(12) STANDARD PATENT (11) Application No. **AU 2009243859 B2**
(19) AUSTRALIAN PATENT OFFICE

(54) Title
Synergistic herbicidal combination of clomazone and pethoxamid

(51) International Patent Classification(s)
A01N 43/80 (2006.01) ***A01P 13/00*** (2006.01)
A01N 37/20 (2006.01)

(21) Application No: **2009243859** (22) Date of Filing: **2009.05.07**

(87) WIPO No: **WO09/135492**

(30) Priority Data

(31) Number	(32) Date	(33) Country
PA 2008 00667	**2008.05.09**	**DK**

(43) Publication Date: **2009.11.12**
(44) Accepted Journal Date: **2013.07.25**

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(56) Related Art
EP 0206251 A1
US 2003/0069137 A1
US 4405357 A

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

CORRECTED VERSION

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
12 November 2009 (12.11.2009)

PCT

(10) International Publication Number
WO 2009/135492 A8

(51) International Patent Classification:
A01N 43/80 (2006.01) *A01P 13/00* (2006.01)
A01N 37/20 (2006.01)

(21) International Application Number:
PCT/DK2009/000105

(22) International Filing Date:
7 May 2009 (07.05.2009)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
PA 2008 00667 9 May 2008 (09.05.2008) DK

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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, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, 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, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (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, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *without international search report and to be republished upon receipt of that report (Rule 48.2(g))*

(48) Date of publication of this corrected version:
21 January 2010

(15) Information about Correction:
see Notice of 21 January 2010

WO 2009/135492 A8

(54) Title: SYNERGISTIC HERBICIDAL COMBINATION OF CLOMAZONE AND PETHOXAMID

(57) Abstract: Presented are herbicidal compositions comprising as active ingredients clomazone and pethoxamid. The combinations of these herbicidal active compounds show a synergistic effect in the control of harmful plants.

Synergistic Herbicidal Combination of Clomazone and Pethoxamid

The present invention relates to herbicidal compositions comprising as active ingredients the compound A which is clomazone and the compound B which is pethoxamid. The combinations of these active compounds show a synergistic effect in the control of harmful plants. The invention further relates to a method for the control of harmful plants, such as weeds in crops of useful plants, and to the use of the herbicidal compositions for that purpose.

Background

The herbicidal active compound clomazone is known from United States patent no. US 4,405,357 and is generally used to control weeds in various crops.

The herbicidal active compound pethoxamid is known from European patent application no. EP 206251-A1 and is generally used to control weeds in various crops such as control of grass weeds and broad-leaved weeds.

Clomazone is known to be a very volatile organic compound to an extend so that clomazone applied in a target area may move to adjacent areas and there cause discoloration, most typically whitening or some degree of bleaching, of a variety of crops, trees, or decorative plants. While this bleaching may be temporary when plants are exposed to sufficiently low concentrations, it is undesirable even when not causing the destruction of the affected plant. Accordingly appropriate use instructions for clomazone is often found on product labels of commercially available clomazone products and in particular on emulsifiable concentrates formulations comprising clomazone in order to prevent exposure to clomazone sensitive plants. Methods of reducing the volatility of clomazone, i.e. to prevent or reduce vapor transfer of clomazone to plants which are not target of application, are proposed in United States patents nos. US 5,597,780 and US 5,583,090 in which encapsulation techniques are applied as to prepare microcapsule suspension for-

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mulations of clomazone.

In crop protection products, it is always desirable to increase the specific activity of an active ingredient and the reliability of action. It would be advantageous if at least preferred embodiments of the present invention provide mixtures which comprise a compound A which is clomazone, and the compound B which is pethoxamid which are selective in crops to control undesirable harmful plants. Surprisingly, it has now been found that combinations of these active compounds exhibits a synergistic effect when used for the control of harmful plants. Further it has been found that by combining clomazone with pethoxamid the volatile nature of clomazone is significantly reduced.

Description of the invention

The present invention provides the following items 1 to 14:

1. A method for controlling harmful plants comprising exposing said harmful plants to an effective amount of a combination of compound A and compound B, wherein compound A is clomazone and compound B is pethoxamid.

