

# List of cases of resistance to plant protection products detected in France

## Background

The management of resistance to PPPs is a major challenge for plant protection because it contributes to limiting ineffective or remedial treatments and therefore to implementing the French “Plan Ecophyto” on the reduction of pesticide use. Optimal resistance management requires the integration of multiple information (*e.g.* resistance dynamics, the mechanisms involved, the frequency of resistant pests in the area concerned, etc.). It must take into account the specificities of each case of resistance to advise relevant and effective management strategies. However, this information is not always readily accessible. It may be included in complex scientific articles, be part of unpublished “private” information, etc... thus not always being available with sufficient precision or speed.

The lists proposed by R4P display our current knowledge on the cases of PPP resistance detected and published in France. They aim at reaching a more sustainable use of the PPPs by stakeholders by allowing to optimise their recommendations. The sensitivity of pests to PPPs should indeed be considered a common good, and managed accordingly.

## Methods

Resistance case lists have been compiled from several sources:

- Experimental data produced by INRA and Anses laboratories (see also the compilation of technical reports on this website) or private laboratories.
- French or foreign literature, scientific or extension literature

Each case presented consist of one “tryptic” (pest / PPP mode of action / crop) for which biological sensitivity assays have proven the occurrence of resistance (*i.e.* at least one resistant individual has been demonstrated as resistant using a relevant procedure). **Suspicious of resistance not validated by appropriate sensitivity assays are not included in the lists.**

The resistance cases listed in these documents concern only France, mainly metropolitan France. A few cases detected in the French overseas departments and territories are also mentioned. The lists may not be comprehensive for these cases, due to a lack of reliable documentary sources. **Similar cases detected in countries other than France are not listed.**

A member of R4P serving as a referent expert is associated to each case listed, as well as relevant publications, preferably in French. The complete references of the publications, as well as the royalty-free files, can be consulted on the "Documentation" section of the R4P website.

Last, the lists display the resistance cases towards fungicides, insecticides, acaricides and herbicides, either for active substances currently registered and in use in France (List I) or for active substances formerly registered in France (List II).

**Legends**

Column	Description
<b>Section “Fungicide/Insecticide/Acaricide/Herbicide”</b>	
<i>Mode of action</i>	Biochemical mode of action of the active substance or group of active substances concerned by resistance, as formulated in R4P classification.
<i>Target site</i>	Biochemical target (target protein) of the active substance or group of active substances concerned by resistance. <i>NB: For more details on targets and modes of action, please refer to the Universal classification of PPPs proposed by R4P on this website.</i>
<i>R4P group</i>	Code corresponding to the active substance or group of active substances concerned by resistance in R4P Universal classification of PPPs.
<i>Group other than R4P</i>	Code corresponding to the active substance or group of active substances concerned by resistance, in the FRAC ( <a href="http://www.frac.info/">http://www.frac.info/</a> ), IRAC ( <a href="http://www.irac-online.org/">http://www.irac-online.org/</a> ), HRAC ( <a href="http://www.hracglobal.com/">http://www.hracglobal.com/</a> ), WSSA ( <a href="http://wssa.net/">http://wssa.net/</a> ) or according to Fourouzesh et al. (Weed Research 55:334-358).
<i>Group abbreviation</i>	Common abbreviation for chemical class proposed by R4P.
<i>Chemical class (R4P or other)</i>	Name of the chemical class to which the active substance, or group of active substances, concerned by resistance belongs. Detailed chemical classification is available on this website (R4P universal classification).
<i>Active ingredients</i>	Active substance(s) concerned by resistance, in the laboratory or in the field. Unlisted active ingredients might be concerned by the resistance, especially within the same mode of action. Where a large number of substances are involved, additional information may be provided. Positive and negative cross resistance are detailed in the R4P universal pesticide classification on this website.
<b>Section “Pathogen/Insect/Mite/Weed”</b>	
<i>Pest/Disease</i>	The vernacular name of the pest or the disease concerned by the resistance.
<i>Scientific name</i>	The Latin binomial name of the pest concerned by the resistance.
<i>EPPO code</i>	Universal (acronymic) code of the pest assigned by EPPO ( <a href="https://gd.eppo.int/">https://gd.eppo.int/</a> ).
<i>Crop</i>	Crop concerned by the case of resistance. Some crops may be grouped together (e.g. "cereals") for generalist pests. HTV: Herbicide Tolerant Variety.
<i>Status of resistance</i>	"+" indicates that field resistance (partial or total loss of field efficacy of the PPP used under optimal conditions) is possible. It depends in particular on the frequency of resistant individuals in local populations. “(+)” indicates “biological resistance” for which a loss of efficacy has possibly been observed in laboratory assays but not (yet) in the field .
<i>Comments</i>	Comment indicating prevalence (i.e. the proportion of plots affected by resistance) and/or frequency of resistance (i.e. the proportion of resistant individuals in populations), depending on the state of knowledge. Information on the geographical location of the resistance case can be detailed when the distribution is not homogeneous, or when resistance is emerging. ARA: Auvergne-Rhône-Alpes; BFC: Bourgogne-Franche-Comté; BZH: Bretagne; COR: Corse; CVL: Centre-Val de Loire; GES: Grand Est; HDF: Hauts de France; IDF:

