



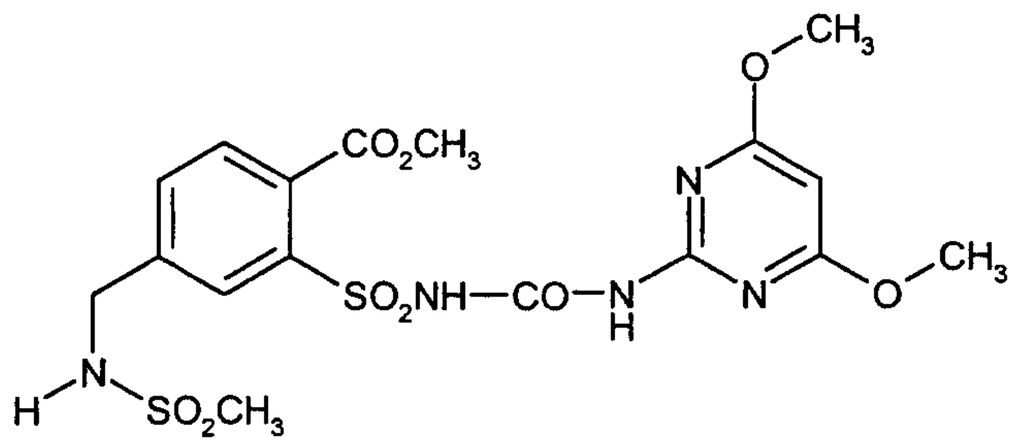
A2



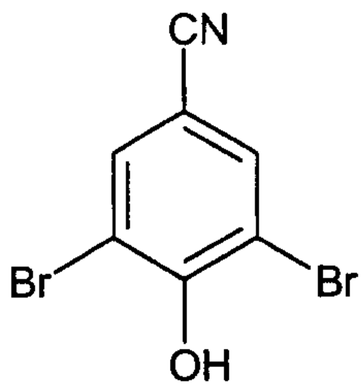
B1.6



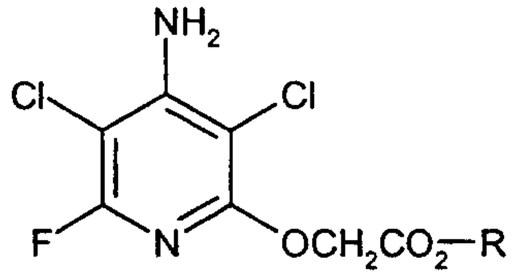
B1.12



B1.13

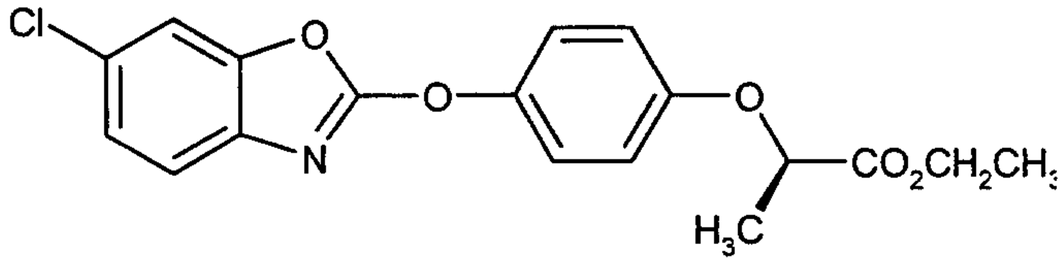


B2.2



R: $CH_3(CH_2)_3OCH_2CH(CH_3)$
or
$CH_3(CH_2)_5CH(CH_3)$

B3.6



B4.4

Table 2:

Herbicide	Dosage	Herbicidal action against POLCO	Value according to Colby
A2	75	90%	
B1.6	2.5	56%	
B1.12	7.5	70%	
A2 + B1.6	75 + 2.5	99%	96%
A2 + B1.12	75 + 7.5	99%	96%

Table 3:

Herbicide	Dosage	Herbicidal action against AVEFA	Value according to Colby
A2	75	20%	
B1.12	7.5	70%	
B4.4	60	80%	
A2 + B1.12	75 + 7.5	85%	76%
A2 + B4.4	75 + 60	90%	84%

Table 4:

Herbicide	Dosage	Herbicidal action against GALAP	Value according to Colby
A2	75	84%	
B2.2	280	61%	
A2 + B2.2	75 + 280	99%	94%

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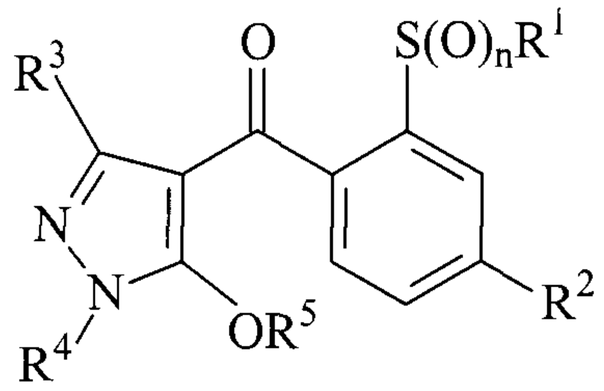
CLAIMS:

1. A herbicidal composition, comprising:

(A) at least one compound of the general formula (I), or an agriculturally acceptable salt, thereof:



(I),

in which:

R^1 is methyl or ethyl,

R^2 is trifluoromethyl, F, Cl, or Br,

R^3 is H or methyl,

R^4 is methyl or ethyl,

R^5 is H, methylsulfonyl, ethylsulfonyl, *n*-propylsulfonyl, phenylsulfonyl, 4-methylphenylsulfonyl, benzyl, benzoylmethyl, nitrobenzoylmethyl or 4-fluoro-benzoylmethyl, and

n is 0, 1, or 2; and

(B2) at least one compound which is an inhibitor of photosynthesis electron transport and is selected from the group consisting of atrazine (B2.1), bromoxynil (B2.2), isoproturon (B2.3), metribuzin (B2.4) and propanyl (B2.5);

wherein the composition comprises (A) and (B2) in a weight ratio of from 1:2000 to 2000:1.

2. The herbicidal composition as claimed in claim 1, wherein the compound of the general formula (I):

R^1 is methyl;

R^2 is trifluoromethyl;

R^3 is H or methyl;

R^4 is methyl or ethyl;

R^5 is H; and

n is 2.

3. The herbicidal composition as claimed in claim 1 or 2, wherein the weight ratio (A):(B2) is in the range from 1:50 to 50:1.

4. The herbicidal composition as claimed in claim 3, wherein the weight ratio (A):(B2) is in the range from 1:20 to 20:1.

5. The herbicidal composition as claimed in any one of claims 1 to 4, which comprises 0.1-99% by weight of herbicides (A) and (B2), and 99 to 0.1% by weight of a formulating agent customary in crop protection.

6. A method for controlling unwanted vegetation, which comprises applying one or more herbicides (A) and one or more herbicides (B2) to the unwanted vegetation, to parts of the unwanted vegetation or to an area under cultivation, the combination of the herbicides (A) and (B2) being as defined in any one of claims 1 to 5.

7. Use of a combination of herbicides (A) and (B2) as defined in any one of claims 1 to 5, as a herbicidal composition for controlling unwanted vegetation.