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(54) **Title**: USE OF ACLONIFEN AND CERTAIN ACLONIFEN CONTAINING HERBICIDE COMBINATIONS IN TUBEROUS ROOT CROP PLANTS

(57) **Abstract**: The present invention primarily relates to the use of aclonifen, specific herbicide combinations containing aclonifen, orc ompositions comprising aclonifen or a specific herbicide combination containing aclonifen for controlling harmful plants in tuberous root crop plants, preferably in cassava. The present invention also relates to the use of aclonifen, specific herbicide combinations containing aclonifen, or compositions comprising aclonifen or a specific herbicide combination containing aclonifen as plant growth regulators for tuberous root crop plants, preferably as plant growth regulators for cassava. Furthermore, the present invention relates to a corresponding method of controlling harmful plants in tuberous root crop plants and to a corresponding method of regulating plant growth of tuberous root crop plants.

Use of aclonifen and certain aclonifen containing herbicide combinations in tuberous root crop plants

The present invention primarily relates to the use of aclonifen, specific herbicide combinations containing aclonifen, or compositions comprising aclonifen or a specific herbicide combination containing aclonifen for controlling harmful plants in tuberous root crop plants, preferably in cassava. The present invention also relates to the use of aclonifen, specific herbicide combinations containing aclonifen, or compositions comprising aclonifen or a specific herbicide combination containing aclonifen as plant growth regulators for tuberous root crop plants, preferably as plant growth regulators for cassava. Furthermore, the present invention relates to a corresponding method of controlling harmful plants in tuberous root crop plants and to a corresponding method of regulating plant growth of tuberous root crop plants.

Cassava (*Manihot esculenta* Crantz) is a major source of carbohydrate for several hundred million people, mainly in Africa and to some extent in Asia and Latin America. In Africa, yields of cassava are generally comparatively low, which to a large extent is due to effects of weed competition or to uncontrolled or unsufficiently controlled weed growth. Hoe-weeding still is a common practice among cassava farmers.

The Proceedings of the 11th ISRTC-AB, Kinshasa, Democratic Republic Congo, 4-8 October 2010, pages 269-275 report on the evaluation of commercially available herbicides for weed control in cassava. The treatments there comprised pre-emergent herbicides employing such as chloroacetanilide, prometryn or S-metolachlor.

In the Crop recommendation #17 of the Ministry of Agriculture of Barbados the following herbicides for weed control in cassava are mentioned: paraquat (optionally mixed with diquat), glyphosate, sulfosate, pendimethalin, metolachlor, fluazifop-butyl, sethoxydim or propaquizafop.

CN102428919A teaches a postemergence cassava field herbicide with mesotrion as an active component.

CN103392724A suggests the use of a ternary herbicide composition as cassava field herbicide with the active components of halosulfuron, oxyfluorfen and an amide herbicide selected from the group of butachlor, propisochlor and metolachlor.

GB 1,028,976 discloses a process for the treatment of plants with storage organs, for example cassava, sweet potato or yam, which comprises spraying the plants with a substituted benzoic acid herbicide in a specific time fram before harvest. There, herbicides like (optionally further substituted) di-, tri- or tetrachlorobenzoic acids are preferred.

African Crop Science Journal 1994, 519-530 reports on weeds and their control in cassava. There, mainly the following herbicides were tested: metobromuron, fluometuron, prometryn (optionally in combination with ametryne), terbutryn, paraquat and diuron.

Planata Daninha, 2010, 28(4), 807-816 describes the application of different herbicdes on weeds in cassava. Inter alia the effects of herbicides like diuron, metribuzin, isoxaflutole, atrazine, ametryn, and several combinations comprising said herbicides are reported therein on two cassava varieties grown in the state of Paraná, Brazil.

In their application, herbicidal crop protection agents (herbicides) known to date for controlling harmful plants or unwanted vegetation in tuberous root crop plants have some disadvantages, be it (a) that they have no or else insufficient herbicidal activity against specific harmful plants, (b) that the spectrum of harmful plants which can be controlled with the herbicides is not broad enough, and/or (c) that the selectivity of herbicides in and the compatibility with tuberous root crop plants is too low, thereby causing unwanted damage and/or unwanted reduced harvest yields of the tuberous root crops.

Overall, the herbicidal activity (above aspects (a) and (b)) and/or the selectivity / compatibility (above aspect (c)) of the herbicides used so far in tuberous root crop plants still allow improvement.

For the reasons mentioned above, there still is a need for alternative, highly active herbicides or herbicidal compositions for the selective application for controlling harmful plants or unwanted vegetation in tuberous root crop plants.

Surprisingly, it has now been found that aclonifen, specific herbicide combinations containing aclonifen, or compositions comprising aclonifen or a specific herbicide combination containing aclonifen exhibit the desired herbicidal activity and are able to selectively control harmful plants or unwanted vegetation in tuberous root crop plants.

The present invention primarily relates to the use of aclonifen or a composition comprising (i) aclonifen

- for controlling harmful plants in tuberous root crop plants,

and/or

- as plant growth regulators in tuberous root crop plants.

The present invention also relates to the use of a combination of herbicides (herbicide combination) or of a composition comprising a combination of herbicides (herbicide combination)

- for controlling harmful plants in tuberous root crop plants,

and/or

- as plant growth regulators in tuberous root crop plants,

wherein said combination of herbicides comprises or consists of (i) aclonifen and (ii) isoxaflutole.

The present invention further releates to the use of a composition as defined herein in the context of the present invention which additionally comprises one or more further components selected from the group consisting of formulation auxiliaries, additives customary in crop protection, and further agrochemically active compounds (i.e. agrochemically active compounds different from aclonifen or different from components (i) and (ii) as defined above, i.e. agrochemically active compounds other than (i) aclonifen and (ii) isoxaflutole).

In a preferred embodiment of the present invention, aclonifen is the only herbicide used. Thus, in a preferred embodiment of the present invention, aclonifen is the only herbicide present in a composition used in the context of the present invention, i.e. no further herbicidal active ingredient is present in said composition.

In another preferred embodiment of the present invention, aclonifen is the only agrochemically active compound used. Thus, in a preferred embodiment of the present invention, aclonifen is the only agrochemically active compound present in a composition used in the context of the present invention, i.e. no further agrochemically active compound is present in said composition.

When a combination of herbicides used in the context of the present invention consists of herbicides (i) aclonifen and (ii) isoxaflutole, this means that in such a case the combination of herbicides used in the context of the present invention or the composition comprising said combination of herbicides used in the context of the present invention does not contain any further (i.e. no additional) herbicidal active ingredient, and preferably does not contain any further agrochemically active compound.

In this context, the term “further herbicidal active ingredient” and “further agrochemically active compound” refers to the herbicides and agrochemically active compounds (pesticides), respectively, listed in "The Pesticide Manual", 16th edition, The British Crop Protection Council and the Royal Soc. of Chemistry, 2012 other than aclonifen or other than aclonifen and isoxaflutole.

Aclonifen, the combination of herbicides (i) and (ii) used in accordance with the present invention or a composition (preferably comprising the combination of herbicides (i) and (ii)) used in accordance with the present invention not only exhibit an excellent herbicidal activity in controlling harmful plants or unwanted vegetation in tuberous root crop plants, but also show compatibility with tuberous root crop plants, i.e. said herbicides do not cause significant damage and/or unwanted reduced harvest yields of the tuberous root crops.

It has been further found that the selectivity of the herbicides used in the prior art can be improved. Aclonifen, the combination of herbicides (i) and (ii) used in accordance with the present invention or a composition (preferably comprising the combination of herbicides (i) and (ii)) used in accordance with the present invention allow good to excellent (total) weed control at an agronomically acceptable level of damage of the tuberous root crop plants. Further, the type of damage observed with aclonifen, the combination of herbicides (i) and (ii) used in accordance with the present invention or a composition (preferably comprising the combination of herbicides (i) and (ii)) used in accordance with the present invention is less harmful and/or less severe compared to many

herbicides used in the prior art, and the tuberous root crop plants affected largely or fully recover from said type of damage.

Further, aclonifen, the combination of herbicides (i) and (ii) used in accordance with the present invention or a composition (preferably comprising the combination of herbicides (i) and (ii)) used in accordance with the present invention can be used as plant growth regulators for tuberous root crop plants, preferably as plant growth regulators for cassava, thereby increasing harvest yields tuberous root crop plants (in particular the weight of the tuberous root) and/or increasing the plant growth of the tuberous root crop plants (in particular the growth of the leaves of the tuberous root crop plants), in each case in comparison to tuberous root crop plants not treated with herbicides (untreated control).

