

**REGISTRATION REPORT**  
**Part B**  
**Section 3**  
**Efficacy Data and Information**  
Concise summary

Product code: GF-3969

Chemical active substances:

Rimsulfuron, 148.15 g/kg  
Thifensulfuron methyl, 92.6 g/kg  
Isoxadifen-ethyl, 111.1 g/kg

Central Zone

Zonal Rapporteur Member State: Poland

**CORE ASSESSMENT**  
(authorization)

Applicant: Corteva/DuPont/DowAgroScience/Pioneer\*

Submission date: December 2020

MS Finalisation date: December 2021 (initial Core Assessment)

May 2022 (final Core Assessment)

\*Corteva Agriscience is new Legal Entity in most of EU countries and should be treated as an Applicant for GF-3969 registration. Information about Applicant for each country is provided in dRR Part A.

This document is the property of the applicant and contains confidential and trade secret information. Except as required by law, this document should not be, partially or fully (i) photocopied or released in any form to any outside party without the prior written consent of the applicant or its affiliates, or (ii) used by a registration authority to support the registration of any other product without the prior written consent of the applicant or its affiliates.

### Version history

When	What
December 2020	Initial dRR – Corteva Agriscience
December 2021	Initial zRMS assessment  The report in the dRR format has been prepared by the Applicant, therefore all comments, additional evaluations and conclusions of the zRMS are presented in grey commenting boxes. Minor changes are introduced directly in the text and highlighted in grey. Not agreed or not relevant information are <del>struck through and shaded for transparency</del> .
May 2022	Final report (Core Assessment updated following the commenting period)  Additional information/assessments included by the zRMS in the report in response to comments recieved from the CMS and the Applicant are highlighted in yellow. Information no longer relevant <del>is struck through and shaded</del> .

## Table of Contents

<b>3</b>	<b>Efficacy Data and Information (including Value Data) on the Plant Protection Product (KCP 6).....</b>	<b>5</b>
3.1	Summary and conclusions of zRMS on Section 3: Efficacy (KCP 6).....	5
3.2	Efficacy data (KCP 6).....	16
3.2.1	Preliminary tests (KCP 6.1).....	21
3.2.2	Minimum effective dose tests (KCP 6.2) .....	29
3.2.3	Efficacy tests (KCP 6.2) .....	34
3.3	Information on the occurrence or possible occurrence of the development of resistance (KCP 6.3).....	72
3.3.1	Mode of action.....	72
3.3.2	Mechanism of resistance .....	72
3.3.3	Evidence of resistance to ALS inhibitors herbicides in EU.....	73
3.3.4	Cross-resistance .....	75
3.3.5	Sensitivity data .....	75
3.3.6	Resistance risk assessment of unrestricted use pattern.....	75
3.3.6.1	The pests .....	76
3.3.6.2	The active substances .....	76
3.3.6.3	Agronomic practices.....	77
3.3.7	Management strategy.....	77
3.3.7.1	Test methods.....	77
3.3.7.2	Resistance management strategy to control <i>Sorghum halepense</i> (SORHA) .....	80
3.3.7.3	Resistance management strategy to control <i>Echinochloa crus-galli</i> (ECHCG).....	88
3.3.7.4	Resistance management strategy to control <i>Setaria</i> species (SETss).....	92
3.3.7.5	Resistance management strategy to control <i>Digitaria sanguinalis</i> (DIGSA).....	93
3.3.7.6	Resistance management strategy to control <i>Amaranthus retroflexus</i> (AMARE).....	94
3.3.8	Implementation of the management strategy.....	97
3.3.9	Monitoring, reporting and reaction to changes in performance.....	98
3.4	Adverse effects on treated crops (KCP 6.4) .....	99
3.4.1	Phytotoxicity to host crop (KCP 6.4.1) .....	99
3.4.2	Effect on the yield of treated plants or plant product (KCP 6.4.2).....	107
3.4.3	Effects on the quality of plants or plant products (KCP 6.4.3).....	110
3.4.4	Effects on transformation processes (KCP 6.4.4).....	113
3.4.5	Impact on treated plants or plant products to be used for propagation (KCP 6.4.5).....	113
3.5	Observations on other undesirable or unintended side-effects (KCP 6.5).....	113
3.5.1	Impact on succeeding crops (KCP 6.5.1) .....	113
3.5.2	Impact on other plants including adjacent crops (KCP 6.5.2).....	115
3.5.3	Effects on beneficial and other non-target organisms (KCP 6.5.3).....	120
3.6	Other/special studies.....	122
3.6.1	Rainfastness.....	122
3.6.2	Cleaning application equipment .....	123
3.6.3	Justification for recommended water volumes .....	124
3.6.4	Justification for recommended nozzle types.....	124
3.6.5	Compatibility studies.....	125
3.6.5.1	Biology Compatibilities studies.....	125
3.6.5.2	Physical and chemical compatibility studies .....	125
3.7	List of test facilities including the corresponding certificates .....	125
<b>Appendix 1</b>	<b>Lists of data considered in support of the evaluation.....</b>	<b>127</b>

### 3 Efficacy Data and Information (including Value Data) on the Plant Protection Product (KCP 6)

This document has been prepared to support the application of GF-3969 (DuPont/Corteva experimental code, DPX-V4B07) in mixture with a non-ionic surfactant for the control of weeds in field crops of maize.

There were 37 field trials conducted across the Central Regulatory zone between 2017 and 2018 on various grasses and broadleaf weeds in maize.