	<p>Ile de France; NAQ: Nouvelle Aquitaine; NOR: Normandie; OCC: Occitanie; PAC: Provence-Alpes-Côtes d'Azur; PDL: Pays de Loire.</p> <p>Information on the cost of resistance can be added, for resistance cases accompanied by a lower competitiveness of resistant individuals, which can lead to a reduction in the dynamics of resistance evolution.</p> <p>Finally, various additional information (in particular on cross resistances) can be added.</p>
<i>Resistance intensity</i>	<p>For fungicides lists.</p> <p>Estimation of the resistance factor of the resistant individuals:</p> <p>LR: low intensity resistance</p> <p>MR: medium intensity resistance</p> <p>HR: high intensity resistance.</p>
<i>Resistance mechanism</i>	<p>TSR: Target Site Resistance (+ mutation if known).</p> <p>NTSR: Non Target Site Resistance (+ details if known).</p> <p><i>For more information on PPP resistance mechanisms, see R4P (2016) Trends in Plant Science.</i></p> <p>Unknown: resistance mechanism non elucidated.</p>
<i>First occurrence in France</i>	<p>Collection date of the oldest sample where the resistance case was detected. May be approximate for "ancient" resistances.</p>
<b>Section "Information"</b>	
<i>Contact</i>	<p>Person who can provide more information on the case of resistance.</p>
<i>References</i>	<p>References describing the case of resistance in France (dynamics, mechanism, phenotype etc...). May include publications about the same resistance case out of France to provide additional information (especially on the resistance mechanism).</p>
<i>Update</i>	<p>Date of update of the information concerning the resistance case.</p>

### Acknowledgements

R4P warmly thanks Pierre Leroux, Christian Gauvrit, Robert Delorme and Annie Micoud for their extensive participation in completing these lists, and Evelyne Martin for her valuable assistance in managing the bibliographic database.

Readers are invited to indicate any errors or omissions in these lists at: [contact-r4p@inra.fr](mailto:contact-r4p@inra.fr)

