

ARYLEX™ ACTIVE (HALAUXIFEN-METHYL): A NOVEL POST-EMERGENCE HERBICIDE FOR CEREAL CROPS WITH A BROAD ACTIVITY ON DICOTYLEDONOUS WEEDS

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ABSTRACT

Arylex™ active (halauxifen-methyl) is the first member of a new class of synthetic auxin herbicides (arylpicolinate, HRAC group: O) in development by Dow AgroSciences for the control of broadleaf weeds in cereals. Arylex is a systemic herbicide mainly absorbed by foliage but also by roots. It is translocated through the phloem and xylem and accumulates in the meristematic tissues. Applied at low dose rates (5 to 7.5 g a.e/ha) in autumn to spring, Arylex herbicide offers effective post-emergence control against important dicotyledonous weeds in spring and winter cereals including herbicide resistant species such as *Papaver rhoeas*. It provides consistent weed control under adverse climatic conditions, and degrades rapidly in soils and crop plant tissues. Arylex exhibits favourable environmental and toxicological profiles. Arylex will be combined with other herbicides from Dow AgroSciences such as florasulam or fluroxypyr and will be offered in a range of formulations.

Keywords: Arylex™ active, Arylex, Halauxifen-methyl, Arylpicolinate, Dicotyledonous, Cereals.

RESUME

ARYLEX™ ACTIVE (HALAUXIFENE-METHYL): UN NOUVEL HERBICIDE ANTIDICOTYLEDONES DE POST EMERGENCE A LARGE CHAMP D'ACTIVITE SUR CEREALES A PAILLE

Arylex™ (halauxifène-méthyl) est le premier représentant d'une nouvelle famille d'herbicides à mode d'action auxinique (arylpicolinate, groupe HRAC: O) développé par Dow AgroSciences pour le désherbage des dicotylédones en post levée sur des céréales. Arylex est un herbicide systémique principalement absorbé par les feuilles mais aussi par les racines des plantes. Il est véhiculé par le phloème et le xylème vers les méristèmes. Appliqué à des doses faibles (5 à 7.5 g e.a./ha) de l'automne au printemps, Arylexdémontre un haut niveau d'efficacité sur des dicotylédones économiquement importantes dans les céréales d'hiver et de printemps incluant des espèces résistantes à d'autres modes d'action comme *Papaver rhoeas*. Il reste efficace en conditions climatiques difficiles et se dégrade rapidement dans le sol et dans les céréales. Arylexsera commercialisé sous différentes formulations en association avec d'autres substances actives de Dow Agrosiences et notamment le florasulame et le fluroxypyr.

Mots-clés : Arylex™ active, Arylex, Halauxifen-méthyl, Arylpicolinate, Dicotylédones, Céréales.

INTRODUCTION AND OBJECTIVES

Dow AgroSciences is constantly seeking to develop new herbicides with new or broader weed control spectrums to address unmet customer needs and with alternative modes of action to help manage resistant weed biotypes.

Arylex[™] active (halauxifen-methyl) is a new herbicide active ingredient being developed by Dow AgroSciences for the control of broadleaf weeds in the European and global cereal markets. It is a novel arylpicolinate herbicide and has been evaluated in all major cereal cultivating regions.

The objective of this study is to describe the key characteristics of this active substance and its weed control spectrum when applied in the conditions of the Southern Europe EPPO zone especially in France, Italy, Spain, Portugal and Greece.

MATERIALS AND METHODS

Field trials and numerous laboratory and greenhouse studies have been conducted to investigate the biological performance of halauxifen-methyl and to evaluate its toxicological and environmental profile.

A large number of field trials were carried out in countries of the Southern Europe EPPO zone including France, Italy, Spain, Portugal and Greece. All trials followed the relevant EPPO guidelines.

Locations of efficacy trial sites within Southern zone were selected across EPPO Zones and countries to cover various scenarios with multiple meteorological parameters (temperatures, rainfall), crop agronomy (soil type, cultivars, crop rotations) and also reflect the commercial importance of winter and spring cereals species grown in the Southern zone countries.

In all trials, visual assessments of weed control were conducted approximately 2, 4, and 8 weeks after application. They were also assessed at spring regrowths and/or at flowering stage of the weeds. The percentage of control was visually estimated on a 0 to 100 linear scale with 0% = no control and 100% = plant death.