The zonal GAP envelope for CEU countries foresees the application of 135 g fp/ha GF-3969 (32.5 g a.s./ha + 15 g isoxadifen ethyl) between BBCH 11-18 of maize. GF-3969 should be tank mixed with surfactant (non-ionic or vegetable oil). Certain countries (BE, HU, NL, LU, RO, and SK) apply for a dose range, which is why also lower doses (67.5 g fp/ha) are presented within the efficacy section. Furthermore, split application of GF-3969 in the ratio of 50:50 (67.5 g fp/ha GF-3969 per application: AT, BE, CZ, DE, HU, NL, LU, PL, RO, SK) and/or as ~~60:40~~ 63:37 (85 g fp/ha first application, 50 g fp/ha second application: AT, CZ, DE) is intended.

Trials were carried out by DuPont and contractor companies, all of which follow the EPPO standards and are officially recognized by the competent authorities to carry out field registration trials in accordance with the principles of Good Experimental Practice (GEP).

Transformation of the dRR (applicant version) into the RR (zRMS version)

#### Comments of zRMS:

Conclusions from the assessment were prepared using grey commenting boxes placed at the end of each chapter. Textual changes were done using grey highlights in the text. The parts of the text amended or added by the zRMS evaluator are highlighted in grey, whereas the parts struck off are ~~visibly marked with the grey font.~~

### 3.1 Summary and conclusions of zRMS on Section 3: Efficacy (KCP 6)

#### Abstract

##### Abstract of the evaluation, by the cMS PL:

This application has been submitted for the authorization of new product GF-3969 in Poland, Austria, Belgium, Czech Republic, Germany, Hungary, Ireland, Netherlands, Luxemburg, Romania, Slovakia and United Kingdom. GF-3969 contains two active substances: rimsulfuron (148,15 g/kg), thifensulfuron methyl (92,6 g/kg) and safener isoxadifen-ethyl (111,1 g/kg). This product is intended to use as a herbicide for weeds control in maize at dose rate 135 g fp/ha. GF-3969 can be apply as single application or split dose in the ratio 50:50 (67.5 g fp/ha per application) and/or ~~60:40~~ 63:37 (85 g fp/ha in first application and 50 g fp/ha in second application).

##### MED

According to the trial results, it can be concluded that the dose rate of 135 g fp/ha is the most effective to control of all weed species submitted in this dossier **and can be considered as minimum effective dose.** However, the Applicant proposes also a range of dose rates of 67,5-135 g fp/ha in Belgium, Hungary, Netherlands, Luxemburg, Romania and Slovakia. Considering efficacy trial results from Maritime and South-East zone, it is visible that dose response is noted for main weed species. Therefore, the dose rate of 67,5 g fp/ha can be concluded as minimum effective dose for the above countries. **The zRMS proposes to include recommendation to the product label (see in the chapter 3.2.2).**

**Efficacy**

Based on the efficacy trial results it can be concluded that herbicide GF-3969 is effective in the control of some monocotyledonous weeds (e.g. AGRRE, ECHCG, POAAN) and dicotyledonous weed species (e.g. CHEAL, POLCO, POLPE, STEME, AMBEL).

**Selectivity**

Based on the submitted selectivity trial results, it can be concluded that GF-3969 with surfactant is safe for maize if it is used in accordance to the label recommendations. However, in the opinion of zRMS it should be included to the label that the test product can cause transient phytotoxicity symptoms (e.g. discoloration, malformation, necrosis or stunting).

**Resistance risk**

To reduce the risk of resistance to sulfonylureas herbicides (HRAC Group 2), resistance management strategy is necessary including: limited number and appropriate time of applications, recommended dose rate and alternating use of different MoA's.

**Table 3.1-1: Acceptability of intended uses (and respective fall-back GAPs, if applicable)**

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Use- No.	Member state(s)	Crop and/ or situation  (crop destination/ purpose of crop)	F, Fn, Fpn G, Gn, Gpn or I*	Pests or Group of pests controlled  (additionally: developmental stages of the pest or pest group)	Application				Application rate			PHI (days)	Remarks:  e.g. g safener/synergist per ha	zRMS Conclusion (efficacy)
					Method/ Kind	Timing/ Growth stage of crop & season	Max. number a) per use b) per crop/ season	Min. interval between applications (days)	kg product/ ha a) max. rate per appl. b) max. total rate per crop/season	g a.s./ha <sup>a</sup> a) max. rate per appl. b) max. total rate per crop/season	Water L/ha  min/ max			
<b>Zonal uses</b>														
1	Zonal GAP envelope for CEU countries	Maize (ZEAMX)	F	Annual monocotyledonous weeds (TTTMS), Annual dicotyledonous weeds (TTTDS), Perennial grass weeds (GGGPE)	Hydraulic sprayer overall	BBCH 11 to BBCH 18 Spring March-July	a) 1 b) 1	n.a.	a) 0.135 b) 0.135	a) 32.5 (20 + 12.5) b) 32.5 (20 + 12.5)	100 / 400	n.a.	Safener: formulated product contains 111.1 g/kg isoxadifen ethyl (max. 15 g/ha) Adjuvant: application with max. 0.2% a non-ionic surfactant (ex. DPX-KG691) or vegetable oil	A
2	AT	Maize (ZEAMX)	F	Annual monocotyledonous weeds ( <del>TTTMS</del> <b>3ANMNT</b> ), Annual dicotyledonous weeds ( <del>TTTDS</del> <b>3ANDIT</b> ), Perennial grass weeds ( <del>GGGPE</del> <b>3PEGWT</b> )	Hydraulic sprayer overall	BBCH 11 to BBCH 18 Spring April-July	a) 1 b) 1	n.a.	a) 0.135 b) 0.135	a) 32.5 (20 + 12.5) b) 32.5 (20 + 12.5)	100 / 400	n.a.	Safener: formulated product contains 111.1 g/kg isoxadifen ethyl (max. 15 g/ha) Adjuvant: application with 0.2% a non-ionic surfactant (ex. DPX- KG691)	A
3	BE	Maize (ZEAMX)	F	Annual monocotyledonous weeds (TTTMS), Annual dicotyledonous weeds (TTTDS), Perennial grass weeds (GGGPE)	Hydraulic sprayer overall	BBCH 11 to BBCH 18 Spring April-June	a) 1 b) 1	n.a.	a) 0.135 b) 0.135	a) 32.5 (20 + 12.5) b) 32.5 (20 + 12.5)	150 / 400	n.a.	Safener: formulated product contains 111.1 g/kg isoxadifen ethyl (max. 15 g/ha) Adjuvant: application with max. 0.2% a non-ionic surfactant (ex. DPX-KG691) or vegetable oil Dose range: 67.5 - 135 g product/ha	A