The present invention preferably relates to the use of aclonifen, the combination of herbicides (i) and (ii) used in accordance with the present invention or a composition (preferably comprising the combination of herbicides (i) and (ii)) used in accordance with the present invention, wherein the tuberous root crop plants are selected from the group consisting of sweet potato (*Ipomoea batatas*), cassava (*Manihot esculenta*), and yam (plant species in the genus *Dioscorea*), more preferably wherein the tuberous root crop plant is cassava (*Manihot esculenta*).

The herbicides (i) and optionally (ii) used in the context of the present invention are known per se, and described inter alia in "The Pesticide Manual", 16th edition, The British Crop Protection Council and the Royal Soc. of Chemistry, 2012 and the literature cited therein. The herbicides (i) and (ii) used in the context of the present invention are described in more detail hereinbelow.

The herbicides (i) and (ii), the combinations comprising the herbicides (i) and (ii) as defined herein and used in the context of the present invention and also certain compositions comprising the herbicides (i) and (ii) or the herbicide combinations used in the context of the present invention as such are known. The herbicides (i) and (ii), the herbicide combinations used in the context of the present invention and also certain compositions comprising the herbicide combinations used in the context of the present invention are commercially available.

Tuberous roots (also called root tubers) are perennating organs, thickened roots that store nutrients over periods when the plant cannot actively grow, thus permitting survival from one year to the next.

Tubers should not be confused with tuberous roots. Tubers are modified shoots, whereas tuberous roots are modified roots.

A tuberous root is a modified lateral root, enlarged to function as a storage organ. The enlarged area of the root-tuber, or storage root, can be produced at the end or middle of a root or involve the entire root. It is thus different in origin but similar in function and appearance to a stem tuber. Examples of plants with notable tuberous roots include the sweet potato, cassava, yam and dahlia.

Cassava (*Manihot esculenta* Crantz), also called manioc, yuca, balinghoy or kamoteng kahoy (in the Philippines), tabolchu (in Northeast India), mogo (in Africa), mandioca, tapioca-root, kappa (predominantly in India) and manioc root, a woody shrub of the Euphorbiaceae (spurge) family native to South America, is extensively cultivated as an annual crop in tropical and subtropical regions for its edible starchy tuberous root, a major source of carbohydrates. Cassava, when dried to a powdery (or pearly) extract, is called tapioca; its fermented, flaky version is named garri.

Cassava is the third largest source of food carbohydrates in the tropics, after rice and maize. Cassava is a major staple food in the developing world, providing a basic diet for over half a billion people. It is one of the most drought-tolerant crops, capable of growing on marginal soils. Nigeria is the world's largest producer of cassava, while Thailand is the largest exporting country of dried cassava.

Cassava grows poorly in weedy fields and consequently produces fewer and smaller storage roots.

Yam is the common name for some plant species in the genus *Dioscorea* (family Dioscoreaceae) that form edible tubers. These are perennial herbaceous vines cultivated for the consumption of their starchy tubers in Africa, Asia, Latin America, the Caribbean and Oceania. There are many cultivars of yam. Although some varieties of sweet potato (*Ipomoea batatas*) are also called *yam* in parts of the United States and Canada, it is not part of the family Dioscoreaceae.

Yams are monocotyledons, related to lilies and grasses. Native to Africa and Asia, yam tubers vary in size from that of a small potato to over 60 kilograms. There are over 600 varieties of yams and 95 percent of these crops are grown in Africa.

According to the present invention the expression "composition" includes compositions comprising a herbicide combination comprising the herbicides (i) and (ii) as defined herein, and can be used in various acceptable or agronomically typical forms and formulations, for example in a single "ready-mix" form.

The herbicides (i) and (ii) used in the herbicide combinations used in the context of the present invention and the compositions comprising the herbicide combinations used in the context of the present invention may be a combined spray mixture composed from separate formulations of the single active compounds, such as a "tank-mix", or said composition can be a combined use of the single active ingredients when applied in a sequential manner, i.e. one after the other within a reasonably short period, such as a few hours (and preferably less than 24 hours).

The herbicides (i) and (ii) used in the herbicide combinations used in the context of the present invention include all (stereo)isomers and their mixtures.

If, in the context of this description, the short form of the common name of an active compound is used, this includes in each case all customary derivatives, such as the esters and salts, and isomers, in particular the

commercially available form or forms. If the common name denotes an ester or salt, this in each case also comprises all other customary derivatives, such as other esters and salts, the free acids and neutral compounds, and isomers, in particular optical isomers, in particular the commercially available form or forms. The given chemical compound names denote at least one of the compounds embraced by the common name, frequently a preferred compound.

The salts of compounds used in the context of the present invention may be used in the form of the respective alkali metal salts, alkaline earth salts or ammonium salts, preferably in the form of the respective alkali metal salts, more preferably in the form of the respective sodium or potassium salts, most preferably in the form of the respective sodium salts.

Aclonifen (IUPAC-Name: 2-chloro-6-nitro-3-phenoxyaniline, CAS Reg. No. 74070-46-5) is known and described for example in EP 007 482 A1 or US 4,394,159.

Isoxaflutole (IUPAC-Name: 5-cyclopropyl-1,2-oxazol-4-yl)(α,α,α-trifluoro-2-mesyl-*p*-tolyl)methanone, CAS Reg. No. 141112-29-0) is described for example in EP 0 527 036 A1.

In accordance with the present invention, the herbicide combinations as defined herein or the composition (preferably comprising the combination of herbicides (i) and (ii)) used in accordance with the present invention comprise a herbicidal effective amount of aclonifen or of said herbicide combination and may comprise further components, for example agrochemically active compounds of a different type and/or formulation auxiliaires and/or additives customary in crop protection, or they may be employed together with these.

In accordance with the present invention, the herbicide combinations as defined herein or the composition comprising a herbicide combination as defined herein may be applied as a split application over time. Another possibility is the application of the individual herbicides (i) and (ii) or the herbicide combinations in a plurality of portions (sequential application), for example after pre-emergence applications, followed by post-emergence applications or after early post-emergence applications, followed by applications at medium or late post-emergence.

Preferred is the simultaneous or nearly simultaneous application of the combination of herbicides (i) and (ii) as defined herein. In the latter context, a nearly simultaneous application of the herbicides (i) and (ii) as defined herein means that the herbicide (i) aclonifen and the herbicide (ii) isoxaflutole are both applied within 24 hours, preferably within 12 hours, more preferably within 6 hours, even more preferably within 3 hours.

In a particularly preferred embodiment, the herbicides (i) and (ii) as defined herein are used together, i.e. at the same time. Thus, in a particularly preferred embodiment, a composition comprising the herbicides (i) and (ii) as defined herein is used.

In a preferred embodiment, aclonifen, the combination of herbicides (i) and (ii) used in accordance with the present invention or a composition (preferably comprising the combination of herbicides (i) and (ii)) used in accordance with the present invention are only used once per season. It was found that one application per season of aclonifen, the combination of herbicides (i) and (ii) used in accordance with the present invention or a composition (preferably comprising the combination of herbicides (i) and (ii)) used in accordance with the present invention is sufficient to achieve the effects described in the context of the present invention, in particular regarding herbicidal activity (above aspects (a) and (b)) and/or the selectivity / compatibility (above aspect (c)).

In a preferred embodiment, aclonifen, the combination of herbicides (i) and (ii) used in accordance with the present invention or a composition (preferably comprising the combination of herbicides (i) and (ii)) used in accordance with the present invention is applied once, twice or three times per Gregorian calendar year, i.e. in one application, in two applications or in three applications per year according to the Gregorian calendar.

In a preferred embodiment, aclonifen, the combination of herbicides (i) and (ii) used in accordance with the present invention or a composition (preferably comprising the combination of herbicides (i) and (ii)) used in accordance with the present invention is applied one time per Gregorian calendar year, i.e. in one application per year according to the Gregorian calendar.

In a preferred embodiment, aclonifen, the combination of herbicides (i) and (ii) used in accordance with the present invention or a composition (preferably comprising the combination of herbicides (i) and (ii)) used in accordance with the present invention is applied one time in about 12 months, i.e. in one application in about 12 months.

The effects observed when using the combination of herbicides (i) and (ii) as defined herein or a composition comprising the combination of herbicides (i) and (ii) as defined herein allow a more potent herbicidal action, the control of hitherto uncontrolable species (activity gaps), an extended application period and/or a reduced number of required individual applications and - as a result for the user - more advantageous weed control systems both from an economical and ecological point of view.