Herbicide											Weed				Information				
Mode of action	Target site	R4P group	HRAC group	WSSA group	Fourouresh group	Group abbreviation	R4P chemical class	HRAC chemical class	Active ingredients	Common name	Scientific name	EPPO code	Crop	Comments	Resistance mechanism	First occurrence in France	Contact person	References	Update
Photosynthesis (chloroplasts)	Photosystem II protein D1	B1	C1	5	Photosystem II inhibitors	-	Heterocyclic ketones	Triazinone	metamitron, metribuzin	Common lambsquarter	<i>Chenopodium album</i>	CHEAL	Sugar beet	Present in regions HDF, IDF. No quantitative data available	TSR	2005	C. Délye - INRAE	Mechant, 2011	CD-Jun20
Lipid metabolism (acetogenins)	Acetyl-coenzyme A carboxylase (ACCase)	D1	A	1	ACCase inhibitors	ACCI	Phenoxypropionic acids and precursors	Aryloxyphenoxy-propionates	fenoxaprop, clodinafop	Silky bentgrass	<i>Apera spica-venti</i>	APESV	Cereals	Present in regions ARA, HDF, PDL. No quantitative data available	TSR and NTSR (can be associated in one population / one plant)	2000s	C. Délye - INRAE	Technical institute field trials	CD-Jun20
Lipid metabolism (acetogenins)	Acetyl-coenzyme A carboxylase (ACCase)	D1	A	1	ACCase inhibitors	ACCI	Phenoxypropionic acids and precursors	Aryloxyphenoxy-propionates	quizalofop, propaquizafop, fluazifop	Silky bentgrass	<i>Apera spica-venti</i>	APESV	Oilseed rape & other dicotyledonous crops	Present in regions ARA, HDF, PDL. No quantitative data available	TSR and NTSR (can be associated in one population / one plant)	2000s	C. Délye - INRAE	Technical institute field trials	CD-Jun20
Lipid metabolism (acetogenins)	Acetyl-coenzyme A carboxylase (ACCase)	D1	A	1	ACCase inhibitors	ACCI	Cyclic $\beta$ -cetoenols and precursors	Phenylpyrazolines	pinoxaden	Silky bentgrass	<i>Apera spica-venti</i>	APESV	Cereals	Present in regions ARA, HDF, PDL. No quantitative data available	TSR and NTSR (can be associated in one population / one plant)	2000s	C. Délye - INRAE	Technical institute field trials	CD-Jun20
Lipid metabolism (acetogenins)	Acetyl-coenzyme A carboxylase (ACCase)	D1	A	1	ACCase inhibitors	ACCI	Phenoxypropionic acids and precursors	Aryloxyphenoxy-propionates	fenoxaprop, clodinafop	Wild oats	<i>Avena sp.</i>	AVESS	Cereals	Present in regions CVL, HDF, NAQ, OCC, PDL. No quantitative data available	TSR (and NTSR?)	1996	C. Délye - INRAE	Technical institute field trials	CD-Jun20
Lipid metabolism (acetogenins)	Acetyl-coenzyme A carboxylase (ACCase)	D1	A	1	ACCase inhibitors	ACCI	Cyclic $\beta$ -cetoenols and precursors	Phenylpyrazolines	pinoxaden	Wild oats	<i>Avena sp.</i>	AVESS	Cereals	Present in regions CVL, HDF, NAQ, OCC, PDL. No quantitative data available	TSR (and NTSR?)	1996	C. Délye - INRAE	Technical institute field trials	CD-Jun20
Lipid metabolism (acetogenins)	Acetyl-coenzyme A carboxylase (ACCase)	D1	A	1	ACCase inhibitors	ACCI	Cyclic $\beta$ -cetoenols and precursors	Cyclohexanediones	cycloxydime, clethodime	Large crabgrass	<i>Digitaria sanguinalis</i>	DIGSA	Vegetable crops	A few cases in region NAQ. No quantitative data available	TSR	2005	C. Délye - INRAE	Gasquez & Bay, 2007	CD-Jun20
Lipid metabolism (acetogenins)	Acetyl-coenzyme A carboxylase (ACCase)	D1	A	1	ACCase inhibitors	ACCI	Phenoxypropionic acids and precursors	Aryloxyphenoxy-propionates	cyhalofop	Barnyard-grass	<i>Echinochloa crus-galli</i>	ECHCG	Rice	Present in the whole rice-growing area (Camargue) in regions OCC and PAC. Very high frequencies of resistant plants in some of the fields concerned (up to 100%). Can be combined with resistance to group F2 (cross-or multiple resistance).	TSR (and NTSR?)	2000s	C. Délye - INRAE	Technical institute field trials	CD-Jun20
Lipid metabolism (acetogenins)	Acetyl-coenzyme A carboxylase (ACCase)	D1	A	1	ACCase inhibitors	ACCI	Phenoxypropionic acids and precursors	Aryloxyphenoxy-propionates	cyhalofop	Rice barnyard-grass	<i>Echinochloa oryzicola</i>	ECHPG	Rice	Present in the whole rice-growing area (Camargue) in regions OCC and PAC. Very high frequencies of resistant plants in some of the fields concerned (up to 100%). Can be combined with resistance to group F2 (cross-or multiple resistance).	TSR (and NTSR?)	2000s	C. Délye - INRAE	Technical institute field trials	CD-Jun20
Lipid metabolism (acetogenins)	Acetyl-coenzyme A carboxylase (ACCase)	D1	A	1	ACCase inhibitors	ACCI	Phenoxypropionic acids and precursors	Aryloxyphenoxy-propionates	diclofop, clodinafop	Rye-grasses	<i>Lolium sp</i>	LOLSS	Cereals	Present in all cereal-growing regions, in at least 40% of LOLSS-infested fields. Frequency of resistant plants in the fields concerned is often high, especially for diclofop. Can be combined with resistance to groups F2 and/or D2 (cross-or multiple resistance).	TSR and NTSR (can be associated in one population / one plant)	1993	C. Délye - INRAE	Délye et al., 2002 a; De Prado et al., 2000; Délye et al., 2002b	CD-Jun20