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Use- No.	Member state(s)	Crop and/ or situation  (crop destination/ purpose of crop)	F, Fn, Fpn G, Gn, Gpn or I*	Pests or Group of pests controlled  (additionally: developmental stages of the pest or pest group)	Application				Application rate			PHI (days)	Remarks:  e.g. g safener/synergist per ha	zRMS Conclusion (efficacy)
					Method/ Kind	Timing/ Growth stage of crop & season	Max. number a) per use b) per crop/ season	Min. interval between applications (days)	kg product/ ha a) max. rate per appl. b) max. total rate per crop/season	g a.s./ha <sup>a</sup> a) max. rate per appl. b) max. total rate per crop/season	Water L/ha  min/ max			
4	CZ	Maize (ZEAMX)	F	Annual monocotyledonous weeds (TTTMS), Annual dicotyledonous weeds (TTTDS), Perennial grass weeds (GGGPE)	Hydraulic sprayer overall	BBCH 11 to BBCH 18 Spring March-July	a) 1 b) 1	n.a.	a) 0.135 b) 0.135	a) 32.5 (20 + 12.5) b) 32.5 (20 + 12.5)	100 / 400	n.a.	Safener: formulated product contains 111.1 g/kg isoxadifen ethyl (max. 15 g/ha) Adjuvant: application with 0.2% a non-ionic surfactant (ex. DPX-KG691) or vegetable oil	A
5	DE	Maize (ZEAMX)	F	Annual monocotyledonous weeds (TTTMS), Annual dicotyledonous weeds (TTTDS), Perennial grass weeds (GGGPE) <b>AGRRE</b>	Hydraulic sprayer overall	BBCH 11 to BBCH 18 Spring April-July	a) 1 b) 1	n.a.	a) 0.135 b) 0.135	a) 32.5 (20 + 12.5) b) 32.5 (20 + 12.5)	100 / 400	n.a.	Safener: formulated product contains 111.1 g/kg isoxadifen ethyl (max. 15 g/ha) Adjuvant: application with 0.2% a non-ionic surfactant (ex. DPX-KG691)	A
6	HU	Maize (ZEAMX)	F	Annual monocotyledonous weeds (TTTMS), Annual dicotyledonous weeds (TTTDS), Perennial grass weeds (GGGPE)	Hydraulic sprayer overall	BBCH 11 to BBCH 18 Spring March-July	a) 1 b) 1	n.a.	a) 0.135 b) 0.135	a) 32.5 (20 + 12.5) b) 32.5 (20 + 12.5)	100 / 400	n.a.	Safener: formulated product contains 111.1 g/kg isoxadifen ethyl (max. 15 g/ha) Adjuvant: application with max. 0.2% a non-ionic surfactant (ex. DPX-KG691) or vegetable oil Dose range: 67.5 - 135 g product/ha	A
7	IE	Maize (ZEAMX)	F	Annual monocotyledonous weeds (TTTMS), Annual dicotyledonous weeds (TTTDS), Perennial grass weeds (GGGPE)	Hydraulic sprayer overall	BBCH 11 to BBCH 18 Spring March-July	a) 1 b) 1	n.a.	a) 0.135 b) 0.135	a) 32.5 (20 + 12.5) b) 32.5 (20 + 12.5)	100 / 400	n.a.	Safener: formulated product contains 111.1 g/kg isoxadifen methyl (max. 15 g/ha) Adjuvant: application with 0.2% a non-ionic surfactant (ex. DPX-KG691) or vegetable oil	A