As already mentioned above, the combination of herbicides (i) and (ii) as defined herein or a composition comprising the combination of herbicides (i) and (ii) as defined herein may be used in pre-emergence applications and/or in post-emergence applications.

Preferaby, the combination of herbicides (i) and (ii) as defined herein or a composition comprising the combination of herbicides (i) and (ii) as defined herein are used in pre-emergence applications.

Preferably, in the herbicide combinations used in accordance with the present invention and in the composition comprising a herbicide combination used in accordance with the present invention the total amount by weight of constituent (i), i.e. aclonifen, is used in a higher amount than constituent (ii) isoxaflutole.

Thus, in the herbicide combinations used in accordance with the present invention and in the composition comprising a herbicide combination used in accordance with the present invention the ratio by weight of the total amount of (i) aclonifen to the total amount of (ii) isoxaflutole preferably is >1, greater than 1 : 1, more preferably >2, i.e. greater than 2 : 1, even more preferably >3, i.e. greater than 3 : 1.

In the herbicide combinations used in accordance with the present invention and or in the composition comprising a herbicide combination used in accordance with the present invention the ratio by weight of the total amount of (i) aclonifen to the total amount of (ii) isoxaflutole preferably is in the range of from 2 : 1 to 15 : 1, more preferably in the range of from 3 : 1 to 12 : 1.

In the herbicide combinations used in accordance with the present invention and or in the composition comprising a herbicide combination used in accordance with the present invention the ratio by weight of the total amount of (i) aclonifen to the total amount of (ii) isoxaflutole particularly preferably is in the range of from 4 : 1 to 12 : 1, and most preferably in the range of from 5 : 1 to 8 : 1.

The preferred application rates [indicated as g a.i./ha, i.e. grams of active ingredient per hectare] of the herbicides (i) aclonifen and optionally (ii) isoxaflutole used in the context of the present invention as defined herein are as follows:

If aclonifen is the only herbicidal active ingredient, or the only agrochemically active compound compound used in the context of the present invention, aclonifen is preferably applied at a rate in the range of 100 to 3000 g a.i./ha, more preferably at a rate in the range of 200 to 2500 g a.i./ha, particularly preferably at a rate in the range of 400 to 2000 g a.i./ha, and most preferably at a rate in the range of 500 to 1800 g a.i./ha.

If a combination of herbicides (i) and (ii) as defined herein or a composition comprising the combination of herbicides (i) and (ii) is used in the context of the present invention, the preferred amounts of (i) aclonifen and (ii) isoxaflutole are the following:

(i) aclonifen is preferably applied at a rate in the range of 100 to 1000 g a.i./ha, more preferably at a rate in the range of 200 to 900 g a.i./ha, particularly preferably at a rate in the range of 400 to 800 g a.i./ha, and most preferably at a rate in the range of 500 to 700 g a.i./ha, and

(ii) isoxaflutole is preferably applied at a rate in the range of 10 to 250 g a.i./ha, more preferably at a rate in the range of 25 to 200 g a.i./ha., particularly preferably at a rate in the range of 40 to 150 g a.i./ha, and most preferably at a rate in the range of 50 to 125 g a.i./ha.

The combination of herbicides (i) and (ii) as defined herein more preferably applied in the more preferred rates as defined above (as defined after the term "more preferably"), and particularly preferably applied in the particularly preferred rates as defined above (as defined after the term "particularly preferably").

Furthermore, the combination of herbicides (i) and (ii) as defined herein can be used together with other agrochemically active compounds, for example from the group of the safeners, fungicides, insecticides, other herbicides and other plant growth regulators, or with formulation auxiliaries and additives customary in crop protection. Additives are, for example, fertilizers and colorants. Preference is in each case given to the application rates or the application rate ranges mentioned above for aclonifen and isoxaflutole, respectively, and to the ratios by weight mentioned above for aclonifen and isoxaflutole.

The most important and most noxious weed species in cassava fields in Colombia reported are (African Crop Science Journal 1994, 519-530): *Pteridium aquilinum* L. Kuhn, *Imperata cylindrica* L. Beauv., *Melinis ninutiflora* Beauv., *Sida acuta* Burm F., *Cyperus rotundus* L., *Commelina diffusa* Burm F. sub-species *diffuse* J.K. Morton, *Ageratum conyzoides* L. and *Portulaca oleraceae* L., *Cyperus rotundus* L (purple nutsedge), *Rottboellia exaltata* (Lour) Clayton (Raoul grass), *Sorghum halepense* L. Pers (Johnson grass) and *Ipomoea* sp. (morning glory).

In Nigeria, broad-leaved species were the most frequent weeds in all areas, averaging 71-78% of all the species recorded. Only 17-19% of the weed species present were grasses and 4-7% were sedges. Five weed species, namely, *Ageratum conyzoides* L., *Alternenthera sessilis* L. R. Br. ex Roth, *Mimosa invisa* Mart, *Digitaria horizontalis* Willd, and *Panicum maximum* Jacq occurred in the entire area surveyed.

In south western Nigeria it was observed that annual weeds, especially broad-leaved weeds, were the most common in cassava, and the prevalent species were *Euphorbia hirta* L. and *Talinum triangulate* Willd.

African Crop Science Joumal 1994, Vol. 2. No.4, pp. 519-530 summarizes the ten most common weed species in cassava fields in Umuahia, southern Nigeria:

Ageratum conyzoide, Calopogonium mucunoides, Alternenthera sessilis, Boreiria ocymoides, Commelina erecta, Chromolaena odorata, Mimosa invisa, Commelina benghalansis, Tridax procumbens, Brachiaria delfexa, Platostoma africanum, Digitaria adscendens, Synedrella nodiflora, Panicum maximum, Cyperus rotundus, Cyperus esculentus.

Further relevant weed species occurring in cassava fields in Nigeria are (grasses, sedges and broadleaf weeds): *Imperata cylindrica, Cynodon dactylon, Pennisetum polystachion, Mariscus alternifolius, Euphorbia heterophylla, Talinum triangulare.*

A relevant parasitic weed species occurring in cassava fields (for example in Nigeria) is *Cuscuta australis.*

Aclonifen, the combination of herbicides as defined herein or the composition according to the present invention as defined herein have an outstanding herbicidal activity against a broad spectrum of economically important harmful monocotyledonous and dicotyledonous harmful plants in tuberous root crop plants, particularly in cassava.

In the context of the present invention "controlling" denotes a significant reduction of the growth of the harmful plant(s) in comparison to the untreated harmful plants. Preferably, the growth of the harmful plant(s) is essentially diminished (60-79%), more preferably the growth of the harmful plant(s) is largely or fully suppressed (80-100%), and in particular the growth of the harmful plant(s) is almost fully or fully suppressed (90-100%).

Preferably, the present invention relates to the use of aclonifen, a combination of herbicides used according to the present invention or a composition used according to the present invention, each as as defined in the context of the present invention, wherein one, several or all harmful plants are selected from the group of weed species consisting of Ageratum spp., Calopogonium spp., Alternanthera spp., Boreiria spp., Commelina spp., Chromolaena spp., Mimosa spp., Tridax spp., Brachiaria spp., Platostoma spp., Digitaria spp., Synedrella spp., Panicum spp., Cyperus spp., Imperata spp., Cynodon spp., Pennisetum spp., Mariscus spp., Euphorbia spp., Talinum spp., Pteridium spp., Melinis spp., Sida spp., Portulaca spp., Rottboellia spp., Sorghum spp., Ipomea spp., Dactyloctenium spp., Spigelia spp., Boerhaavia spp., Aspilia spp., Aneilima spp., Hyparrhenia spp., Andropogon spp., Paspalum spp., Rhynchelytrum spp., Eleusine spp., Setaria spp., Triumfetta spp., Stachytarpheta spp., Desmodium spp., Gomphrena spp., Tephrosia spp., Acanthospermum spp., Hyptis spp., Cenchrus spp., Urena spp., Vernonia spp., Cleome spp., Crotalaria spp., Kyllinga spp., Corchorus spp., Ipomoea spp., Mitracarpus spp., Melanthera spp., Centrosema spp., Emilia spp., Croton spp., Phyllanthus spp., Passiflora spp., Axonopus spp., Oldenlandia spp., Schwenckia spp., Acalypha spp., Solenostemon spp., Celosia spp., Indigofera spp., Heterotis spp., Acmella spp., Leucaena spp., Boerhavia spp., Spermacoce spp., Oplismenus spp., and Fimbristylis spp..