Lipid metabolism (acetogenins)	Acetyl-coenzyme A carboxylase (ACCase)	D1	A	1	ACCase inhibitors	ACCI	Phenoxypropionic acids and precursors	Aryloxyphenoxy-propionates	quizalofop, propaquizafop, fluazifop	Rye-grasses	<i>Lolium sp</i>	LOLSS	Oilseed rape & other dicotyledonous crops	Present in all cereal-growing regions, in at least 40% of LOLSS-infested fields. Frequency of resistant plants in the fields concerned is often high. Can be combined with resistance to groups F2 and/or D2 (cross-or multiple resistance).	TSR and NTSR (can be associated in one population / one plant)	1993	C. Délye - INRAE	Délye et al., 2002 a; De Prado et al., 2002b	CD-Jun20
Lipid metabolism (acetogenins)	Acetyl-coenzyme A carboxylase (ACCase)	D1	A	1	ACCase inhibitors	ACCI	Cyclic $\beta$ -cetoenols and precursors	Cyclohexanediones	cycloxydime, clethodime	Rye-grasses	<i>Lolium sp</i>	LOLSS	Oilseed rape & other dicotyledonous crops	Present in all cereal-growing regions. Less frequent than resistance to phenoxypropionic acids and to pinoxaden because only TSR is involved. Can be combined with resistance to groups F2 and/or D2 (multiple resistance).	TSR	1993	C. Délye - INRAE	Délye et al., 2002 a; Délye et al., 2002b	CD-Jun20
Lipid metabolism (acetogenins)	Acetyl-coenzyme A carboxylase (ACCase)	D1	A	1	ACCase inhibitors	ACCI	Cyclic $\beta$ -cetoenols and precursors	Phenylpyrazolines	pinoxaden	Rye-grasses	<i>Lolium sp</i>	LOLSS	Cereals	Present in all cereal-growing regions, in at least 40% of LOLSS-infested fields. Frequency of resistant plants in the fields concerned is often high. Can be combined with resistance to groups F2 and/or D2 (cross-or multiple resistance).	TSR and NTSR (can be associated in one population / one plant)	2008	C. Délye - INRAE	Délye et al., 2002a; Délye et al., 2002b	CD-Jun20
Lipid metabolism (acetogenins)	Acetyl-coenzyme A carboxylase (ACCase)	D1	A	1	ACCase inhibitors	ACCI	Phenoxypropionic acids and precursors	Aryloxyphenoxy-propionates	fenoxaprop, clodinafop	Black-grass	<i>Alopecurus myosuroides</i>	ALOMY	Cereals	Present in all cereal-growing regions, in at least 40% of ALOMY-infested fields. Frequency of resistant plants in the fields concerned is often high, especially for fenoxaprop. Can be combined with resistance to group F2 (cross-or multiple resistance).	TSR and NTSR (can be associated in one population / one plant)	1993	C. Délye - INRAE	Délye et al., 2007; Délye et al., 2008; Petit et al., 2010 a; Délye et al., 2010; Délye et al., 2002 a; Délye et al., 2003; Petit et al., 2010 b; Délye et al., 2006	CD-Jun20
Lipid metabolism (acetogenins)	Acetyl-coenzyme A carboxylase (ACCase)	D1	A	1	ACCase inhibitors	ACCI	Phenoxypropionic acids and precursors	Aryloxyphenoxy-propionates	quizalofop, propaquizafop, fluazifop	Black-grass	<i>Alopecurus myosuroides</i>	ALOMY	Oilseed rape & other dicotyledonous crops	Present in all cereal-growing regions, in at least 40% of ALOMY-infested fields. Frequency of resistant plants in the fields concerned is often high. Can be combined with resistance to group F2 (cross-or multiple resistance).	TSR and NTSR (can be associated in one population / one plant)	2010	C. Délye - INRAE	Délye et al., 2011 a	CD-Jun20
Lipid metabolism (acetogenins)	Acetyl-coenzyme A carboxylase (ACCase)	D1	A	1	ACCase inhibitors	ACCI	Cyclic $\beta$ -cetoenols and precursors	Cyclohexanediones	cycloxydime, clethodime	Black-grass	<i>Alopecurus myosuroides</i>	ALOMY	Oilseed rape & other dicotyledonous crops	Present in all cereal-growing regions. Less frequent than resistance to phenoxypropionic acids and to pinoxaden because only TSR is involved. Can be combined with resistance to group F2 (cross-or multiple resistance).	TSR	1993	C. Délye - INRAE	Menchari et al., 2006	CD-Jun20
Lipid metabolism (acetogenins)	Acetyl-coenzyme A carboxylase (ACCase)	D1	A	1	ACCase inhibitors	ACCI	Cyclic $\beta$ -cetoenols and precursors	Phenylpyrazolines	pinoxaden	Black-grass	<i>Alopecurus myosuroides</i>	ALOMY	Cereals	Present in all cereal-growing regions, in at least 40% of ALOMY-infested fields. Frequency of resistant plants in the fields concerned is often high. Can be combined with resistance to group F2 (cross-or multiple resistance).	TSR and NTSR (can be associated in one population / one plant)	2008	C. Délye - INRAE	Petit et al., 2010 a; Petit et al., 2010 b; Délye et al., 2006	CD-Jun20