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Use- No.	Member state(s)	Crop and/ or situation  (crop destination/ purpose of crop)	F, Fn, Fpn G, Gn, Gpn or I*	Pests or Group of pests controlled  (additionally: developmental stages of the pest or pest group)	Application				Application rate			PHI (days)	Remarks:  e.g. g safener/synergist per ha	zRMS Conclusion (efficacy)
					Method/ Kind	Timing/ Growth stage of crop & season	Max. number a) per use b) per crop/ season	Min. interval between applications (days)	kg product/ ha a) max. rate per appl. b) max. total rate per crop/season	g a.s./ha <sup>a</sup> a) max. rate per appl. b) max. total rate per crop/season	Water L/ha  min/ max			
8	NL	Maize (ZEAMX)	F	Annual monocotyledonous weeds (TTTMS), Annual dicotyledonous weeds (TTTDS), Perennial grass weeds (GGGPE) <b>AGRRE, CHEAL, CHEPO, ECHCG</b>	Hydraulic sprayer overall	BBCH 11 to BBCH 18 Spring April-June	a) 1 b) 1	n.a.	a) 0.135 b) 0.135	a) 32.5 (20 + 12.5) b) 32.5 (20 + 12.5)	150 / 400	n.a.	Safener: formulated product contains 111.1 g/kg isoxadifen ethyl (max. 15 g/ha) Adjuvant: application with max. 0.2% a non-ionic surfactant (ex. DPX-KG691) or vegetable oil Dose range: 67.5 - 135 g product/ha	A  67,5 g fp/ha: ECHCG, CHEAL, CHEPO  135 g fp/ha: AGRRE, ECHCG
9	LU	Maize (ZEAMX)	F	Annual monocotyledonous weeds (TTTMS), Annual dicotyledonous weeds (TTTDS), Perennial grass weeds (GGGPE)	Hydraulic sprayer overall	BBCH 11 to BBCH 18 Spring April-June	a) 1 b) 1	n.a.	a) 0.135 b) 0.135	a) 32.5 (20 + 12.5) b) 32.5 (20 + 12.5)	150 / 400	n.a.	Safener: formulated product contains 111.1 g/kg isoxadifen ethyl (max. 15 g/ha) Adjuvant: application with max. 0.2% a non-ionic surfactant (ex. DPX-KG691) or vegetable oil Dose range: 67.5 - 135 g product/ha	A
10	PL	Maize (ZEAMX)	F	Annual monocotyledonous weeds (TTTMS), Annual dicotyledonous weeds (TTTDS), Perennial grass weeds (GGGPE) <i>Echinochloa crus-galli</i> (ECHCG)	Hydraulic sprayer overall	BBCH 11 to BBCH 18 Spring April-June	a) 1 b) 1	n.a.	a) 0.135 b) 0.135	a) 32.5 (20 + 12.5) b) 32.5 (20 + 12.5)	100 / 400	n.a.	Safener: formulated product contains 111.1 g/kg isoxadifen ethyl (max. 15 g/ha) Adjuvant: application with max. 0.2% a non-ionic surfactant (ex. DPX-KG691) or vegetable oil	A

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Use- No.	Member state(s)	Crop and/ or situation  (crop destination/ purpose of crop)	F, Fn, Fpn G, Gn, Gpn or I*	Pests or Group of pests controlled  (additionally: developmental stages of the pest or pest group)	Application				Application rate			PHI (days)	Remarks:  e.g. g safener/synergist per ha	zRMS Conclusion (efficacy)
					Method/ Kind	Timing/ Growth stage of crop & season	Max. number a) per use b) per crop/ season	Min. interval between applications (days)	kg product/ ha a) max. rate per appl. b) max. total rate per crop/season	g a.s./ha <sup>a</sup> a) max. rate per appl. b) max. total rate per crop/season	Water L/ha  min/ max			
11	RO	Maize (ZEAMX)	F	Annual monocotyledonous weeds (TTTMS), Annual dicotyledonous weeds (TTTDS), Perennial grass weeds (GGGPE)	Hydraulic sprayer overall	BBCH 11 to BBCH 18 Spring April-June	a) 1 b) 1	n.a.	a) 0.135 b) 0.135	a) 32.5 (20 + 12.5) b) 32.5 (20 + 12.5)	100 / 400	n.a.	Safener: formulated product contains 111.1 g/kg isoxadifen ethyl (max. 15 g/ha) Adjuvant: application with max. 0.2% a non-ionic surfactant (ex. DPX-KG691) or vegetable oil Dose range: 67.5 - 135 g product/ha	A
12	SK	Maize (ZEAMX)	F	Annual monocotyledonous weeds (TTTMS), Annual dicotyledonous weeds (TTTDS), Perennial grass weeds (GGGPE)	Hydraulic sprayer overall	BBCH 11 to BBCH 18 Spring March-July	a) 1 b) 1	n.a.	a) 0.135 b) 0.135	a) 32.5 (20 + 12.5) b) 32.5 (20 + 12.5)	100 / 400	n.a.	Safener: formulated product contains 111.1 g/kg isoxadifen ethyl (max. 15 g/ha) Adjuvant: application with 0.2% a non-ionic surfactant (ex. DPX-KG691) or vegetable oil Dose range: 67.5 - 135 g product/ha	A
13	UK	Maize (ZEAMX)	F	Annual monocotyledonous weeds (TTTMS), Annual dicotyledonous weeds (TTTDS), Perennial grass weeds (GGGPE)	Hydraulic sprayer overall	BBCH 11 to BBCH 18 Spring May-July	a) 1 b) 1	n.a.	a) 0.135 b) 0.135	a) 32.5 (20 + 12.5) b) 32.5 (20 + 12.5)	100 / 400	n.a.	Safener: formulated product contains 111.1 g/kg isoxadifen ethyl (max. 15 g/ha) Adjuvant: application with 0.2% a non-ionic surfactant (ex. DPX-KG691) or vegetable oil	A