In a preferred aspect, the present invention relates to the use aclonifen, a combination of herbicides used according to the present invention or a composition used according to the present invention, each as as defined in the context of the present invention, wherein one, several or all harmful plants are selected from the group of weed species consisting of Ageratum spp., Calopogonium spp., Alternanthera spp., Boreiria spp., Commelina spp., Chromolaena spp., Mimosa spp., Tridax spp., Brachiaria spp., Platostoma spp., Digitaria spp., Synedrella spp., Panicum spp., Cyperus spp., Imperata spp., Cynodon spp., Pennisetum spp., Mariscus spp., Euphorbia spp., Talinum spp., Pteridium spp., Melinis spp., Sida spp., Portulaca spp., Rottboellia spp., Sorghum spp., Ipomea spp., Dactyloctenium spp., Spigelia spp., Boerhaavia spp., Aspilia spp., Aneilima spp., Hyparrhenia spp., Andropogon spp., Paspalum spp., Rhynchelytrum spp., Eleusine spp., Setaria spp., Triumfetta spp., Stachytarpheta spp., Desmodium spp., Gomphrena spp., Tephrosia spp., Acanthospermum spp., Hyptis spp., Cenchrus spp., Urena spp., Vernonia spp., and Cleome spp..

Particularly, aclonifen, a combination of herbicides used according to the present invention or a composition used according to the present invention, each as as defined in the context of the present invention, are used to control one, several or all harmful plants selected from the group of weed species consisting of Ageratum spp., Calopogonium spp., Alternanthera spp., Boreiria spp., Commelina spp., Chromolaena spp., Mimosa spp., Tridax spp., Brachiaria spp., Platostoma spp., Digitaria spp., Synedrella spp., Panicum spp., Cyperus spp., Imperata spp., Cynodon spp., Pennisetum spp., Mariscus spp., Euphorbia spp., Talinum spp., Pteridium spp., Melinis spp., Sida spp., Portulaca spp., Rottboellia spp., Sorghum spp., Ipomea spp., Dactyloctenium spp., Spigelia spp., Boerhaavia spp., Desmodium spp., Gomphrena spp., Tephrosia spp., Acanthospermum spp., Hyptis spp., Cenchrus spp., Urena spp., Vernonia spp., and Cleome spp..

More particularly, aclonifen, a combination of herbicides used according to the present invention or a composition used according to the present invention, each as as defined in the context of the present invention, are used to control one, several or all harmful plants selected from the group of weed species consisting of Ageratum spp., Calopogonium spp., Alternanthera spp., Boreiria spp., Commelina spp., Chromolaena spp., Mimosa spp., Tridax spp., Brachiaria spp., Platostoma spp., Digitaria spp., Synedrella spp., Panicum spp., Cyperus spp., Imperata spp., Cynodon spp., Pennisetum spp., Mariscus spp., Euphorbia spp., Talinum spp., Pteridium spp., Melinis spp., Sida spp., Portulaca spp., Rottboellia spp., Sorghum spp., Ipomea spp., Dactyloctenium spp., Spigelia spp., and Boerhaavia spp..

Specifically, examples may be mentioned of some representatives of the monocotyledonous and dicotyledonous weed flora which can be controlled by the combinations according to the present invention.

In a more specific aspect, the present invention relates to the use of aclonifen, a combination of herbicides used according to the present invention or a composition used according to the present invention, each as as defined in the context of the present invention, wherein one, several or all harmful plants are selected from the group consisting of *Ageratum conyzoides, Calopogonium mucunoides, Alternanthera sessilis, Boreiria ocymoides, Commelina erecta, Chromolaena odorata, Mimosa invisa, Commelina benghalensis, Tridax procumbens, Brachiaria delfexa, Platostoma africanum, Digitaria adscendens, Digitaria horizontalis, Synedrella nodiflora, Panicum maximum, Cyperus rotundus, Cyperus esculentus, Imperata cylindrica, Cynodon dactylon, Pennisetum polystachion, Pennisetum purpureum, Pennisetum violaceum, Mariscus alternifolius, Euphorbia heterophylla, Euphorbia hirta, Talinum triangulare, Pteridium aquilinum, Melinis ninutiflora, Sida acuta, Sida rhombifolia, Commelina diffusa, Portulaca oleraceae, Rottboellia exaltata, Rottboellia cochinchinensis, Sorghum halepense, Ipomea triloba, Dactyloctenium aegyptium, Brachiara lata, Spigelia anthemia, Boerhaavia erecta, Aspilia africana, Aneilima beniniense, Hyparrhenia involucrate, Andropogon gayanus, Paspalum conjugatum, Paspalum orbiculatum, Rhynchelytrum repens, Eleusine indica, Setaria barbata, Setaria megaphylla, Triumfetta cordifolia, Stachytarpheta cayennensis, Desmodium scorpiurus, Gomphrena celosioides, Tephrosia bracteolata, Acanthospermum hispidum, Hyptis suaveolens, Cenchrus biflorus, Urena lobata, Vernonia ambigua, Cleome viscosa, Cuscuta australis, Corchorus olitorius,*

Mitracarpus villosus, *Melanthera scandens*, *Centrosema pubescens*, *Emilia coccinea*, *Croton hirtus*, *Phyllanthus amarus*, *Corchorus trilocularis*, *Passiflora foetida*, *Ipomoea involucrate*, *Axonopus compressus*, *Oldenlandia corymbosa*, *Acalypha ciliata*, *Schwenckia americana*, *Solenostemon monostachyus*, *Celosia trigyna*, *Indigofera hirsute*, *Heterotis rotundifolia*, *Acmella brachyglossa*, *Leucaena leucocephala*, *Boerhavia diffusa*, *Spermacoce ocymoides*, *Oplismenus burmannii*, *Fimbristylis littoralis*, *Cyperus iris*, and *Kyllinga erecta*.

In a more preferred aspect, the present invention relates to the use of aclonifen, the combination of herbicides as defined herein or a composition comprising aclonifen or a combination of herbicides as defined herein, wherein one, several or all harmful plants are selected from the group consisting of *Ageratum conyzoides*, *Calopogonium mucunoides*, *Alternanthera sessilis*, *Boreiria ocymoides*, *Commelina erecta*, *Chromolaena odorata*, *Mimosa invisa*, *Commelina benghalensis*, *Tridax procumbens*, *Brachiaria delfexa*, *Platostoma africanum*, *Digitaria adscendens*, *Digitaria horizontalis*, *Synedrella nodiflora*, *Panicum maximum*, *Cyperus rotundus*, *Cyperus esculentus*, *Imperata cylindrica*, *Cynodon dactylon*, *Pennisetum polystachion*, *Pennisetum purpureum*, *Pennisetum violaceum*, *Mariscus alternifolius*, *Euphorbia heterophylla*, *Euphorbia hirta*, *Talinum triangulare*, *Pteridium aquilinum*, *Melinis ninutiflora*, *Sida acuta*, *Sida rhombifolia*, *Commelina diffusa*, *Portulaca oleraceae*, *Rottboellia exaltata*, *Rottboellia cochinchinensis*, *Sorghum halepense*, *Ipomea triloba*, *Ipomoea mauritiana*, *Dactyloctenium aegyptium*, *Brachiara lata*, *Spigelia anthemia*, *Boerhaavia erecta*, *Aspilia africana*, *Aneilima beniniense*, *Hyparrhenia involucrate*, *Andropogon gayanus*, *Paspalum conjugatum*, *Paspalum orbiculatum*, *Rhynchelytrum repens*, *Eleusine indica*, *Setaria barbata*, *Setaria megaphylla*, *Triumfetta cordifolia*, *Stachytarpheta cayennensis*, *Desmodium scorpiurus*, *Gomphrena celosioides*, *Tephrosia bracteolata*, *Acanthospermum hispidum*, *Hyptis suaveolens*, *Cenchrus biflorus*, *Urena lobata*, *Vernonia ambigua*, *Cleome viscosa*, and *Cuscuta australis*.