RESULTS

DESCRIPTION OF ARYLEX[™] ACTIVE (HALAUXIFEN-METHYL)

Chemistry

Common Name: Halauxifen-methyl (ISO provisionally approved)

Chemical Family: Arylpicolinate

Chemical Name: methyl 4-amino-3-chloro-6-(4-chloro-2-fluoro-3-methoxyphenyl) pyridine-2-carboxylate

Chemical structure:



Herbicidal Action

Mode of action, Absorption and Translocation

Halauxifen-methyl is the first member of a new class of synthetic auxin herbicides (arylpicolinate, HRAC group: O). Arylex is highly active at low doses (5 to 7.5 g a.e/ha). The control of the target weeds by halauxifen-methyl is not significantly influenced by the temperature at application.

Halauxifen-methyl is a systemic herbicide that is mainly absorbed by foliage but also by roots. After de-esterification to halauxifen-acid, it is translocated through the phloem and xylem and accumulates in the meristematic tissues.

To susceptible weed species, Arylex causes the typical symptoms of synthetic auxins. First symptoms can occur within a few hours.

Crop Selectivity

Halauxifen-methyl is rapidly de-esterified to halauxifen-acid in sensitive weed species; however, in wheat Arylex is slowly de-esterified coupled with more rapid demethylation on the phenyl ring. Selectivity in cereals is due the slower rate of Arylex de-esterification to the active and mobile form of Arylex: halauxifen-acid.

When applied with the safener cloquintocet-mexyl, Arylex is selective in winter and spring cereals. Cloquintocet-mexyl enhances the metabolism rate in cereals through demethylation and conjugation prior to the formation of halauxifen-acid.

Crop rotation

Halauxifen-methyl undergoes rapid degradation to halauxifen-acid in soil with an average DT₅₀ of 1.5 days in laboratory conditions. Half-life of halauxifen-acid is 17 days under field conditions in European soils.

Herbicidally active residues of Arylex do not persist in cereal straw.

Under European conditions all crops can be safely grown during the season following application whatever the soil cultivation practices.

Use in European Cereals

Halauxifen-methyl will be applied at 5.0 to 7.5 g a.e/ha in post-emergence in autumn to spring to winter and spring wheat, winter and spring barley, durum wheat, spelt, rye and triticale at crop stages from 1 leaf stage (BBCH 11) up to late boot stage (BBCH 45). Young plants are better controlled than aged weeds.

Cloquintocet-mexyl will be included in formulations to provide excellent crop safety. An adjuvant is built into the liquid formulations or tank-mixed with wettable granule formulations for more robust weed control.

Halauxifen-methyl will be combined with other herbicides from Dow AgroSciences such as florasulam or fluroxypyr and will be offered in dry or liquid formulations.

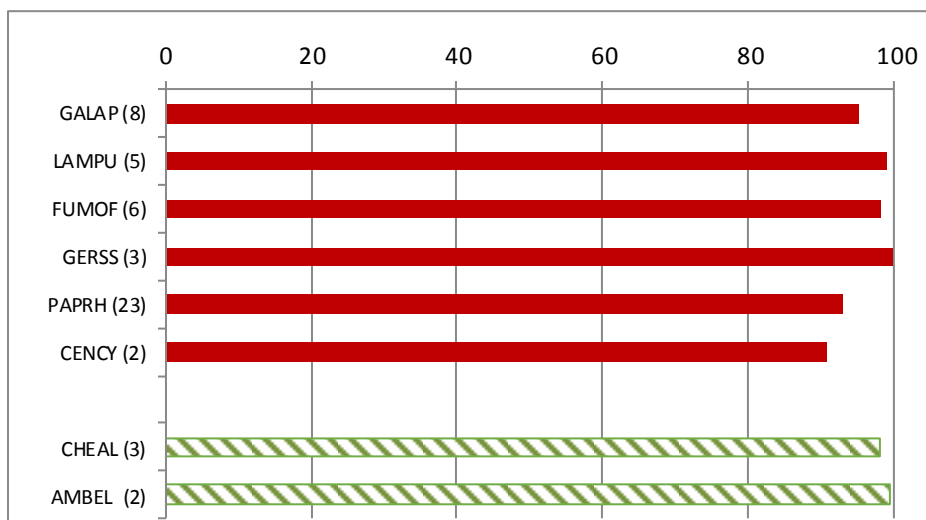
EFFICACY OF HALAUXIFEN-METHYL

Results are presented from 52 field trials carried out in the conditions of the Southern Europe EPPO zone in France (FR), Italy (IT), Spain (ES), Portugal (PT) and Greece (GR).