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Use- No.	Member state(s)	Crop and/ or situation  (crop destination/ purpose of crop)	F, Fn, Fpn G, Gn, Gpn or I*	Pests or Group of pests controlled  (additionally: developmental stages of the pest or pest group)	Application				Application rate			PHI (days)	Remarks:  e.g. g safener/synergist per ha	zRMS Conclusion (efficacy)
					Method/ Kind	Timing/ Growth stage of crop & season	Max. number a) per use b) per crop/ season	Min. interval between applications (days)	kg product/ ha a) max. rate per appl. b) max. total rate per crop/season	g a.s./ha <sup>a</sup> a) max. rate per appl. b) max. total rate per crop/season	Water L/ha  min/ max			
14	Zonal GAP envelope for CEU countries	Maize (ZEAMX)	F	Annual monocotyledonous weeds (TTTMS), Annual dicotyledonous weeds (TTTDS), Perennial grass weeds (GGGPE)	Hydraulic sprayer overall	BBCH 11 to BBCH 18 Spring March-July	a) 2 b) 2	7	a) 0.135 b) 0.135	a) 32.5 (20 + 12.5) b) 32.5 (20 + 12.5)	100 / 400	n.a.	Safener: formulated product contains 111.1 g/kg isoxadifen ethyl (max. 15 g/ha) Adjuvant: application with max. 0.2% a non-ionic surfactant (ex. DPX-KG691) or vegetable oil Split application possible without exceeding the total maximum of 135 g product/ha	A
15	AT	Maize (ZEAMX)	F	Annual monocotyledonous weeds ( <del>TTTMS</del> 3ANMNT), Annual dicotyledonous weeds ( <del>TTTDS</del> 3ANDIT), Perennial grass weeds ( <del>GGGPE</del> 3PEGWT)	Hydraulic sprayer overall	BBCH 11 to BBCH 18 Spring April-July	a) 2 b) 2	7	a) 0.085 b) 0.135	a) 20.46 (12.59 + 7.87) b) 32.5 (20 + 12.5)	100 / 400	n.a.	Safener: formulated product contains 111.1 g/kg isoxadifen ethyl (max. 15 g/ha) Adjuvant: application with 0.2% a non-ionic surfactant (ex. DPX-KG691) Split application: <del>2x 67.5-g</del> product/ha or 85 + 50 g product/ha	A
16	AT	Maize (ZEAMX) (silage and grain)	F	Annual monocotyledonous weeds ( <del>TTTMS</del> 3ANMNT), Annual dicotyledonous weeds ( <del>TTTDS</del> 3ANDIT), Perennial grass weeds ( <del>GGGPE</del> 3PEGWT)	Hydraulic sprayer overall	BBCH 11 to BBCH 18 Spring April-July	a) 2 b) 2	7	a) 0.0675 b) 0.135	a) 16.25 (10 + 6.25) b) 32.5 (20 + 12.5)	100 / 400	n.a.	Safener: formulated product contains 111.1 g/kg isoxadifen ethyl (max. 15 g/ha) Adjuvant: application with 0.2% a non-ionic surfactant (ex. KG691) Split application: 2x 67.5 g product/ha	A

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Use- No.	Member state(s)	Crop and/ or situation  (crop destination/ purpose of crop)	F, Fn, Fpn G, Gn, Gpn or I*	Pests or Group of pests controlled  (additionally: developmental stages of the pest or pest group)	Application				Application rate			PHI (days)	Remarks:  e.g. g safener/synergist per ha	zRMS Conclusion (efficacy)
					Method/ Kind	Timing/ Growth stage of crop & season	Max. number a) per use b) per crop/ season	Min. interval between applications (days)	kg product/ ha a) max. rate per appl. b) max. total rate per crop/season	g a.s./ha <sup>a</sup> a) max. rate per appl. b) max. total rate per crop/season	Water L/ha  min/ max			
17	BE	Maize (ZEAMX)	F	Annual monocotyledonous weeds (TTTMS), Annual dicotyledonous weeds (TTTDS), Perennial grass weeds (GGGPE)	Hydraulic sprayer overall	BBCH 11 to BBCH 18 Spring April-June	a) 2 b) 2	7	a) 0.0675 b) 0.135	a) 16.25 (10 + 6.25) b) 32.5 (20 + 12.5)	150 / 400	n.a.	Safener: formulated product contains 111.1 g/kg isoxadifen ethyl (max. 15 g/ha) Adjuvant: application with max. 0.2% a non-ionic surfactant (ex. DPX-KG691) or vegetable oil Split application: 2x 67.5 g product/ha	A
18	CZ	Maize (ZEAMX)	F	Annual monocotyledonous weeds (TTTMS), Annual dicotyledonous weeds (TTTDS), Perennial grass weeds (GGGPE)	Hydraulic sprayer overall	BBCH 11 to BBCH 18 Spring March-July	a) 2 b) 2	7	a) 0.0675 b) 0.135	a) 16.25 (10 + 6.25) b) 32.5 (20 + 12.5)	100 / 400	n.a.	Safener: formulated product contains 111.1 g/kg isoxadifen ethyl (max. 15 g/ha) Adjuvant: application with 0.2% a non-ionic surfactant (ex. DPX-KG691) or vegetable oil Split application: 2x 67.5 g product/ha	A
19	CZ	Maize (ZEAMX) (silage and grain)	F	Annual monocotyledonous weeds (TTTMS), Annual dicotyledonous weeds (TTTDS), Perennial grass weeds (GGGPE)	Hydraulic sprayer overall	BBCH 11 to BBCH 18 Spring March-July	a) 2 b) 2	7	a) 0.085 b) 0.135	a) 20.46 (12.59 + 7.87) b) 32.5 (20 + 12.5)	100 / 400	n.a.	Safener: formulated product contains 111.1 g/kg isoxadifen ethyl (max. 15 g/ha) Adjuvant: application with 0.2% a non-ionic surfactant (ex. KG691) or vegetable oil Split application: 85 + 50 g product/ha	A