Herbicide											Weed					Information			
Mode of action	Target site	R4P group	HRAC group	WSSA group	Fourouzes group	Group abbreviation	R4P chemical class	HRAC chemical class	Active ingredients	Common name	Scientific name	EPPO code	Crop	Comments	Resistance mechanism	First occurrence in France	Contact person	References	Update
Lipid metabolism (acetogenins)	Fatty acid elongase	D2	K3	15	Mitosis inhibitors	LCEI	Carboxamides	Oxyacetamides	flufenacet	Rye-grasses	<i>Lolium sp</i>	LOLSS	Cereals	First cases reported in regions GES and OCC. Can be combined with resistance to groups D1 and/or F2 (cross-or multiple resistance)	NTSR	2018	C. Dèye - INRAE	<a href="http://www.weedscience.com">www.weedscience.com</a>	CD-Jun20
Biosynthesis of amino-acids or proteins	5 enol-pyruvyl 3 phosphate synthase (EPSP synthase)	F1	G	9	EPSP synthase inhibitors	EPSPSI	Organo-phosphona-tes	Glycines	glyphosate	Tropical horseweed	<i>Erigeron sumatrensis</i>	ERISU	Grapevine	Present locally in regions ARA, OCC and PAC. Can be combined with resistance to group F2 (Region OCC - multiple resistance) - very easily propagated by the seeds. No quantitative data available	unknown	2010	C. Dèye - INRAE	Dubois et al., 2011	CD-Jun20
Biosynthesis of amino-acids or proteins	5 enol-pyruvyl 3 phosphate synthase (EPSP synthase)	F1	G	9	EPSP synthase inhibitors	EPSPSI	Organo-phosphona-tes	Glycines	glyphosate	Canadian horseweed	<i>Erigeron canadensis</i>	ERICA	Grapevine	Present locally in region NAQ. Very easily propagated by the seeds. No quantitative data available.	unknown	2019	C. Dèye - INRAE	National Territory Biological Monitoring	CD-Jun20
Biosynthesis of amino-acids or proteins	5 enol-pyruvyl 3 phosphate synthase (EPSP synthase)	F1	G	9	EPSP synthase inhibitors	EPSPSI	Organo-phosphona-tes	Glycines	glyphosate	Rye-grasses	<i>Lolium sp</i>	LOLSS	Grapevine	Present locally in regions PDL, NAQ, OCC, PAC. No quantitative data available since 2009	unknown	2005	J. Grosman - DGAL	Favier & Gauvrit, 2007	CD-Jun20
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Imidazolinones	Imidazolinones	imazamox	Black-grass	<i>Alopecurus myosuroides</i>	ALOMY	Sunflower (HTV)	Present in all cereal-growing regions. ALOMY is a winter grass weed that is increasingly frequently observed in spring or summer crops	TSR and NTSR (can be associated in one population / one plant)	2007	C. Dèye - INRAE	Dèlye, unpublished	CD-Jun20
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Imidazolinones	Imidazolinones	imazamox	Black-grass	<i>Alopecurus myosuroides</i>	ALOMY	Soybean	Present in all cereal-growing regions. ALOMY is a winter grass weed that is increasingly frequently observed in spring or summer crops	TSR and NTSR (can be associated in one population / one plant)	2007	C. Dèye - INRAE	Dèlye, unpublished	CD-Jun20
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Sulfonylureas	Sulfonylureas	mesosulfuron + iodosulfuron	Black-grass	<i>Alopecurus myosuroides</i>	ALOMY	Cereals	Present in all cereal-growing regions, in at least 30% of ALOMY-infested fields. Frequency of resistant plants in the fields concerned is often high. Can be combined with resistance to group D1 (cross-or multiple resistance)	TSR and NTSR (can be associated in one population / one plant)	2000	C. Dèye - INRAE	Petit et al., 2010 b; Dèlye et al., 2011 a; Lelouez & Gasquez, 2003; Dèlye & Boucansaud, 2008; Dèlye et al., 2009 a	CD-Jun20
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Imidazolinones	Imidazolinones	imazamox	Common ragweed	<i>Ambrosia artemisiifolia</i>	AMBEL	Sunflower (HTV)	Present in regions ARA, BFC, CVL, NAQ and OCC. Present locally in areas encompassing several km² - 10-40% resistant plants in the fields concerned	TSR and NTSR (can be associated in one population / one plant)	2013	C. Dèye - INRAE	Dèlye et al., 2015 a	CD-Jun20
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Imidazolinones	Imidazolinones	imazamox	Common ragweed	<i>Ambrosia artemisiifolia</i>	AMBEL	Soybean	Present in regions ARA, BFC, CVL, NAQ and OCC. Present locally in areas encompassing several km² - 10-40% resistant plants in the fields concerned	TSR and NTSR (can be associated in one population / one plant)	2013	C. Dèye - INRAE	Dèlye et al., 2015 a	CD-Jun20
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Sulfonylureas	Sulfonylureas	tribenuron	Common ragweed	<i>Ambrosia artemisiifolia</i>	AMBEL	Sunflower (HTV)	Present in regions ARA, BFC, CVL, NAQ and OCC. Present locally in areas encompassing several km² - 10-40% resistant plants in the fields concerned	TSR and NTSR (can be associated in one population / one plant)	2013	C. Dèye - INRAE	Dèlye et al., 2015 a	CD-Jun20
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Sulfonylureas	Sulfonylureas	mesosulfuron + iodosulfuron	Silky bentgrass	<i>Apera spica-venti</i>	APESV	Cereals	Present locally in regions ARA, CVL, HDF, NOR. No quantitative data available	TSR and NTSR (can be associated in one population / one plant)	2006	C. Dèye - INRAE	Technical institute field trials	CD-Jun20
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Triazolopyrimidines	Triazolopyrimidines	pyroxulam	Silky bentgrass	<i>Apera spica-venti</i>	APESV	Cereals	Present locally in regions ARA, CVL, HDF, NOR. No quantitative data available	TSR and NTSR (can be associated in one population / one plant)	2006	C. Dèye - INRAE	Technical institute field trials	CD-Jun20
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Sulfonylureas	Sulfonylureas	mesosulfuron + iodosulfuron	Wild oats	<i>Avena sp.</i>	AVESS	Cereals	Present locally in region OCC. No quantitative data available	TSR (and NTSR?)	2006	C. Dèye - INRAE	Technical institute field trials	CD-Jun20
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Triazolopyrimidines	Triazolopyrimidines	pyroxulam	Wild oats	<i>Avena sp.</i>	AVESS	Cereals	Present locally in region OCC. No quantitative data available	TSR (and NTSR?)	2006	C. Dèye - INRAE	Technical institute field trials	CD-Jun20
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Sulfonylureas	Sulfonylureas	sulfosulfuron	Poverty brome	<i>Bromus sterilis</i>	BROST	Cereals	Present locally in regions BFC, GES, HDF. No quantitative data available	NTSR (and TSR?)	2008	C. Dèye - INRAE	Delattre & Vaccari, 2010	CD-Jun20
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Triazolones	Sulfonylamino-carbonyl-triazolones	propoxycarbazone	Poverty brome	<i>Bromus sterilis</i>	BROST	Cereals	Present locally in regions BFC, GES, HDF. No quantitative data available	NTSR (and TSR?)	2008	C. Dèye - INRAE	Delattre & Vaccari, 2010	CD-Jun20