2. A method according to item 1, wherein the harmful plants are present together with useful plants.

3. The method according to item 2, wherein the useful plants are selected among the group consisting of maize, soya, pea, bean, sunflower, oilseed rape, sugar cane, cassava, pumpkin, potato, vegetables and tobacco.

4. The method according to any one of the items 1 to 3, wherein the harmful plants are grasses and annual and perennial monocotyledonous and dicotyledonous plants.

5. The method according to any one of the items 1 to 4, comprising employing from 1 to 300 g/ha of compound A and from 100 to 3000 g/ha of compound B.

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6. The method according to item 5, comprising employing from about 10 to about 200 g/ha of compound A and from about 500 to about 2500 g/ha of compound B.

7. The method according to item 6, comprising employing from about 50 to about 150 g/ha of compound A and from about 800 to about 1500 g/ha of compound B.

8. A herbicidal composition comprising compound A and compound B, wherein compound A is clomazone and compound B is pethoxamid.

9. A composition according to item 8, wherein compound A and compound B is present in a form selected from the group consisting of ready-to-use solutions, emulsifiable concentrates, emulsions, suspensions, wettable powders, soluble powders, granules, soluble granules, dispersible granules, micro-emulsions, microcapsule suspensions and mixtures thereof.

10. A composition according to item 9, wherein the weight ratio of compounds A:B ranges from about 1:1 to about 1:30.

11. A method for reducing the volatility of clomazone, said method comprising combining a compound A and a compound B wherein compound A is clomazone and compound B is pethoxamid.

12. A method according to item 11, wherein the weight ratio of compounds A:B ranges from about 1:1 to about 1:30.

13. The use of a combination of compound A and compound B for controlling harmful plants, wherein compound A is clomazone and compound B is pethoxamid.

14. The use of a combination of compound A and compound B, wherein compound A is clomazone and compound B is pethoxamid, for reducing the volatility of clomazone.

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In one embodiment, the invention relates to a method for controlling harmful plants comprising exposing said harmful plants to an effective amount of a combination of the compound A which is clomazone, and the compound B which is pethoxamid. In a preferred embodiment the harmful plants are exposed to an effective amount of a synergistic combination of the compound A and the compound B.

In another embodiment, the invention relates to a method for controlling harmful plants in the presence of useful plants comprising exposing said harmful plants and useful plants to an effective amount of a combination of the compound A which is clomazone, and the compound B which is pethoxamid, it being understood that the useful plants remain unharmed after the exposure. In a preferred embodiment the harmful plants are exposed to an effective amount of a synergistic combination of the compound A and the compound B.

In yet another embodiment, the invention relates to a herbicidal composition comprising a herbicidal effective amount of the compound A which is clomazone and the compound B which is pethoxamid. In a preferred embodiment the herbi-

cidal composition comprise a herbicidal effective amount of the compound A and the compound B wherein the active components A and B are present in a synergistically effective amount. The composition is preferably selected among those compositions comprising a form selected from the group consisting of ready-to-use solutions, emulsifiable concentrates, emulsions, suspensions, wettable powders, soluble powders, granules, soluble granules, dispersible granules, microemulsions, microcapsule suspensions and mixtures thereof.

In a further embodiment, the invention relates to a method of reducing the volatility of clomazone, said method comprising combining clomazone as compound A with a compound B which is pethoxamid, preferably in a herbicidal composition as described herein. Preferably the ratio between the compounds A and B is in a ratio as to reduce the volatility of clomazone on a comparative scale to an emulsifiable concentrate composition comprising a similar amount of clomazone and without the compound B being present. Preferable compounds A and B are present in a herbicidal effective amount but the compound B need not necessarily be present so as to produce a synergistic effect with the compound A. However, in a very preferred embodiment, the method of reducing the volatility of clomazone comprise combining clomazone as compound A with a compound B which is pethoxamid, in a ratio as to reduce the volatility of the clomazone while maintaining a synergistic herbicidal effect and without substantially sacrificing the overall herbicidal activity. Such ratios are preferably as herein described. Thus, the present invention relates to a herbicidal composition having reduced clomazone vapour transfer comprising a compound A which is clomazone and a compound B which is pethoxamid and preferably the composition comprise a herbicidal effective amount of the compound A and the compound B wherein the active components A and B are present in a synergistically effective amount. Such ratios and amounts are preferably as herein described.