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Use- No.	Member state(s)	Crop and/ or situation  (crop destination/ purpose of crop)	F, Fn, Fpn G, Gn, Gpn or I*	Pests or Group of pests controlled  (additionally: developmental stages of the pest or pest group)	Application				Application rate			PHI (days)	Remarks:  e.g. g safener/synergist per ha	zRMS Conclusion (efficacy)
					Method/ Kind	Timing/ Growth stage of crop & season	Max. number a) per use b) per crop/ season	Min. interval between applications (days)	kg product/ ha a) max. rate per appl. b) max. total rate per crop/season	g a.s./ha <sup>a</sup> a) max. rate per appl. b) max. total rate per crop/season	Water L/ha  min/ max			
20	DE	Maize (ZEAMX)	F	Annual monocotyledonous weeds (TTTMS), Annual dicotyledonous weeds (TTTDS), <small>Perennial-grass weeds (GGGPE)</small> <b>AGRRE</b>	Hydraulic sprayer overall	BBCH 11 to BBCH 18 Spring April-July	a) 2 b) 2	7	a) 0.0675 b) 0.135	a) 16.25 (10 + 6.25) b) 32.5 (20 + 12.5)	100 / 400	n.a.	Safener: formulated product contains 111.1 g/kg isoxadifen ethyl (max. 15 g/ha) Adjuvant: application with 0.2% a non-ionic surfactant (ex. DPX-KG691) Split application: 2x 67.5 g product/ha	A
21	DE	Maize (ZEAMX)	F	Annual monocotyledonous weeds (TTTMS), Annual dicotyledonous weeds (TTTDS), <small>Perennial-grass weeds (GGGPE)</small> <b>AGRRE</b>	Hydraulic sprayer overall	BBCH 11 to BBCH 18 Spring April-July	a) 2 b) 2	7	a) 0.085 b) 0.135	a) 20.46 (12.59 + 7.87) b) 32.5 (20 + 12.5)	100 / 400	n.a.	Safener: formulated product contains 111.1 g/kg isoxadifen ethyl (max. 15 g/ha) Adjuvant: application with 0.2% a non-ionic surfactant (ex. DPX-KG691) Split application: 85 + 50 g product/ha	A
22	HU	Maize (ZEAMX)	F	Annual monocotyledonous weeds (TTTMS), Annual dicotyledonous weeds (TTTDS), Perennial grass weeds (GGGPE)	Hydraulic sprayer overall	BBCH 11 to BBCH 18 Spring March-July	a) 2 b) 2	7	a) 0.0675 b) 0.135	a) 16.25 (10 + 6.25) b) 32.5 (20 + 12.5)	100 / 400	n.a.	Safener: formulated product contains 111.1 g/kg isoxadifen ethyl (max. 15 g/ha) Adjuvant: application with max. 0.2% a non-ionic surfactant (ex. DPX-KG691) or vegetable oil Split application: 2x 67.5 g product/ha	A

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Use- No.	Member state(s)	Crop and/ or situation  (crop destination/ purpose of crop)	F, Fn, Fpn G, Gn, Gpn or I*	Pests or Group of pests controlled  (additionally: developmental stages of the pest or pest group)	Application				Application rate			PHI (days)	Remarks:  e.g. g safener/synergist per ha	zRMS Conclusion (efficacy)
					Method/ Kind	Timing/ Growth stage of crop & season	Max. number a) per use b) per crop/ season	Min. interval between applications (days)	kg product/ ha a) max. rate per appl. b) max. total rate per crop/season	g a.s./ha <sup>a</sup> a) max. rate per appl. b) max. total rate per crop/season	Water L/ha  min/ max			
23	NL	Maize (ZEAMX)	F	Annual monocotyledonous weeds (TTTMS), Annual dicotyledonous weeds (TTTDS), Perennial grass weeds (GGGPE) <b>AGRRE, ECHCG, CHEAL, CHEPO</b>	Hydraulic sprayer overall	BBCH 11 to BBCH 18 Spring April-June	a) 2 b) 2	7	a) 0.0675 b) 0.135	a) 16.25 (10 + 6.25) b) 32.5 (20 + 12.5)	150 / 400	n.a.	Safener: formulated product contains 111.1 g/kg isoxadifen ethyl (max. 15 g/ha) Adjuvant: application with max. 0.2% a non-ionic surfactant (ex. DPX-KG691) or vegetable oil Split application: 2x 67.5 g product/ha	A
24	LU	Maize (ZEAMX)	F	Annual monocotyledonous weeds (TTTMS), Annual dicotyledonous weeds (TTTDS), Perennial grass weeds (GGGPE)	Hydraulic sprayer overall	BBCH 11 to BBCH 18 Spring April-June	a) 2 b) 2	7	a) 0.0675 b) 0.135	a) 16.25 (10 + 6.25) b) 32.5 (20 + 12.5)	150 / 400	n.a.	Safener: formulated product contains 111.1 g/kg isoxadifen ethyl (max. 15 g/ha) Adjuvant: application with max. 0.2% a non-ionic surfactant (ex. KG691) or vegetable oil Split application: 2x 67.5 g product/ha	A
25	PL	Maize (ZEAMX)	F	Annual monocotyledonous weeds (TTTMS), Annual dicotyledonous weeds (TTTDS), Perennial grass weeds (GGGPE) <i>Echinochloa crus-galli</i> (ECHCG)	Hydraulic sprayer overall	BBCH 11 to BBCH 18 Spring April-June	a) 2 b) 2	7	a) 0.0675 b) 0.135	a) 16.25 (10 + 6.25) b) 32.5 (20 + 12.5)	100 / 400	n.a.	Safener: formulated product contains 111.1 g/kg isoxadifen ethyl (max. 15 g/ha) Adjuvant: application with max. 0.2% a non-ionic surfactant (ex. DPX-KG691) or vegetable oil Split application: 2x 67.5 g product/ha	A