WEED SPECTRUM

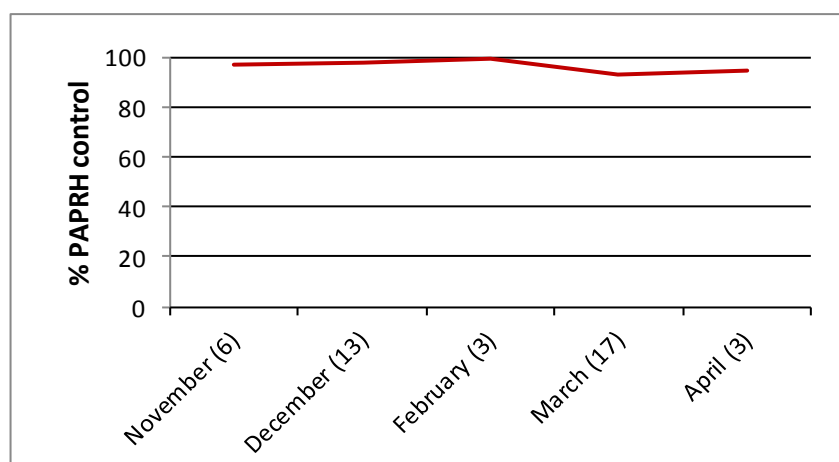
Arylex at 6 g a.e./ha of halauxifen-methyl provided broad spectrum control of broadleaf weeds with a spring post emergence application in winter and spring cereals (Fig. 1). *Papaver rhoeas* control results are from mixed susceptible and resistant populations to ALS inhibitor herbicides.

Figure 1 : Weed control (%) of halauxifen-methyl at 6 g a.e./ha when spring-applied in winter (red bars) and spring-cereals (shaded green bars) – (data from FR, ES, IT, PT, GR)
Efficacité (%) de 6 g e.a/ha de halauxifène-méthyl appliqué au printemps sur dicotylédones en céréales d'hiver (rouge) et céréales de printemps (hachuré vert)
(Résultats de FR, ES, IT, PT, GR)



Arylex efficacy was consistent regardless of month of application under multiple weather conditions in autumn to spring (Fig. 2).

Figure 2 : PAPRH control (%) of halauxifen-methyl at 6 g a.e./ha by months of application – (data from FR, ES, IT)
Efficacité (%) de 6 g e.a/ha de halauxifène-méthyl contre PAPRH appliqué de l'automne au printemps (résultats de FR, ES, IT)



When applied post-emergence in spring and winter cereals, halauxifen-methyl herbicide controlled a broad range of important weeds in cereal markets such as *Centaurea Cyanus* (CENCY), *Chenopodium*

album (CHEAL), *Fumaria officinalis* (FUMOF), *Galium aparine* (GALAP), *Geranium species* (GERSS), *Lamium species* (LAMSS), *Ambrosia artemisiifolia* (AMBEL) and *Papaver rhoeas* (PAPRH) including weed biotypes resistant to other modes of action such as ALS inhibitors.

But unlike some other synthetic auxin herbicides, the activity of halauxifen-methyl on weeds is not significantly influenced by temperature. Efficacy of halauxifen-methyl at 6 g a.e./ha against *Papaver rhoeas* is consistent under variable climatic conditions encountered in autumn to spring.

CONCLUSION

Arylex™ active (halauxifen-methyl) is a new cereal herbicide being developed by Dow AgroSciences for the control of broadleaf weeds. It offers effective post-emergence control including ALS inhibitor herbicide resistant biotypes at low dose rates, provides consistent weed control under variable and adverse climatic conditions, and degrades rapidly in soils and crop plant tissues.

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