The compositions according to the invention can be employed for the selective

control of grasses and annual and perennial monocotyledonous and dicotyledonous harmful plants the presence of useful plants such as maize, soya, peas, beans, sunflowers, oilseed rape, sugar cane, cassava, pumpkins, potatoes, vegetables and tobacco. Within the scope of this invention is also the control of such harmful plants found among transgenic useful plants or among useful plants selected by classical means which are resistant to the active compounds A and B. Likewise, the compositions can be employed for controlling undesirable harmful plants in plantation crops. Among harmful plants, e.g. weeds or volunteer crop plants, that may be controlled are *Ambrosia artemisiifolia*, *Amaranthus retroflexus*, *Apera spica-venti*, *Capsella bursa-pastoris*, *Chenopodium album*, *Convolvulus arvensis*, *Digitaria ischaemum*, *Digitaria sanguinalis*, *Echinochloa crus-galli*, *Galium aparine*, *Lamium purpureum*, *Matricaria* spp., *Mercurialis annua*, *Myosotis arvensis*, *Poa* spp., *Polygonum convolvulus*, *Polygonum persicaria*, *Portulaca oleracea*, *Senecio vulgaris*, *Setaria geniculata*, *Solanum nigrum*, *Stellaria media*, *Veronica persica* and *Viola arvensis*.

Compositions containing the active compounds A and B may be employed in any conventional form, for example, in the form of a twin pack, or ready-to-use solutions, emulsifiable concentrates, emulsions, suspensions, wettable powders, soluble powders, granules, soluble granules, dispersible granules, microemulsions, microcapsule suspensions e.g. capsules comprising both active ingredients or present within separate capsules; and mixtures thereof such as a ZC, ZE or ZW formulation. Such compositions can be formulated using adjuvants and formulation techniques that are known in the art for individually formulating the herbicides. For example, the herbicides may be mixed together, optionally with other formulating ingredients.

The compositions may contain a diluent, which may be added during the formulation process, after the formulation process (e.g. by the user – a farmer or custom applicator), or both. The term diluent includes all liquid and solid agriculturally

acceptable material-including carriers which may be added to the herbicides to bring them in a suitable application or commercial form and include solvents, emulsifiers, and dispersants. Examples of suitable solid diluents or carriers are aluminium silicate, talc, calcined magnesia, kieselguhr, tricalcium phosphate, powdered cork, absorbent carbon black, chalk, silica, and clays such as kaolin and bentonite. Examples of suitable liquid diluents include water, organic solvents (e.g. acetophenone, cyclohexanone, isophorone, toluene, xylene, petroleum distillates), amines (e.g. ethanolamine, dimethylformamide), and mineral, animal, and vegetable oils (used alone or in combination). The compositions may also contain surfactants, protective colloids, thickeners, penetrating agents, stabilizers, sequestering agents, anti-caking agents, coloring agents, corrosion inhibitors, and dispersants such as lignosulfite waste liquors and methylcellulose. The term surfactant, as used herein, means an agriculturally acceptable material which imparts emulsifiability, stability, spreading, wetting, dispersibility or other surface-modifying properties. Examples of suitable surfactants include lignin sulfonates, fatty acid sulfonates (e.g. lauryl sulfonate), the condensation product of formaldehyde with naphthalene sulfonate, alkylarylsulfonates, ethoxylated alkylphenols, and ethoxylated fatty alcohols. Other known surfactants that have been used with herbicides are also acceptable.

When mixed with additional components, the composition typically contain about 0.01 to about 95% by weight of active compounds, about 0 to about 20% agriculturally acceptable surfactants, and about 5 to 99.99% solid or liquid diluent(s). The compositions may additionally contain other additives known in the art, such as pigments, thickeners and the like.