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Use- No.	Member state(s)	Crop and/ or situation  (crop destination/ purpose of crop)	F, Fn, Fpn G, Gn, Gpn or I*	Pests or Group of pests controlled  (additionally: developmental stages of the pest or pest group)	Application				Application rate			PHI (days)	Remarks:  e.g. g safener/synergist per ha	zRMS Conclusion (efficacy)
					Method/ Kind	Timing/ Growth stage of crop & season	Max. number a) per use b) per crop/ season	Min. interval between applications (days)	kg product/ ha a) max. rate per appl. b) max. total rate per crop/season	g a.s./ha <sup>a</sup> a) max. rate per appl. b) max. total rate per crop/season	Water L/ha  min/ max			
26	RO	Maize (ZEAMX)	F	Annual monocotyledonous weeds (TTTMS), Annual dicotyledonous weeds (TTTDS), Perennial grass weeds (GGGPE)	Hydraulic sprayer overall	BBCH 11 to BBCH 18 Spring April-June	a) 2 b) 2	7	a) 0.0675 b) 0.135	a) 16.25 (10 + 6.25) b) 32.5 (20 + 12.5)	100 / 400	n.a.	Safener: formulated product contains 111.1 g/kg isoxadifen ethyl (max. 15 g/ha) Adjuvant: application with max. 0.2% a non-ionic surfactant (ex. DPX-KG691) or vegetable oil Split application: 2x 67.5 g product/ha	A
27	SK	Maize (ZEAMX)	F	Annual monocotyledonous weeds (TTTMS), Annual dicotyledonous weeds (TTTDS), Perennial grass weeds (GGGPE)	Hydraulic sprayer overall	BBCH 11 to BBCH 18 Spring March-July	a) 2 b) 2	7	a) 0.0675 b) 0.135	a) 16.25 (10 + 6.25) b) 32.5 (20 + 12.5)	100 / 400	n.a.	Safener: formulated product contains 111.1 g/kg isoxadifen ethyl (max. 15 g/ha) Adjuvant: application with 0.2% a non-ionic surfactant (ex. DPX-KG691) or vegetable oil Split application: 2x 67.5 g product/ha	A

\* F: professional field use, Fn: non-professional field use, Fpn: professional and non-professional field use, G: professional greenhouse use, Gn: non-professional greenhouse use, Gpn: professional and non-professional greenhouse use, I: indoor application

a Dose expressed as total g active substance (g rimsulfuron + g thifensulfuron methyl).

b n.a. = not applicable

Column 15: zRMS conclusion.

A	Acceptable
R	Acceptable with further restriction
C	To be confirmed by CMS
N	Not acceptable/ evaluation not possible

## 3.2 Efficacy data (KCP 6)

### Introduction

This biology dossier is prepared to comply with article Articles 33-39 of Regulation (EC) No. 1107/2009 of the European Parliament and of the Council for product GF-3969. The new product GF-3969 contains the active substances rimsulfuron (DuPont coded as DPX-E9636 25SG; 20 g a.s./ha), and thifensulfuron methyl (DuPont coded as DPX-M6316 50SG; 12.5 g a.s./ha) in the Central regulatory zone. GF-3969 is a non-segregating blend of a water dispersible granule (WG) and contains 148.15 g/kg rimsulfuron and 92.6 g/kg thifensulfuron methyl as well as a concentration of 111.1 g/kg isoxadifen-ethyl (safener, max 15 g a.s./ha) and a surfactant (non-ionic or vegetable oil).

The zonal GAP envelope for CEU countries foresees the application of 135 g fp/ha GF-3969 (32.5 g a.s./ha + 15 g isoxadifen ethyl) for an efficient control of annual monocotyledonous weeds, annual dicotyledonous weeds, and perennial grass weeds in maize. The developmental stage at application should be between BBCH 11-18 of the maize plant. GF-3969 contains isoxadifen (max 15 g a.s./ha) as safener and needs to be applied with a surfactant (non-ionic or vegetable oil). Certain countries (BE, HU, NL, LU, RO, and SK) apply for a dose range, which is why 23.5 g fp/ha - 67.5 g fp/ha are presented within the efficacy section.

Furthermore, GF-3969 can be applied as splitting application in 2 times 50:50 of the full dose that corresponds to 67.5 g fp/ha GF-3969 per application for countries like AT, BE, CZ, DE, HU, NL, LU, PL, RO, SK, or as 60:40 63:37 (85 g fp/ha first application, 50 g fp/ha second application) for AT, CZ and DE.

**Table 3.2-1: Overview of countries acting as zRMS and cMS**

	Country
zRMS	Poland
	Austria
cMS	Belgium
	Czech Republic
	Germany
	Hungary
	Ireland
	Netherlands
	Luxemburg
	Romania
	Slovakia
	United Kingdom

### Description of active substances

#### Rimsulfuron

Rimsulfuron was included into Annex I of Council Directive 91/414/EEC by Commission Directive 2006/39/EC of 12 April 2006. Commission Implementing Regulation (EU) No. 540/2011 of May 2011 established the list of active substances approved under Regulation 1107/2009, which replaced Directive 91/414/EEC. The SANCO report for rimsulfuron (SANCO/10528/2005 rev 2, 27 January 2006) is considered to provide the relevant review information or a reference to where such information can be found.

Consideration of active substances for Annex I inclusion does not include an evaluation of efficacy. Therefore, there are no concerns to address arising from the inclusion directive of rimsulfuron relating to efficacy.

Unless specifically indicated, all reports in this section are submitted to address mandatory data requirements for the authorisation of plant protection products.

### Thifensulfuron methyl

The active substance thifensulfuron methyl was included into Annex I of Directive 91/414/EEC by the Commission Directive 2001/99/EC, replaced by Regulation (EU) No. 540/211 (Nr 26), as amended by Regulation (EU) No. 2015/1885, for the implementation of Regulation (EC) No 1107/2009.

The active substance thifensulfuron methyl was reviewed in the European Union as per Commission regulation (EU) No. 1141/2010 of 07 December 2010. The renewal dossier was submitted in August 2012 to the United Kingdom and Austria acting as Rapporteur Member State and Co-Rapporteur Member State. The final Assessment Report was issued in March 2015. The approval renewal of thifensulfuron methyl was published in Regulation (EU) 2016/1424 with the date of application 1 November 2016.