Particularly, aclonifen, a combination of herbicides used according to the present invention or a composition used according to the present invention, each as as defined in the context of the present invention, are used to control one, several or all harmful plants selected from the group consisting of *Ageratum conyzoides*, *Calopogonium mucunoides*, *Alternanthera sessilis*, *Boreiria ocymoides*, *Commelina erecta*, *Chromolaena odorata*, *Mimosa invisa*, *Commelina benghalensis*, *Tridax procumbens*, *Brachiaria delfexa*, *Platostoma africanum*, *Digitaria adscendens*, *Digitaria horizontalis*, *Synedrella nodiflora*, *Panicum maximum*, *Cyperus rotundus*, *Cyperus esculentus*, *Imperata cylindrica*, *Cynodon dactylon*, *Pennisetum polystachion*, *Mariscus alternifolius*, *Euphorbia heterophylla*, *Euphorbia hirta*, *Talinum triangulare*, *Pteridium aquilinum*, *Melinis ninutiflora*, *Sida acuta*, *Commelina diffusa*, *Portulaca oleraceae*, *Rottboellia exaltata*, *Sorghum halepense*, *Ipomea triloba*, *Ipomoea mauritiana*, *Dactyloctenium aegyptium*, *Brachiara lata*, *Spigelia anthemia*, *Boerhaavia erecta*, *Desmodium scorpiurus*, *Gomphrena celosioides*, *Tephrosia bracteolata*, *Acanthospermum hispidum*, *Hyptis suaveolens*, *Cenchrus biflorus*, *Urena lobata*, *Vernonia ambigua*, *Cleome viscosa*, and *Cuscuta australis*.

More particularly, aclonifen, a combination of herbicides used according to the present invention or a composition used according to the present invention, each as as defined in the context of the present invention, are used to control one, several or all harmful plants selected from the group consisting of *Ageratum conyzoides, Calopogonium mucunoides, Alternanthera sessilis, Boreiria ocymoides, Commelina erecta, Chromolaena odorata, Mimosa invisa, Commelina benghalensis, Tridax procumbens, Brachiaria delfexa, Platostoma africanum, Digitaria adscendens, Digitaria horizontalis, Synedrella nodiflora, Panicum maximum, Cyperus rotundus, Cyperus esculentus, Imperata cylindrica, Cynodon dactylon, Pennisetum polystachion, Mariscus alternifolius, Euphorbia heterophylla, Euphorbia hirta, Talinum triangulare, Pteridium aquilinum, Melinis ninutiflora, Sida acuta, Commelina diffusa, Portulaca oleraceae, Rottboellia exaltata, Sorghum halepense, Ipomea triloba, Ipomoea mauritiana, Dactyloctenium aegyptium, Brachiara lata, Spigelia anthemia, Boerhaavia erecta* and *Cuscuta australis*.

If aclonifen, a combination of herbicides used according to the present invention or a composition used according to the present invention, each as as defined in the context of the present invention, is applied to the soil surface before germination, then the weed seedlings are either prevented completely from emerging, or the weeds grow until they have reached the cotyledon stage but then their growth stops, and, eventually, after three to four weeks have elapsed, they die completely.

If aclonifen, a combination of herbicides used according to the present invention or a composition used according to the present invention, each as as defined in the context of the present invention, is applied post-emergence to the green parts of the plants, growth likewise stops drastically a very short time after the treatment and the weed plants remain at the growth stage of the point of time of application, or they die completely after a certain time, so that in this manner competition by the weeds, which is harmful to the crop plants, is eliminated at a very early point in time and in a sustained manner.

The use of aclonifen, a combination of herbicides used according to the present invention or a composition used according to the present invention, each as as defined in the context of the present invention, is characterized by a rapidly commencing and long-lasting herbicidal action.

In particular when aclonifen, a combination of herbicides used according to the present invention or a composition used according to the present invention, each as as defined in the context of the present invention, are employed application rates may be reduced, a broader spectrum of broad-leaved weeds and grass weeds maybe controlled, the herbicidal action may take place more rapidly, the duration of action may be longer, the harmful plants may be controlled better while using only one, or few, applications, and the application period which is possible to be extended.

The abovementioned properties and advantages are of benefit for weed control practice to keep agricultural crops free from undesired competing plants and thus to safeguard and/or increase the yields from the qualitative

and quantitative point of view. These novel combinations markedly exceed the technical state of the art with a view to the properties described.

While the aclonifen, a combination of herbicides used according to the present invention or a composition used according to the present invention, each as as defined in the context of the present invention, have an outstanding herbicidal activity against monocotyledonous and dicotyledonous weeds, the crop plants are damaged only to a minor extent, if at all.

Moreover, some of the compositions according to the present invention have outstanding growth-regulatory properties on the crop plants. They engage in the plants' metabolism in a regulatory manner and can thus be employed for provoking directed effects on plant constituents and to facilitate harvesting such as for example by triggering desiccation and stunted growth. Moreover, they are also suitable for the general control and inhibition of undesired vegetative growth without simultaneously destroying the plants. An inhibition of vegetative growth is very important in a large number of monocotyledonous and dicotyledonous crops since yield losses as a result of lodging can thus be reduced, or prevented completely.

Owing to their herbicidal and plant-growth-regulatory properties, the compositions according to the present invention can be employed for controlling harmful plants in genetically modified crop plants or crop plants obtained by mutation/selection. These crop plants are distinguished as a rule by particular, advantageous properties, such as resistances to herbicidal compositions or resistances to plant diseases or causative agents of plant diseases such as particular insects or microorganisms such as fungi, bacteria or viruses. Other particular properties relate, for example, to the harvested material with regard to quantity, quality, storability, composition and specific constituents. Thus, for example, transgenic plants are known whose starch content is increased or whose starch quality is altered, or those where the harvested material has a different fatty acid composition.

The tuberous root crop plants can also have been genetically modified or been obtained by mutation selection. For example, WO 97/44473 A1 relates to transforming and producing cassava plant (protoplasts). WO 92/05259 A1 descibes transgenic plants having modified carbohydrate content, inter alia cassava plants.

The present invention also relates to a method of controlling undesired vegetation (e.g. harmful plants) in tuberous root crop plants, which comprises applying aclonifen, a combination of herbicides used according to the present invention or a composition used according to the present invention, each as as defined in the context of the present invention, for example by the pre-emergence method, by the post-emergence method or by the pre-emergence and the post-emergence method, to the plants, for example harmful plants, parts of these plants, plant seeds or the area where the plants grow, for example the area under cultivation.

Thus, in a further aspect, the present invention relates to a method for

- controlling undesired plant growth,

and/or

- controlling harmful plants in tuberous root crop plants,

and/or

- regulating plant growth in tuberous root crop plants,

comprising the step of applying aclonifen, a combination of herbicides used according to the present invention or a composition used according to the present invention, each as as defined hereinabove, onto the tuberous root crop plants, parts of tuberous root crop plants, seeds of tuberous root crop plants, the area where the tuberous root crop plants grow or the area where the tuberous root crop plants are intended to grow.

Preferably, in a method according to the present invention as defined above , the tuberous root crop plants are selected from the group consisting of sweet potato (*Ipomoea batatas*), cassava (*Manihot esculenta*), and yam (plant species in the genus *Dioscorea*), more preferably the tuberous root crop plant is cassava (*Manihot esculenta*).

In another aspect, the present invention relates to a method according to the present invention as defined above, wherein one, several, or all harmful plants as mentioned above are controlled.

In another aspect, the present invention relates to a method according to the present invention as defined abov, wherein the tuberous root crop plants have been genetically modified, preferably said tuberous root crop plants are transgenic plants or obtained by mutation/selection.

As already mentioned above, the herbicide combinations as defined in the context of the present invention can not only be used as mixed formulations, if appropriate together with further agrochemically active compounds, additives and/or customary formulation auxiliaries, which are then applied in the customary manner as a dilution with water, but also as so-called tank mixes by jointly diluting the separately formulated, or partially separately formulated, components with water.

The herbicide combinations as defined in the context of the present invention and the compositions comprising a herbicide combination as defined in the context of the present invention can be formulated in various ways, depending on the prevailing biological and/or chemical-physical parameters. The following are examples of general possibilities for formulations: wettable powders (WP), water-soluble concentrates, emulsifiable concentrates (EC), aqueous solutions (SL), emulsions (EW) such as oil-in-water and water-in-oil emulsions, sprayable solutions or emulsions, suspension concentrates (SC), oil dispersions (OD), oil- or water-based dispersions, suspoemulsions, dusts (DP), seed-dressing materials, granules for soil application or for broadcasting, or water-dispersible granules (WG), ULV formulations, microcapsules or waxes.

The individual formulation types are known in principle and are described for example, in: Winnacker-Küchler, "Chemische Technologie", Volume 7, C. Hauser Verlag Munich, 4th Edition, 1986; van Valkenburg, "Pesticide 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", Volume 7, C. Hauser Verlag Munich, 4th Edition 1986.

Based on these formulations, combinations with other agrochemically active substances, such as other herbicides not belonging to constituents (i) and (ii) as defined in the context of the present invention, fungicides or insecticides, and with safeners, fertilizers and/or growth regulators, may also be prepared, for example in the form of a readymix or a tank mix.