The compositions may be applied in various combinations of the two active compounds. For example, they may be applied as a single "ready-mix" form, or in a combined spray mixture composed from separate formulations of the active compounds, e.g. a "tank-mix" form. Thus, to be used in combination, it is not

necessary that the two herbicides, be applied in a physically combined form, or even at the same time, i.e. the components may be applied in a separately and/or sequentially application, provided that the application of the second active compound occurs within a reasonable period of time from the application of the first active compound. The combination effect results so long as the two herbicides are present at the same time, regardless of when they were applied. Thus, for instance, a physical combination of the two herbicides could be applied, or one could be applied earlier than the other so long as the earlier-applied herbicide is still present on the harmful plant to be controlled or in the soil surrounding the harmful plant to be controlled when the second is applied, and so long as the weight ratio of available herbicides falls within that provided herein. The order of applying the individual components A and B is not essential. Likewise, any form of combination of the active components may be applied for either pre- or post-emergence control of harmful plants, e.g. weeds in crops of useful plants.

Rates of application of the composition will vary according to prevailing conditions such as targeted weeds, degree of infestation, weather conditions, soil conditions, crop species, mode of application, and application time. Compositions containing the active compounds may be applied in the manner, which they are formulated, as discussed above. For example, they may be applied as sprays, such as water-dispersible concentrates, wettable powders, or water-dispersible granules.

The weight ratio of component A to component B is preferably selected to provide a synergistic herbicidal action. Such amounts are also called synergistically effective amounts and can easily be determined by the skilled person using well known principles. In general, the weight ratio of A:B ranges from about 1:1 to about 1:30, preferably 1:5 to 1:25 and more preferably 1:8 to 1:20 and most preferably 1:10 to 1:15. The weight ratio of A:B will depend on various factors such as the mode of application, the harmful plants to be combated, the useful

plant to be protected, the application time, etc.

An effective amount of A and B is any amount that has the ability to combat the harmful plants. In general, satisfactory results will be obtained when employing from about 1 to about 300 g/ha, preferably 10 to about 200 g/ha of compound A, and more preferably from about 50 to about 150 g/ha; and from about 100 to about 3000 g/ha, preferably about 500 to about 2500 g/ha of the compound B, and more preferably from about 800 to about 1500 g/ha. However, higher and in particular lower doses may also provide adequate control.

Additional herbicides may be also be used, preferably so provided that the additional herbicide does not interfere with the synergistic relationship between the compound A herbicide and the compound B. An additional herbicide may be utilized if broadening of the spectrum of control or preventing the build-up of resistance is desired.

Examples of additional herbicides are acetyl-CoA carboxylase inhibitors (ACC), for example cyclohexenone oxime ethers, such as alloxydim, clethodim, cloproxydim, cycloxydim, sethoxydim, tralkoxydim, butroxydim, clefoxydim or tepraloxydim; phenoxyphenoxypropionic esters, such as clodinafop-propargyl, cyhalofopbutyl, diclofop-methyl, fenoxaprop-ethyl, fenoxaprop-P-ethyl, fenthiapropethyl, fluazifop-butyl, fluazifop-P-butyl, haloxyfop-ethoxyethyl, haloxyfop-methyl, haloxyfop-P-methyl, isoxapyrifop, propaquizafop, quizalofop-ethyl, quizalofop-P-ethyl or quizalofop-tefuryl; or arylaminopropionic acids, such as flamprop-methyl or flamprop-isopropyl; p-hydroxyphenylpyruvat-dioxygenase (HPPD)-inhibitors, for example pyrazolynate, pyrazoxyfen, benzofenap, sulcotrione, isoxaflutole, mesotrione, isoxachlortole, ketospiradox, tembotrione; acetolactate synthase inhibitors (ALS), for example imidazolinones, such as imazapyr, imazaquin, imazamethabenz-methyl (imazame), imazamox, imazapic or imazethapyr; pyrimidyl ethers, such as pyrithiobac-acid, pyrithiobac-sodium, bis-