Herbicide											Weed							Information		
Mode of action	Target site	R4P group	HRAC group	WSSA group	Fourouzes group	Group abbreviation	R4P chemical class	HRAC chemical class	Active ingredients	Common name	Scientific name	EPPO code	Crop	Comments	Resistance mechanism	First occurrence in France	Contact person	References	Update	
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Triazolopyrimidines	Triazolopyrimidines	pyroxulam	Poverty brome	<i>Bromus sterilis</i>	BROST	Cereals	Present locally in regions BFC, GES, HDF. No quantitative data available	NTSR (and TSR?)	2008	C. Déye - INRAE	Delattre & Vaccari, 2010	CD-Jun20	
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Sulfonylureas	Sulfonylureas	nicosulfuron, foramsulfuron	Large crabgrass	<i>Digitaria sanguinalis</i>	DIGSA	Maize	Locally emerging in regions BZH, GES, PDL, NAQ - scattered fields with frequencies of resistant plants up to 95-100%	TSR (and NTSR?)	2014	C. Déye - INRAE	Délye et al., 2015 a	CD-Jun20	
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Sulfonylureas	Sulfonylureas	nicosulfuron, foramsulfuron	Barnyard grass	<i>Echinochloa crus-galli</i>	ECHCG	Maize	Locally emerging in regions BFC and NAQ - scattered fields with frequencies of resistant plants up to 95-100%	TSR (and NTSR?)	2014	C. Déye - INRAE	Délye et al., 2015 a	CD-Jun20	
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Triazolopyrimidines	Triazolopyrimidines	penoxsulam	Barnyard-grass	<i>Echnichloa crus-galli</i>	ECHCG	Rice	Present in the whole rice-growing area (Camargue) in regions OCC and PAC. Very high frequencies of resistant plants in some of the fields concerned (up to 100%). Can be combined with resistance to group D1 (cross-or multiple resistance).	TSR (and NTSR?)	2013	C. Déye - INRAE	Délye et al., 2014; Délye et al., 2015 b	CD-Jun20	
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Sulfonylureas	Sulfonylureas	azimsulfuron	Barnyard-grass	<i>Echnichloa crus-galli</i>	ECHCG	Rice	Present in the whole rice-growing area (Camargue) in regions OCC and PAC. Very high frequencies of resistant plants in some of the fields concerned (up to 100%). Can be combined with resistance to group D1 (cross-or multiple resistance).	TSR (and NTSR?)	2013	C. Déye - INRAE	Délye et al., 2014; Délye et al., 2015 b	CD-Jun20	
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Triazolopyrimidines	Triazolopyrimidines	penoxsulam	Rice barnyard-grass	<i>Echinochloa oryzicola</i>	ECHPG	Rice	Present in the whole rice-growing area (Camargue) in regions OCC and PAC. Very high frequencies of resistant plants in some of the fields concerned (up to 100%). Can be combined with resistance to group D1 (cross-or multiple resistance).	TSR (and NTSR?)	2013	C. Déye - INRAE	Délye et al., 2014; Délye et al., 2015 b	CD-Jun20	
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Sulfonylureas	Sulfonylureas	azimsulfuron	Rice barnyard-grass	<i>Echnichloa oryzicola</i>	ECHPG	Rice	Present in the whole rice-growing area (Camargue) in regions OCC and PAC. Very high frequencies of resistant plants in some of the fields concerned (up to 100%). Can be combined with resistance to group D1 (cross-or multiple resistance).	TSR (and NTSR?)	2013	C. Déye - INRAE	Délye et al., 2014; Délye et al., 2015 b	CD-Jun20	
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Sulfonylureas	Sulfonylureas	fiazasulfuron	Tropical horseweed	<i>Erigeron sumatrensis</i>	ERISU	Grapevine	Present locally in regions ARA, OCC and PAC. Can be combined with resistance to group UF1 as multiple resistance (Region OCC). Very easily propagated by the seeds. No quantitative data available	TSR	2016	C. Déye - INRAE	Délye et al., 2017	CD-Jun20	
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Triazolopyrimidines	Triazolopyrimidines	penoxsulam	Tropical horseweed	<i>Erigeron sumatrensis</i>	ERISU	Grapevine	Present locally in regions ARA, OCC and PAC. Can be combined with resistance to group UF1 as multiple resistance (Region OCC). Very easily propagated by the seeds. No quantitative data available	TSR	2016	C. Déye - INRAE	Délye et al., 2017	CD-Jun20	
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Sulfonylureas	Sulfonylureas	rimsulfuron, triflusulfuron	Gallant soldier	<i>Galinsoga parviflora</i>	GASPA	Chicory (HTV)	First case reported in region HDF	TSR	2017	C. Déye - INRAE	Délye et al., 2019	CD-Jun20	
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Triazolopyrimidines	Triazolopyrimidines	penoxsulam	Gallant soldier	<i>Galinsoga parviflora</i>	GASPA	Chicory	First case reported in region HDF	TSR	2017	C. Déye - INRAE	Délye et al., 2019	CD-Jun20	
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Imidazolinones	Imidazolinones	imazamox	Weedy sunflower	<i>Helianthus annuus</i>	HELAN	Sunflower (HTV)	Present in regions NAQ and OCC. Resistance mostly due to gene flow from HTV sunflower. No quantitative data available	TSR	2009	C. Déye - INRAE	Terres Innovia, 2014	CD-Jun20	
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Sulfonylureas	Sulfonylureas	tribenuron	Weedy sunflower	<i>Helianthus annuus</i>	HELAN	Sunflower (HTV)	Present in regions NAQ and OCC. Resistance mostly due to gene flow from HTV sunflower. No quantitative data available	TSR	2009	C. Déye - INRAE	Terres Innovia, 2014	CD-Jun20	
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Imidazolinones	Imidazolinones	imazamox	Rye-grasses	<i>Lolium sp</i>	LOLSS	Sunflower (HTV)	Present in all cereal-growing regions. No quantitative data available	TSR and NTSR (can be associated in one population / one plant)	2006	C. Déye - INRAE	Délye, unpublished	CD-Jun20	
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Imidazolinones	Imidazolinones	imazamox	Rye-grasses	<i>Lolium sp</i>	LOLSS	Soybean	Present in all cereal-growing regions. No quantitative data available	TSR and NTSR (can be associated in one population / one plant)	2006	C. Déye - INRAE	Délye, unpublished	CD-Jun20	
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Sulfonylureas	Sulfonylureas	mesosulfuron + iodosulfuron	Rye-grasses	<i>Lolium sp</i>	LOLSS	Cereals	Present in all cereal-growing regions, in at least 30% of LOLSS-infested fields. Frequency of resistant plants in the fields concerned is often high. Can be combined with resistance to groups D1 and/or D2 (cross-or multiple resistance)	TSR and NTSR (can be associated in one population / one plant)	2006	C. Déye - INRAE	Délye et al., 2009 a; Délye et al., 2009 b; Duhoux & Délye, 2013; Duhoux et al., 2015	CD-Jun20	