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

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 addition of one or more ionic or nonionic surfactants (emulsifiers). Examples of emulsifiers which may be used are: calcium salts of alkylarylsulfonic acids, such as calcium dodecylbenzene sulfonate, 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 polyoxethylene 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.

Suspension concentrates (SC) can be water- or oil-based. They can be prepared, for example, by wet grinding by means of commercially available bead mills and, if appropriate, addition of further surfactants as they have already been mentioned for example above in the case of the other formulation types.

Emulsions, for example oil-in-water emulsions (EW), can be prepared for example by means of stirrers, colloid mills and/or static mixers using aqueous organic solvents and, if appropriate, further surfactants as have already been mentioned for example above in the case of the other formulation types.

Granules can be prepared either by spraying the active compound onto adsorptive, granulated inert material or by applying active compound concentrates to the surface of carriers such as sand, kaolinites or granulated inert material with the aid of binders, for example polyvinyl alcohol, sodium polyacrylate or else mineral oils. Suitable active compounds may also be granulated in the manner conventionally used for the production of fertilizer granules, if desired in a mixture with fertilizers. As a rule, water-dispersible granules are prepared by customary processes such as spray drying, fluidized-bed granulation, disk granulation, mixing with high-speed mixers and extrusion without solid inert material. Regarding the production of disk granules, fluidized-bed granules, extruder granules and spray granules, see, for example, the methods in "Spray-Drying Handbook" 3rd ed. 1979, G. Goodwin Ltd., London; J.E. Browning, "Agglomeration", Chemical and Engineering 1967, page 147 et seq; "Perry's Chemical Engineer's Handbook", 5th Ed., McGraw-Hill, New York 1973, pp. 8-57.

As regards further details on the formulation of crop protection products, see, for example, G.C. Klingmam, "Weed Control as a Science", John Wiley and Sons, Inc., New York, 1961, pages 81-96 and J.D. Freyer, S.A. Evans, "Weed Control Handbook", 5th Ed., Blackwell Scientific Publications, Oxford, 1968, pages 101-103.

As a rule, the agrochemical formulations comprise 1 to 95% by weight, of active compounds, the following concentrations being customary, depending on the type of formulation:

The active compound concentration in wettable powders is, for example, approximately 10 to 95% by weight, the remainder to 100% by weight being composed of customary formulation constituents. In the case of emulsifiable concentrates, the active compound concentration may amount to, for example, 5 to 80% by weight. Formulations in the form of dusts comprise, in most cases, 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 present in liquid or solid form and on which granulation auxiliaries and fillers are being used. As a rule, the content amounts to between 10 and 90% by weight in the case of the water-dispersible granules.

In addition, the abovementioned active compound formulations may comprise, if appropriate, the conventional adhesives, wetters, dispersants, emulsifiers, preservatives, antifreeze agents, solvents, fillers, colorants, carriers, antifoams, evaporation inhibitors, pH regulators or viscosity regulators.

The herbicidal action of the herbicide combinations according to the present invention can be improved, for example, by surfactants, preferably by wetters from the group of the fatty alcohol polyglycol ethers. The fatty alcohol polyglycol ethers preferable contain 10 – 18 carbon atoms in the fatty alcohol radical and 2 – 20 ethylene oxide units in the polyglycol ether moiety. The fatty alcohol polyglycol ethers can be nonionic or ionic,

for example in the form of fatty alcohol polyglycol ethers sulfates, which can be used, for example, as alkali metal salts (e.g. sodium salts or potassium salts) or ammonium salts, but also as alkaline earth metal salts such as magnesium salts, such as sodium C_{12}/C_{14}-fatty alcohol diglycol ether sulfate (Genapol® LRO, Clariant); see, for example, EP-A-0476555, EP-A-0048436, EP-A-0336151 or US-A-4,400,196 and also Proc. EWRS Symp. "Factors Affecting Herbicidal Activity and Selectivity", 227 - 232 (1988). Nonionic fatty alcohol polyglycol ethers are, for example, (C_{10}-C_{18})-, preferably (C_{10}-C_{14})-fatty alkohol polyglycol ethers containing 2 – 20, preferably 3 – 15, ethylene oxide units (e.g. isotridecyl alcohol polyglycol ether), for example from the Genapol® series, such as Genapol® X-030, Genapol® X-060, Genapol® X-080 or Genapol® X-150 (all from Clariant GmbH).

The present invention furthermore embraces the combination of herbicides (i) and (ii) as defined above with the wetting agents mentioned above from the group of the fatty alcohol polyglycolethers which preferably contain 10 - 18 carbon atoms in the fatty alcohol radical and 2 - 20 ethylene oxide units in the polyglycol ether moiety and which can be present in nonionic or ionic form (for example as fatty alcohol polyglycol ether sulfates). Preference is given to C_{12}/C_{14}-fatty alcohol diglycol ether sulfate sodium (Genapol® LRO, Clariant); and isotridecyl alcohol polyglycol ether with 3 - 15 ethylene oxide units, for example from the Genapol® X series, such as Genapol® X-030, Genapol® X-060, Genapol® X-080 or Genapol® X-150 (all from Clariant GmbH). It is furthermore known that fatty alcohol polyglycol ethers such as nonionic or ionic fatty alcohol polyglycol ethers (for example fatty alcohol polyglycol ether sulfates) are also suitable for use as penetrants and activity enhancers for a number of other herbicides, inter alia also for herbicides from the group of the imidazolinones (see, for example, EP-A-0502014).

Moreover, it is known that fatty alcohol polyglycol ethers such as nonionic or ionic fatty alcohol polyglycol ethers (for example fatty alcohol polyglycol ether sulfates) are also suitable as penetrants and synergists for a number of other herbicides, inter alia also herbicides from the group of the imidazolinones; (see, for example, EP-A-0502014).

The herbicidal effect of the herbicide combinations according to the present invention can also be increased using vegetable oils. The term vegetable oils is to be understood as meaning oils from oil-plant species, such as soya oil, rapeseed oil, corn oil, sunflower oil, cottonseed oil, linseed oil, coconut oil, palm oil, safflower oil or castor oil, in particular rapeseed oil, and their transesterification products, for example alkyl esters, such as rapeseed oil methyl ester or rapeseed oil ethyl ester.

The vegetable oils are preferably esters of C_{10}-C_{22}-, preferably C_{12}-C_{20}-fatty acids. The C_{10}-C_{22}-fatty acid esters are, for example, esters of unsaturated or saturated C_{10}-C_{22}-fatty acids, in particular those with an even number of carbon atoms, for example erucic acid, lauric acid, palmitic acid and, in particular, C_{18}-fatty acids such as stearic acid, oleic acid, linoleic acid or linolenic acid.

Preferred C_1-C_{20}-alkyl-C_{10}-C_{22}-fatty acid esters are the methyl, ethyl, propyl, butyl, 2-ethylhexyl and dodecyl esters. Preferred glycol- and glycerol-C_{10}-C_{22}-fatty acid esters are the uniform or mixed glycol esters and glycerol esters of C_{10}-C_{22}-fatty acids, in particular those fatty acids which have an even number of carbon atoms, for example erucic acid, lauric acid, palmitic acid and, in particular, C_{18}-fatty acids such as stearic acid, oleic acid, linolic acid or linolenic acid.

The vegetable oils can be present in the herbicidal compositions according to the present invention for example in the form of commercially available oil-containing formulation additives, in particular those based on rapeseed oil such as Hasten® (Victorian Chemical Company, Australia, hereinbelow termed Hasten, main constituent: rapeseed oil ethyl ester), Actirob®B (Novance, France, hereinbelow termed ActirobB, main constituent: rapeseed oil methyl ester), Rako-Binol® (Bayer AG, Germany, termed Rako-Binol hereinbelow, main constituent: rapeseed oil), Renol® (Stefes, Germany, termed Renol hereinbelow, vegetable oil constituent: rapeseed oil methyl ester), or Stefes Mero® (Stefes, Germany, hereinbelow termed Mero, main constituent: rapeseed oil methyl ester).