pyribac-sodium or pyribenzoxym; sulfonamides, such as cloransulam, diclosulam, florasulam, flumetsulam, metosulam or penoxsulam; or sulfonylureas, such as amidosulfuron, azimsulfuron, bensulfuron-methyl, chlorimuronethyl, chlorsulfuron, cinosulfuron, cyclosulfamuron, ethametsulfuron-methyl, ethoxysulfuron, flazasulfuron, foramsulfuron, halosulfuron-methyl, imazosulfuron, iodosulfuron, metsulfuron-methyl, nicosulfuron, primisulfuron-methyl, prosulfuron, pyrazosulfuronethyl, rimsulfuron, sulfometuron-methyl or -3-oxetanyl, sulfosulfuron, thifensulfuron-methyl, triasulfuron, tribenuron-methyl, triflusulfuron-methyl or tritosulfuron; amides, for example allidochlor, benzoylprop-ethyl, bromobutide, chlorthiamid, diphenamid, etobenzanid (benzchlomet), fluthiamide, fosamin or monalide; auxin herbicides, for example pyridinecarboxylic acids, such as clopyralid or picloram; 2,4-D or benazolin; auxin transport inhibitors, for example naptalame or diflufenzopyr; carotenoid biosynthesis inhibitors, for example amitrol, diflufenican, fluorochloridone, fluridone, flurtamone, norflurazon or picolinafen; enolpyruvylshikimate-3-phosphate synthase inhibitors (EPSPS), for example glyphosate or sulfosate; glutamine synthetase inhibitors, for example bilanafos (bialaphos) or glufosinate-ammonium; lipid biosynthesis inhibitors, for example anilides, such as anilofos or mefenacet; chloroacetanilides, such as dimethenamid, S-dimethenamid, acetochlor, alachlor, butachlor, butenachlor, diethatyl-ethyl, dimethachlor, metazachlor, metolachlor, S-metolachlor, pretilachlor, propachlor, prynachlor, terbuchlor, thenylchlor or xylachlor; thioureas, such as butylate, cycloate, di-allate, dimepiperate, EPTC, esprocarb, molinate, pebulate, prosulfocarb, thiobencarb (benthiocarb), tri-allate or vernolate; or benfuresate or perfluidone; mitosis inhibitors, for example carbamates, such as asulam, carbetamid, chlorpropham, orbencarb, propyzamid, propham or tiocarbazil; dinitroanilines, such as benefin, butralin, dinitramin, ethalfluralin, fluchloralin, oryzalin, pendimethalin, prodiamine or trifluralin; pyridines, such as dithiopyr or thiazopyr; or butamifos, chlorthal-dimethyl (DCPA) or maleic hydrazide; protoporphyrinogen IX oxidase inhibitors, for example diphenyl ethers, such as acifluorfen, acifluorfen-sodium, aclonifen, bifenox, chlornitrofen (CNP), ethoxyfen,