Herbicide											Weed							Information		
Mode of action	Target site	R4P group	HRAC group	WSSA group	Fourouzes group	Group abbreviation	R4P chemical class	HRAC chemical class	Active ingredients	Common name	Scientific name	EPPO code	Crop	Comments	Resistance mechanism	First occurrence in France	Contact person	References	Update	
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Triazolopyrimidines	Triazolopyrimidines	pyroxulam	Rye-grasses	<i>Lolium sp</i>	LOLSS	Cereals	Present in all cereal-growing regions, in at least 30% of LOLSS-infested fields. Frequency of resistant plants in the fields concerned is often high. Can be combined with resistance to groups D1 and/or D2 (cross-or multiple resistance)	TSR and NTSR (can be associated in one population / one plant)	2006	C. Délye - INRAE	Duhoux & Délye, 2013; Duhoux et al., 2015	CD-Jun20	
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Sulfonylureas	Sulfonylureas	iodosulfuron + mesosulfuron, metsulfuron, tribenuron	Chamomile	<i>Matricaria sp.</i>	MATSS	Cereals	Present locally and increasing in regions BZH, HDF, NAQ, NOR, OCC. No quantitative data available	unknown	2010	C. Délye - INRAE	Official letter company to Government	CD-Jun20	
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Imidazolinones	Imidazolinones	imazamox	Corn poppy	<i>Papaver rhoeas</i>	PAPRH	Oilseed rape (HTV)	Present and increasing in all cereal-growing regions, in at least 15-20% of PAPRH-infested fields. Frequency of resistant plants in the fields concerned is often high. Can be combined with resistance to group UL1 (multiple resistance)	TSR and NTSR (can be associated in one population / one plant)	2005	C. Délye - INRAE	Délye et al., 2011 b; Délye et al., 2011 c; Scarabel et al., 2015	CD-Jun20	
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Sulfonylureas	Sulfonylureas	tribenuron, metsulfuron, iodosulfuron + mesosulfuron, tritosulfuron	Corn poppy	<i>Papaver rhoeas</i>	PAPRH	Cereals	Present and increasing in all cereal-growing regions, in at least 15-20% of PAPRH-infested fields. Frequency of resistant plants in the fields concerned is often high. Can be combined with resistance to group UL1 (multiple resistance)	TSR and NTSR (can be associated in one population / one plant)	2005	C. Délye - INRAE	Délye et al., 2011 b; Délye et al., 2011 c; Scarabel et al., 2015	CD-Jun20	
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Triazolopyrimidines	Triazolopyrimidines	florasulam	Corn poppy	<i>Papaver rhoeas</i>	PAPRH	Cereals	Present and increasing in all cereal-growing regions, in at least 15-20% of PAPRH-infested fields. Frequency of resistant plants in the fields concerned is often high. Can be combined with resistance to group UL1 (multiple resistance)	TSR and NTSR (can be associated in one population / one plant)	2005	C. Délye - INRAE	Délye et al., 2011 b; Délye et al., 2011 c; Scarabel et al., 2015	CD-Jun20	
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Sulfonylureas	Sulfonylureas	mesosulfuron + iodosulfuron	Annual bluegrass	<i>Poa annua</i>	POAAN	Cereals	First cases reported in regions BZH, PDL and OCC	unknown	2015	C. Délye - INRAE	Bayer CropScience internal assays	CD-Jun20	
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Sulfonylureas	Sulfonylureas	mesosulfuron + iodosulfuron	Rough meadow-grass	<i>Poa trivialis</i>	POATR	Cereals	First case reported in region PDL	unknown	2012	C. Délye - INRAE	Bayer CropScience internal assays	CD-Jun20	
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Sulfonylureas	Sulfonylureas	metsulfuron, thifensulfuron	Bitter dock	<i>Rumex obtusifolius</i>	RUMOB	Cereals	First case reported in region BZH	TSR	2017	C. Délye - INRAE	Piekacz et al., 2019	CD-Jun20	
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Triazolopyrimidines	Triazolopyrimidines	florasulam	Bitter dock	<i>Rumex obtusifolius</i>	RUMOB	Cereals	First case reported in region BZH	TSR	2017	C. Délye - INRAE	Piekacz et al., 2019	CD-Jun20	
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Imidazolinones	Imidazolinones	imazamox	Common Groundsel	<i>Senecio vulgaris</i>	SENVU	Cereals	Present locally in regions BFC, BZH, CVL, HDF, NAQ, NOR, OCC, PDL. Resistance very easily propagated by the seeds. Frequencies of resistant plants can reach 95-100% in the fields concerned	TSR (and NTSR?)	2013	C. Délye - INRAE	Délye et al., 2015 c; Délye et al., 2016 a	CD-Jun20	
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Sulfonylureas	Sulfonylureas	tribenuron, metsulfuron, iodosulfuron + mesosulfuron, prosulfuron	Common Groundsel	<i>Senecio vulgaris</i>	SENVU	Cereals	Present locally in regions BFC, BZH, CVL, HDF, NAQ, NOR, OCC, PDL. Resistance very easily propagated by the seeds. Frequencies of resistant plants can reach 95-100% in the fields concerned	TSR (and NTSR?)	2013	C. Délye - INRAE	Délye et al., 2015 c; Délye et al., 2016 a	CD-Jun20	
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Sulfonylureas	Sulfonylureas	fiazasulfuron	Common Groundsel	<i>Senecio vulgaris</i>	SENVU	Grapevine	Present locally in regions BFC, CVL, NAQ, OCC, PDL. Resistance very easily propagated by the seeds. Frequencies of resistant plants can reach 95-100% in the fields concerned	TSR (and NTSR?)	2009	C. Délye - INRAE	Délye et al., 2015 c; Délye et al., 2016 a	CD-Jun20	
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Triazolinones	Sulfonylamino-carbonyl-triazolinones	thiencarbazone	Common Groundsel	<i>Senecio vulgaris</i>	SENVU	Cereals	Present locally in regions BFC, BZH, CVL, HDF, NAQ, NOR, OCC, PDL. Resistance very easily propagated by the seeds. Frequencies of resistant plants can reach 95-100% in the fields concerned	TSR (and NTSR?)	2013	C. Délye - INRAE	Délye et al., 2015 c; Délye et al., 2016 a	CD-Jun20	
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Triazolopyrimidines	Triazolopyrimidines	florasulam, pyroxulam	Common Groundsel	<i>Senecio vulgaris</i>	SENVU	Cereals	Present locally in regions BFC, BZH, CVL, HDF, NAQ, NOR, OCC, PDL. Resistance very easily propagated by the seeds. Frequencies of resistant plants can reach 95-100% in the fields concerned	TSR (and NTSR?)	2013	C. Délye - INRAE	Délye et al., 2015 c; Délye et al., 2016 a	CD-Jun20	
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Sulfonylureas	Sulfonylureas	nicosulfuron, foramsulfuron	Foxtail	<i>Setaria sp.</i>	SETSS	Maize	Locally emerging in regions ARA, GES and NAQ - scattered fields with frequencies of resistant plants up to 95-100%	TSR (and NTSR?)	2011	C. Délye - INRAE	Official letter company to Government; Délye et al., 2015 a	CD-Jun20	
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Sulfonylureas	Sulfonylureas	rimsulfuron	Spiny annual sow-thistle	<i>Sonchus asper</i>	SONAS	Chicory (HTV)	Present in region HDF. Resistance very frequently observed in the whole chicory-growing area, with up to 100% resistant plants in the fields concerned. The fields concerned also bear winter crops (cereals, rape...) that can be infested by SONAS	TSR	2015	C. Délye - INRAE	Délye et al., 2016 c	CD-Jun20	
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Triazolopyrimidines	Triazolopyrimidines	penoxsulam	Spiny annual sow-thistle	<i>Sonchus asper</i>	SONAS	Chicory	Present in region HDF. Resistance very frequently observed in the whole chicory-growing area, with up to 100% resistant plants in the fields concerned. The fields concerned also bear winter crops (cereals, rape...) that can be infested by SONAS	TSR	2015	C. Délye - INRAE	Délye et al., 2016 c	CD-Jun20	
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Sulfonylureas	Sulfonylureas	tribenuron, metsulfuron, iodosulfuron + mesosulfuron, tritosulfuron	Chickweed	<i>Stellaria media</i>	STEME	Cereals	Present locally in regions HDF, NOR, PDL. No quantitative data available	TSR	2012	C. Délye - INRAE	Délye & Causse, 2012	CD-Jun20	