In a further embodiment, the present invention embraces the combination of a herbicide combination as defined in the context of the present invention with the vegetable oils mentioned above. Thus, in a further embodiment, the present invention embraces the use of compositions comprising a herbicide combination as defined in the context of the present invention comprising the vegetable oils mentioned above, such as rapeseed oil, preferably in the form of commercially available oil-containing formulation additives, in particular those based on rapeseed oil such as Hasten® (Victorian Chemical Company, Australia, hereinbelow termed Hasten, main constituent: rapeseed oil ethyl ester), Actirob®B (Novance, France, hereinbelow termed ActirobB, main constituent: rapeseed oil methyl ester), Rako-Binol® (Bayer AG, Germany, termed Rako-Binol hereinbelow, main constituent: rapeseed oil), Renol® (Stefes, Germany, termed Renol hereinbelow, vegetable oil constituent: rapeseed oil methyl ester), or Stefes Mero® (Stefes, Germany, hereinbelow termed Mero, main constituent: rapeseed oil methyl ester).

For use, the formulations, which are present in commercially available form, are optionally diluted in the 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 broadcasting and sprayable solutions are usually not diluted 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 (soil of a field), preferably to the green plants and parts of the plants and, if appropriate, additionally to the soil of the field.

A composition comprising a herbicide combination used in the context of the present invention has the advantage of being easier to apply, and the quantities of the components are advantageously already presented in

the correct ratio to each other. Moreover, the adjuvants in the formulation can be matched optimally to each other.

Examples

1. Products used

The following commercially available herbicides and herbicide combinations were tested (all products available from Bayer CropScience):

Product P1 contained 600 g/L of aclonifen

Product P2 contained 500 g/L of aclonifen and 75 g/L of isoxaflutole

2. Biological Trials

Trials were conducted on cassava plants on Research Farms in Nigeria.

Table 1 shows the respective total weed control ratings for products P1 and P2 tested in pre-emergence 6 weeks after treatment. In each case, the total weed control takes into account the control of broad-leaved species, grasses and sedges.

Inter alia controlling of the following weeds was assessed: *Acalypha ciliate, Celosia trigyna, Corchorus trilocularis*, *Indigofera hirsute, Oldenlandia corymbosa, Euphorbia heterophylla*, *Phyllanthus amarus*, *Mitracarpus villosus*, *Spigelia anthemia*, *Tridax procumbens*, *Talinum triangulare, Triumfetta cordifolia, Acmella brachyglossa, Passiflora foetida*, *Spermacoce ocymoides, Leucaena leucocephala, Centrosema pubescens*, *Brachiaria deflexa*, *Panicum maximum*, *Emilia coccinea*, *Croton hirtus, Ipomoea involucrate*, *Chromolaena odorata*, *Calopogonium mucunoides*, *Mimosa invisa*, *Aspilia africana*, *Cyperus rotundus*, *Mariscus alternifolius*, *Solenostemon monostachyus, Heterotis rotundifolia, Oplismenus burmannii, Setaria barbata*, and *Paspalum scrobiculatum.*

Inter alia very good to excellent efficacy in controlling of the following weeds was observed: *Acalypha ciliate, Centrosema pubescens*, *Solenostemon monostachyus, Heterotis rotundifolia, Setaria barbata*, *Corchorus olitorius Corchorus trilocularis, Urena lobata, Acanthospermum hispidum*, *Mitracarpus villosus, Euphorbia heterophylla, Commelina benghalensis, Gomphrena celosioides. Tephrosia bracteolata, Setaria barbata, Digitaria horizontalis, Rottboellia cochinchinensis, Eleusine indica, Cenchrus biflorus*, *Paspalum scrobiculatum*, *Cyperus rotundus, Cyperus iris, Cleome viscosa, Euphorbia heterophylla, Euphorbia hirta, Phyllanthus amarus, Melanthera scandens*, *Schwenckia Americana, Aspilia africana,* and *Tephrosia brateolata.*

Table 2 shows the plant growth regulating effects of products P1 and P2 (herbicide compositions used in accordance with the present invention) on cassava crop plants after harvest relative to hoe-weeded cassava crop plants (as reference). The plant growth regulating effects were measured as the respective fresh root cassava yields, in each case as perecentage in comparison to the fresh root cassava yield of hoe-weeded cassava crop plants as reference (defined as 100%).

Table 1: Ratings of total weed control in plots treated pre-emergence 6 weeks after treatment with product P1 and P2, respectively

Product	Amount of Product applied	Total Weed Control in %
P1	2.5 L/ha	72
P2	1.0 L/ha	78

Table 2: Plant growth regulating effects of products P1 and P2, respectively, on tuberous root crop plants indicated as fresh root yield

Product or treatment	Amount of Product applied	Yield of fresh root yield in comparison to hoe-weeding
P1	1.5 L/ha	130%
P2	1.0 L/ha	141%
Hoe-weeding (Reference)	-	100%

In further field trials in several different locations in Nigeria, the following effects were observed.

In the field trials, product P2 showed no negative impact on cassava population, no negative impact on cassava vigorous growth and no negative impact on cassava plant height above the ground.

Plots in the field treated with product P2 provided up 82 days control of grasses and broad leaves with a total weed control efficacy of 75 - 100%, depending on the location and the weeds present in the respective location.

Product P2 showed good (80–90%) to excellent (90–100%) control of *Ageratum conyzoides*, *Calopogonium mucunoides*, *Centrosema pubescens*, *Chromoleana odorata*, *Corchorus tricularia*, *Desmodium scorpirus*, *Phyllanthus amarus*, *Solanum* sp, *Spermacoce ocymoides,* and *Spigelia anthelmia*.

Product P2 provided good to excellent control of the major weeds at different locations, in particular *Acalypha ciliata*, *Ageratum conyzoides*, *Boerhavia erecta*, *Brachiaria deflexa*, *Commelina bengalensis*, *Cyperus rotun*dus, *Digitaria horizontalis*, *Euphobia heterophylla*, *Fimbristylis* sp, *Rottboellia cochinchinensis*, *Tridax procumbens*, and *Vernonia ambigua*.

Passiflora foetida and *Ipomoea mauritiana* were the most difficult weeds to control at some locations. Product P2 provided > 90% control of these two difficult to control weeds, in particular with good land preparation before crop planting.

Claims:

1. Use of aclonifen or a composition comprising (i) aclonifen

- for controlling harmful plants in tuberous root crop plants,

and/or

- as plant growth regulators in tuberous root crop plants.

2. Use according to claim 1, wherein a combination of herbicides or a composition comprising a combination of herbicides is used

- for controlling harmful plants in tuberous root crop plants,

and/or

- as plant growth regulators in tuberous root crop plants,

wherein said combination of herbicides comprises or consists of (i) aclonifen and (ii) isoxaflutole.

3. Use according to claim 1 or 2, wherein aclonifen is applied at a rate in the range of 100 to 3000 g a.i./ha.

4. Use according to claim 2 or claim 3, wherein in the herbicide combination or in the composition comprising the herbicide combination the ratio by weight of the total amount of (i) aclonifen to the total amount of (ii) isoxaflutole is in the range of from 2 : 1 to 15 : 1, preferably in the range of from 3 : 1 to 12 : 1.

5. Use according to any one of claims 1 to 4, wherein a composition is employed which additionally comprises one or more further components selected from the group consisting of formulation auxiliaries, additives customary in crop protection, and further agrochemically active compounds.

6. Use according to any one of claims 1 to 5, wherein the tuberous root crop plants are selected from the group consisting of sweet potato (*Ipomoea batatas*), cassava (*Manihot esculenta*), and yam (plant

species in the genus *Dioscorea*), preferably the tuberous root crop plant is cassava (*Manihot esculenta*).

7. Use according to any one of claims 1 to 6, wherein one, several or all harmful plants are selected from the group of weed species consisting of Ageratum spp., Calopogonium spp., Alternanthera spp., Boreiria spp., Commelina spp., Chromolaena spp., Mimosa spp., Tridax spp., Brachiaria spp., Platostoma spp., Digitaria spp., Synedrella spp., Panicum spp., Cyperus spp., Imperata spp., Cynodon spp., Pennisetum spp., Mariscus spp., Euphorbia spp., Talinum spp., Pteridium spp., Melinis spp., Sida spp., Portulaca spp., Rottboellia spp., Sorghum spp., Ipomea spp., Dactyloctenium spp., Spigelia spp., Boerhaavia spp., Aspilia spp., Aneilima spp., Hyparrhenia spp., Andropogon spp., Paspalum spp., Rhynchelytrum spp., Eleusine spp., Setaria spp., Triumfetta spp., Stachytarpheta spp., Desmodium spp., Gomphrena spp., Tephrosia spp., Acanthospermum spp., Hyptis spp., Cenchrus spp., Urena spp., Vernonia spp., Cleome spp., Crotalaria spp., Kyllinga spp., Corchorus spp., Ipomoea spp., Mitracarpus spp., Melanthera spp., Centrosema spp., Emilia spp., Croton spp., Phyllanthus spp., Passiflora spp., Axonopus spp., Oldenlandia spp., Schwenckia spp., Acalypha spp., Solenostemon spp., Celosia spp., Indigofera spp., Heterotis spp., Acmella spp., Leucaena spp., Boerhavia spp., Spermacoce spp., Oplismenus spp., and Fimbristylis spp..