fluorodifen, fluoroglycofen-ethyl, fomesafen, furyloxyfen, lactofen, nitrofen, nitrofluorfen or oxyfluorfen; oxadiazoles, such as oxadiargyl or oxadiazon; cyclic imides, such as azafenidin, butafenacil, carfentrazone-ethyl, cinidon-ethyl, flumiclorac-pentyl, flumioxazin, flumipropyn, flupropacil, fluthiacet-methyl, sulfentrazone or thidiazimin; or pyrazoles, such as ET-751, JV 485 or nipyraclofen; photosynthesis inhibitors, for example propanil, pyridate or pyridafol; benzothiadiazinones, such as bentazone; dinitrophenols, for example bromofenoxim, dinoseb, dinoseb-acetate, dinoterb or DNOC; dipyridylenes, such as cyperquat-chloride, difenzoquat-methylsulfate, diquat or paraquat-dichloride; ureas, such as chlorbromuron, chlorotoluron, difenoxuron, dimefuron, diuron, ethidimuron, fenuron, fluometuron, isoproturon, isouron, linuron, methabenzthiazuron, methazole, metobenzuron, metoxuron, monolinuron, neburon, siduron or tebuthiuron; phenols, such as bromoxynil or ioxynil; chloridazon; triazines, such as ametryn, atrazine, cyanazine, desmetryn, dimethamethryn, hexazinone, prometon, prometryn, propazine, simazine, simetryn, terbumeton, terbutryn, terbutylazine or trietazine; triazinones, such as metamitron or metribuzin; uracils, such as bromacil, lenacil or terbacil; or biscarbamates, such as desmedipham or phenmedipham; growth substances, for example aryloxyalkanoic acids, such as 2,4-DB, clomeprop, dichlorprop, dichlorprop-P (2,4-DP-P), fluoroxypyr, MCPA, MCPB, mecoprop, mecoprop-P or triclopyr; benzoic acids, such as chloramben or dicamba; or quinolinecarboxylic acids, such as quinclorac or quinmerac; cell wall synthesis inhibitors, for example isoxaben or dichlobenil; various other herbicides, for example dichloropropionic acids, such as dalapon; dihydrobenzofurans, such as ethofumesate; henylacetic acids, such as chlorfenac (fenac); or aziprotryn, barban, bensulide, benzthiazuron, benzofluor, buminafos, buthidazole, buturon, cafenstrole, chlorbufam, chlorfenprop-methyl, chloroxuron, cinmethylin, cumyluron, cycluron, cyprazine, cyprazole, dibenzyluron, dipropetryn, dymron, eglinazin-ethyl, endothall, ethiozin, flucabazone, fluorbentranil, flupoxam, isocarbamid, isopropalin, karbutilate, mefluidide, monuron, napropamide, napropanilide, nitralin, oxaciclomefone, phenisopham, piperophos, procyazine, profluralin, pyribu-

ticarb, secbumeton, sulfallate (CDEC), terbucarb, triaziflam, triazofenamid or trimeturon; or their environmentally compatible salts, "acids", esters and amides.

The compounds A and B and optionally one or more additional herbicides may also be applied in combination with at least one safener compound. A safener compound is a compound, which is effective for antagonism the herbicides A, B or both or the optional additional herbicide(s), and which is applied in a suitable amount i.e., an amount which counteracts to some degree a phytotoxic response of a useful plant to the herbicide(s). The safener may suitably be incorporated in the composition discussed above. Safeners suitable for use include cloquintocet, cloquintocet-mexyl, benoxacor, dichlormid, fenchlorazole-ethyl, fenclorim, flurazole, fluxofenim, furilazole, isoxadifen, isoxadifen-ethyl, mefenpyr, mefenpyr-diethyl and oxabetrinil or their environmentally compatible salts, "acids", esters and amides.

A synergistic effect exists whenever the action of a combination of active components is greater than the sum of the action of each of the components alone. Therefore, a synergistic combination is a combination of active components having an action that is greater than the sum of the action of each active component alone, and a synergistically effective amount is an effective amount of a synergistic combination. Well-known methods for determining whether synergy exists include the Colby method, the Tammes method and the Wadley method, all of which are described below. Any one of these methods may be used to determine if synergy exists between the compounds A and B.

In the Colby method, also referred to as the Limpels method, the action to be expected E for a given active ingredient combination obeys the so-called Colby formula. According to Colby, the expected action of active ingredients A+B using p+q ppm of active ingredient is:

$$E = X + Y - \frac{X \cdot Y}{100}$$

where ppm=milligrams of active ingredient (=a.i.) per liter of spray mixture X=% action by component A using p ppm of active ingredient Y=% action by component B using q ppm of active ingredient. If the ratio R defined as the action actually observed (O) divided by the expected action (E) is >1 then the action of the combination is superadditive, i.e. there is a synergistic effect. For a more detailed description of the Colby formula, see Colby, S. R. "Calculating synergistic and antagonistic responses of herbicide combination," Weeds, Vol. 15, pages 20-22; 1967; see also Limpel et al., Proc. NEWCC 16: 48-53 (1962).

The Tammes method uses a graphic representation to determine whether a synergistic effect exists. See "Isoboles, a graphic representation of synergism in pesticides," Netherlands Journal of Plant Pathology, 70 (1964) p. 73-80.