Herbicide										Weed							Information		
Mode of action	Target site	R4P group	HRAC group	WSSA group	Fourouzes group	Group abbreviation	R4P chemical class	HRAC chemical class	Active ingredients	Common name	Scientific name	EPPO code	Crop	Comments	Resistance mechanism	First occurrence in France	Contact person	References	Update
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Triazolopyrimidines	Triazolopyrimidines	florasulam, pyroxsulam	Chickweed	<i>Stellaria media</i>	STEME	Cereals	Present locally in regions HDF, NOR, PDL. No quantitative data available	TSR	2012	C. Déye - INRAE	Déye & Causse, 2012	CD-Jun20
Biosynthesis of amino-acids or proteins	Acetolactate synthase (ALS) = acetohydroxyacid synthase (=AHAS)	F2	B	2	ALS inhibitors	ALSI	Triazolopyrimidines	Triazolopyrimidines	pyroxsulam	Black-grass	<i>Alopecurus myosuroides</i>	ALOMY	Cereals	Present in all cereal-growing regions, in at least 30% of ALOMY-infested fields. Frequency of resistant plants in the fields concerned is often high. Can be combined with resistance to group D1 (cross-or multiple resistance)	TSR and NTSR (can be associated in one population / one plant)	2007	C. Déye - INRAE	Déye et al., 2011a; Déye & Boucansaud, 2008	CD-Jun20
Hormonal regulation	Auxin receptors	L1	O	4	Synthetic Auxins	-	Carboxylic acids	Phenoxy-carboxylic acids	2,4-D, MCPA	Corn poppy	<i>Papaver rhoeas</i>	PAPRH	Cereals	Emerging in regions BFC, CVL, GES, HDF, IDF, NAQ, NOR, OCC. Frequency of resistant plants in the fields concerned can be high. Can be combined with resistance to group F2 (multiple resistance)	unknown	2013	C. Déye - INRAE	Déye et al., 2016 b	CD-Jun20
Hormonal regulation	Auxin receptors	L1	O	4	Synthetic Auxins	-	Pyridines	Pyridine-carboxylic acids	aminopyralid	Corn poppy	<i>Papaver rhoeas</i>	PAPRH	Cereals	Emerging in regions BFC, CVL, GES, HDF, IDF, NAQ, NOR, OCC. Frequency of resistant plants in the fields concerned can be high. Can be combined with resistance to group F2 (multiple resistance)	unknown	2013	C. Déye - INRAE	Déye et al., 2016 b	CD-Jun20