8. Use according to any one of claims 1 to 7, wherein one, several or all harmful plants are selected from the group of weed species consisting of Ageratum spp., Calopogonium spp., Alternanthera spp., Boreiria spp., Commelina spp., Chromolaena spp., Mimosa spp., Tridax spp., Brachiaria spp., Platostoma spp., Digitaria spp., Synedrella spp., Panicum spp., Cyperus spp., Imperata spp., Cynodon spp., Pennisetum spp., Mariscus spp., Euphorbia spp., Talinum spp., Pteridium spp., Melinis spp., Sida spp., Portulaca spp., Rottboellia spp., Sorghum spp., Ipomea spp., Dactyloctenium spp., Spigelia spp., Boerhaavia spp., Aspilia spp., Aneilima spp., Hyparrhenia spp., Andropogon spp., Paspalum spp., Rhynchelytrum spp., Eleusine spp., Setaria spp., Triumfetta spp., Stachytarpheta spp., Desmodium spp., Gomphrena spp., Tephrosia spp., Acanthospermum spp., Hyptis spp., Cenchrus spp., Urena spp., Vernonia spp., and Cleome spp..

9. Use according to any one of claims 1 to 8, wherein one, several or all harmful plants are selected from the group consisting of *Ageratum conyzoides, Calopogonium mucunoides, Alternanthera sessilis, Boreiria ocymoides, Commelina erecta, Chromolaena odorata, Mimosa invisa, Commelina benghalensis, Tridax procumbens, Brachiaria delfexa, Platostoma africanum, Digitaria adscendens, Digitaria horizontalis, Synedrella nodiflora, Panicum maximum, Cyperus rotundus, Cyperus*

esculentus, Imperata cylindrica, Cynodon dactylon, Pennisetum polystachion, Pennisetum purpureum, Pennisetum violaceum, Mariscus alternifolius, Euphorbia heterophylla, Euphorbia hirta, Talinum triangulare, Pteridium aquilinum, Melinis ninutiflora, Sida acuta, Sida rhombifolia, Commelina diffusa, Portulaca oleraceae, Rottboellia exaltata, Rottboellia cochinchinensis, Sorghum halepense, Ipomea triloba, Ipomoea mauritiana, Dactyloctenium aegyptium, Brachiara lata, Spigelia anthemia, Boerhaavia erecta, Aspilia africana, Aneilima beniniense, Hyparrhenia involucrate, Andropogon gayanus, Paspalum conjugatum, Paspalum orbiculatum, Rhynchelytrum repens, Eleusine indica, Setaria barbata, Setaria megaphylla, Triumfetta cordifolia, Stachytarpheta cayennensis, Desmodium scorpiurus, Gomphrena celosioides, Tephrosia bracteolata, Acanthospermum hispidum, Hyptis suaveolens, Cenchrus biflorus, Urena lobata, Vernonia ambigua, Cleome viscosa, Cuscuta australis, Corchorus olitorius, Mitracarpus villosus, Melanthera scandens, Centrosema pubescens, Emilia coccinea, Croton hirtus, Phyllanthus amarus, Corchorus trilocularis, Passiflora foetida, Ipomoea involucrate, Axonopus compressus, Oldenlandia corymbosa, Acalypha ciliata, Schwenckia americana, Solenostemon monostachyus, Celosia trigyna, Indigofera hirsute, Heterotis rotundifolia, Acmella brachyglossa, Leucaena leucocephala, Boerhavia diffusa, Spermacoce ocymoides, Oplismenus burmannii, Fimbristylis littoralis, Cyperus iris, and *Kyllinga erecta*.

10. Use according to any one of claims 1 to 9, wherein one, several or all harmful plants are selected from the group consisting of *Ageratum conyzoides, Calopogonium mucunoides, Alternanthera sessilis, Boreiria ocymoides, Commelina erecta, Chromolaena odorata, Mimosa invisa, Commelina benghalensis, Tridax procumbens, Brachiaria delfexa, Platostoma africanum, Digitaria adscendens, Digitaria horizontalis, Synedrella nodiflora, Panicum maximum, Cyperus rotundus, Cyperus esculentus, Imperata cylindrica, Cynodon dactylon, Pennisetum polystachion, Pennisetum purpureum, Pennisetum violaceum, Mariscus alternifolius, Euphorbia heterophylla, Euphorbia hirta, Talinum triangulare, Pteridium aquilinum, Melinis ninutiflora, Sida acuta, Sida rhombifolia, Commelina diffusa, Portulaca oleraceae, Rottboellia exaltata, Rottboellia cochinchinensis, Sorghum halepense, Ipomea triloba, Ipomoea mauritiana, Dactyloctenium aegyptium, Brachiara lata, Spigelia anthemia, Boerhaavia erecta, Aspilia africana, Aneilima beniniense, Hyparrhenia involucrate, Andropogon gayanus, Paspalum conjugatum, Paspalum orbiculatum, Rhynchelytrum repens, Eleusine indica, Setaria barbata, Setaria megaphylla, Triumfetta cordifolia, Stachytarpheta cayennensis, Desmodium scorpiurus, Gomphrena celosioides, Tephrosia bracteolata, Acanthospermum hispidum, Hyptis suaveolens, Cenchrus biflorus, Urena lobata, Vernonia ambigua, Cleome viscosa,* and *Cuscuta australis*.

11. Method for

- controlling undesired plant growth,

and/or

- controlling harmful plants in tuberous root crop plants,

and/or

- regulating plant growth in tuberous root crop plants,

comprising the step of applying aclonifen, a combination of herbicides or a composition as defined in any one of claims 1 to 5 onto the tuberous root crop plants, parts of tuberous root crop plants, seeds of tuberous root crop plants, the area where the tuberous root crop plants grow or the area where the tuberous root crop plants are intended to grow.

12. Method according to claim 11, wherein the tuberous root crop plants are selected from the group consisting of sweet potato (*Ipomoea batatas*), cassava (*Manihot esculenta*), and yam (plant species in the genus *Dioscorea*).

13. Method according to claim 11 or 12, wherein the tuberous root crop plant is cassava (*Manihot esculenta*).

14. The method according to any one of claims 11 to 13, wherein one, several, or all harmful plants as defined in any one of claims 7 to 10 are controlled.

15. The method according to any one of claims 11 to 14, wherein the tuberous root crop plants have been genetically modified, preferably said tuberous root crop plants are transgenic plants or obtained by mutation/selection.

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2016/068868

A. CLASSIFICATION OF SUBJECT MATTER
INV. A01N33/22 A01N43/80 A01P13/00
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, CHEM ABS Data, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB 1 028 976 A (FISONS PEST CONTROL LTD) 11 May 1966 (1966-05-11) cited in the application the whole document	1-15
A	MELIFONWU A A: "Weeds and their control in cassava", AFRICAN CROP SCIENCE JOURNAL, vol. 2, no. 4, 1994, pages 519-530, XP002745690, cited in the application tables 8, 9, 10	1-15

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
7 October 2016	20/10/2016

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INTERNATIONAL SEARCH REPORT

International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2008/152074 A1 (BASF SE [DE]; HUPE EIKE [DE]; MOBERG WILLIAM KARL [DE]; REINHARD ROBER) 18 December 2008 (2008-12-18) page 4, lines 36-37 page 101, lines 41-42 claim 15: page 147, linev 33 claim 16: page 150, line 39 -----	1-15

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2016/068868

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 1028976 A	11-05-1966	NONE	
WO 2008152074 A1	18-12-2008	AR 066991 A1	23-09-2009
		AU 2008263903 A1	18-12-2008
		BR PI0812954 A2	07-10-2014
		CA 2690072 A1	18-12-2008
		CN 101677540 A	24-03-2010
		EA 200901658 A1	30-06-2010
		EP 2157856 A1	03-03-2010
		JP 2010529170 A	26-08-2010
		KR 20100018066 A	16-02-2010
		PE 03662009 A1	26-04-2009
		TW 200911120 A	16-03-2009
		US 2010190794 A1	29-07-2010
		UY 31149 A1	05-01-2009
		WO 2008152074 A1	18-12-2008