The Wadley method is based on comparison of an observed EC50 value (i.e concentration providing 50% control) obtained from experimental data using the dose response curves and an expected EC50 calculated theoretically from the formula:

$$EC50(A+B)_{exp} = \frac{a+b}{\frac{a}{EC50(A)_{obs}} + \frac{b}{EC50(B)_{obs}}}$$

wherein a and b are the weight ratios of compound A and B in the mixture and EC50obs is the experimentally determined EC50 value obtained using the dose response curves for the individual compounds. The ratio EC50(A+B)expected/EC50(A+B)observed expresses the factor of interaction (F) (synergy factor). In case of synergism, F is >1. For a more detailed description of the Wadley method, see Levi et al., EPPO-Bulletin 16, 1986, 651-657.

The invention is illustrated by the following examples:

The herbicidal compounds A and B were applied in the formulation in which they

are present as commercially available product. Damage by the herbicidal compositions was evaluated with reference to a scale of 0% to 100% in comparison with untreated control plots. 0 means no damage and 100 means complete destruction of the harmful plants.

Example 1

In a field of sunflowers, clomazone (rate of 90 g/ha) and pethoxamid (rate of 1200 g/ha) were applied individually and in combination (90 + 1200 g/ha) to different plots by spraying. 55 days after application the rate of control of various weeds was recorded. Results are provided in table 1. The expected control is calculated according to the Colby method.

Table 1

Weed	Active substance (AI)	Control observed (O) %	Expected control (E) %
Echinochloa crus-galli	Clomazone	50	
	Pethoxamid	47	
	Clomazone+Pethoxamid	94	74 (1.28)
Solanum nigrum	Clomazone	37	
	Pethoxamid	47	
	Clomazone+Pethoxamid	87	67 (1.31)

( ) indicates the synergism ratio R.

Example 2

In a field of sunflowers, clomazone (rate of 90 g/ha) and pethoxamid (rate of 1200 g/ha) were applied individually and in combination (90 + 1200 g/ha) to different plots by spraying. 50 days after application the rate of control of various weeds was recorded. Results are provided in table 2. The expected control is calculated according to the Colby method.

Table 2

Weed	Active substance (AI)	Control observed (O) %	Expected control (E) %
Mercurialis annua	Clomazone	13	
	Pethoxamid	27	
	Clomazone+Pethoxamid	76	37 (2.08)
Ambrosia artemisiifolia	Clomazone	10	
	Pethoxamid	10	
	Clomazone+Pethoxamid	100	19 (5.26)

Example 3

In an oilseed rape field, Clomazone, and pethoxamid were applied individually and in combination to different plots by spraying. 206 days after application the rate of control of *Viola arvensis* was recorded. Results are provided in table 3. The expected control is calculated according to the Colby method.

Table3

Active substance (AI)	g. AI/hectare	Control observed (O) %	Expected control (E) %
Clomazone	72	0	
Pethoxamid	1200	50	
Clomazone+Pethoxamid	72+1200	63	50 (1.26)

( ) indicates the synergism ratio R.

Example 4

In an oilseed rape field, Clomazone, and pethoxamid were applied individually and in combination to different plots by spraying. 64 days after application the rate of control of *Galium aparine* was recorded. Results are provided in table 4. The expected control is calculated according to the Colby method.

Table 4

Active substance (AI)	g. AI/hectare	Control observed (O) %	Expected control (E) %
Clomazone	72	40	
Pethoxamid	1200	0	
Clomazone+Pethoxamid	72+1200	81	40 (2.03)

( ) indicates the synergism ratio R.

Example 5

The volatility of clomazone in clomazone/pethoxamid mixtures as well as straight clomazone in emulsifiable concentrate (EC) and microcapsule suspension (CS) formulations was tested. The following formulations were prepared, wherein the microcapsule suspensions are mixtures of microcapsules comprising the individual active ingredients:

Table 5

Formulation type	a.i. content:
1 - (CS)	400 g/l pethoxamid + 35g/l clomazone
2 - (EC)	400 g/l pethoxamid + 24g/l clomazone
3 - (CS)	360 g/l clomazone
4 - (EC)	500 g/l clomazone

Test plants (newly germinated wheat seeds; Vinjet) were planted in 81 cm^3 pots. 30 ml formulation (diluted as to comprise 0.5g/l of clomazone) in small glass bowls was placed at the bottom of each of the four desiccator jars. Plants were placed in petri dishes with moistened filter paper. In every desiccator, four pots of wheat were placed on the top of the plates and each trial setup was covered with the desiccator lid (open at the top). After 72 hours, the plants were removed from the desiccators. The development of foliar injury due to clomazone vapor was evaluated and scored visually after 7 and 11 days (average). Clomazone caused easily notable foliar injuries such as bleaching and tip-burning. Results are provided in the below table

Table 6

	% Phytotoxicity	
Formulation	Day 7	Day 11
Control (no a.i.)	0	0
1 - (CS) – pethoxamid+clomazone	33	41
2 - (EC) – pethoxamid+clomazone	25	23
3 - (CS) – clomazone	75	85
4 - (EC) – clomazone	78	65

Plants exposed to formulations containing only clomazone showed a higher level of foliar injury than plants exposed to mixtures of pethoxamid and clomazone.

It is to be understood that, if any prior art publication is referred to herein, such reference does not constitute an admission that the publication forms a part of the common general knowledge in the art, in Australia or any other country.

In the claims which follow and in the preceding description of the invention, except where the context requires otherwise due to express language or necessary implication, the word "comprise" or variations such as "comprises" or "comprising" is used in an inclusive sense, i.e. to specify the presence of the stated features but not to preclude the presence or addition of further features in various embodiments of the invention.

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The claims defining the invention are as follows:

1. A method for controlling harmful plants comprising exposing said harmful plants to an effective amount of a combination of compound A and compound B, wherein compound A is clomazone and compound B is pethoxamid.

2. A method according to claim 1, wherein the harmful plants are present together with useful plants.

3. The method according to claim 2, wherein the useful plants are selected among the group consisting of maize, soya, pea, bean, sunflower, oilseed rape, sugar cane, cassava, pumpkin, potato, vegetables and tobacco.

4. The method according to any one of the claims 1 to 3, wherein the harmful plants are grasses and annual and perennial monocotyledonous and dicotyledonous plants.

5. The method according to any one of the claims 1 to 4, comprising employing from 1 to 300 g/ha of compound A and from 100 to 3000 g/ha of compound B.

6. The method according to claim 5, comprising employing from about 10 to about 200 g/ha of compound A and from about 500 to about 2500 g/ha of compound B.

7. The method according to claim 6, comprising employing from about 50 to about 150 g/ha of compound A and from about 800 to about 1500 g/ha of compound B.

8. A herbicidal composition comprising compound A and compound B, wherein compound A is clomazone and compound B is pethoxamid.

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9. A composition according to claim 8, wherein compound A and compound B is present in a form selected from the group consisting of ready-to-use solutions, emulsifiable concentrates, emulsions, suspensions, wettable powders, soluble powders, granules, soluble granules, dispersible granules, micro-emulsions, microcapsule suspensions and mixtures thereof.

10. A composition according to claim 9, wherein the weight ratio of compounds A:B ranges from about 1:1 to about 1:30.

11. A method for reducing the volatility of clomazone, said method comprising combining a compound A and a compound B wherein compound A is clomazone and compound B is pethoxamid.

12. A method according to claim 11, wherein the weight ratio of compounds A:B ranges from about 1:1 to about 1:30.

13. The use of a combination of compound A and compound B for controlling harmful plants, wherein compound A is clomazone and compound B is pethoxamid.

14. The use of a combination of compound A and compound B, wherein compound A is clomazone and compound B is pethoxamid, for reducing the volatility of clomazone.

15. A method according to any one of claims 1 to 7, 11 and 12; a composition according to any one of claims 8 to 10; or use according to claim 13 or 14; substantially as herein described with reference to any one of the Examples.