The Review Report (SANTE/10150/2016) and the EFSA Conclusion on the Peer Review of the Pesticide Risk Assessment of thifensulfuron methyl (EFSA Journal 2015; 13(7):4201) are considered to provide the relevant review information or a reference to where such information can be found.

There is no particular point for Member States in their decision making according to the Uniform Principles to pay attention to with regards to the efficacy.

Appendix 1 of this document contains the list of references included in this document for support of the evaluation.

### Mode of action

Rimsulfuron and thifensulfuron methyl belong to the sulfonylurea herbicide family. Sulfonylurea herbicides are highly specific inhibitors of the enzyme acetolactate synthase (ALS) (single site of action). This enzyme is involved in the biosynthesis of the branched chain (essential) amino acids, valine, leucine, and isoleucine<sup>1 2</sup>. The inhibition of the ALS enzyme results in the rapid cessation of plant cell division and growth. Symptoms such as chlorosis usually appear a few days after treatment but susceptible weeds can take up to four weeks to die depending on growing conditions. During this time, the affected weeds do not take up any water or nutrients from the soil. Maize plants are tolerant to rimsulfuron and thifensulfuron methyl because they can rapidly metabolise them to compounds that are inactive on the ALS enzyme.

Translocation of rimsulfuron and thifensulfuron methyl is rapid, occurring in both xylem and phloem. Thifensulfuron methyl and rimsulfuron are absorbed by leaves and roots and are distributed fast in the whole plant.

**Table 3.2-2: Details of the active substances as contained in GF-3969**

Active substance	Rimsulfuron	Thifensulfuron methyl
Concentration (Unit: g/kg or g/L...)	148.15 g/kg	92.6 g/kg
Chemical group	Sulfonylurea	Sulfonylurea
Mode of action	Inhibition of acetolactate synthase (ALS)	Inhibition of acetolactate synthase (ALS)

<sup>1</sup> Ray T.B., 1984 – The mode of action of chlorsulfuron. Inhibition of valine and isoleucine biosynthesis in plants. *Plant Physiol.*, 77, 481-482.

<sup>2</sup> Scheel D, and Casida J.E., 1985 – Sulfonylurea herbicides: Growth inhibition in soybean cell suspension cultures and in bacteria correlated with block in biosynthesis of valine, leucine and isoleucine. *Pestic. Biochem. Physiol.*, 23, 398-412.

Active substance	Rimsulfuron	Thifensulfuron methyl
Biological action	Post-emergence herbicide, absorbed by foliage and roots and translocated	post-emergence herbicide, absorbed by foliage and roots and translocated

### Description of the plant protection product

GF-3969 is formulated as water dispersible granule (WG) and contains the active substances as: 148.15 g/kg rimsulfuron and 92.6 g/kg thifensulfuron methyl as well as a concentration of 111.1 g/kg isoxadifen-ethyl (safener, max 15 g a.s./ha) and a surfactant (non-ionic or vegetable oil).

**Table 3.2-3: Simplified table of requested uses for GF-3969**

Uses		Member State	Requested rate(s)	Comments / Other relevant details on GAPs
Crop(s)	Target(s)			
Maize (BBCH11-18)	Annual monocotyledonous weeds (TTTMS), Annual dicotyledonous weeds (TTTDS), Perennial grass weeds (GGGPE)	AT, BE, DE, CZ, HU, IE, NL, LU, PL, RO, SK, UK	<ol style="list-style-type: none"> <li>1) Single application of 135 g fp/ha</li> <li>2) dose range between 67.5 and 135 g fp/ha</li> <li>3) split application without exceeding the total maximum rate of 135 g product/ha</li> </ol>	Safener: formulated product contains 111.1 g/kg isoxadifen ethyl (max. 15 g/ha) Adjuvant: application with max. 0.2% non-ionic surfactant or vegetable oil.

Further details are in the table “All intended uses” in Part B - Section 0.

### Rainfastness

GF-3969 is considered to be “rainfast” two hours after postemergence application.

### Description of the target pests

**Table 3.2-4: Glossary of pests mentioned in the dossier.**

EPPO code	Scientific name
ABUTH	<i>Abutilon theophrasti</i>
AGRRE	<i>Elymus repens</i>
AMALI	<i>Amaranthus blitum</i>
AMARE	<i>Amaranthus retroflexus</i>
AMBEL	<i>Ambrosia artemisiifolia</i>
ATXHO	<i>Atriplex hortensis</i>
BRSNN	<i>Brassica napus</i>
BRSNW	<i>Brassica napus</i>
CAPBP	<i>Capsella bursa-pastoris</i>
CHEAL	<i>Chenopodium album</i>
CHEHG	<i>Chenopodium gigantospermum</i>
CHEPO	<i>Chenopodium polyspermum</i>
CIRAR	<i>Cirsium arvense</i>
DATST	<i>Datura stramonium</i>
DIGIS	<i>Digitaria ischaemum</i>
DIGSA	<i>Digitaria sanguinalis</i>
ECHCG	<i>Echinochloa crus-galli</i>
ECGCH	<i>Echinopogon cheelii</i>
EROCI	<i>Erodium cicutarium</i>
FUMOF	<i>Fumaria officinalis</i>
GAETE	<i>Galeopsis tetrahit</i>

EPPO code	Scientific name
GALAP	<i>Gallium apparine</i>
GASCI	<i>Galinsoga quadriradiata</i>
GASPA	<i>Galinsoga parviflora</i>
GERPU	<i>Geranium pusillum</i>
HELAN	<i>Helianthus annuus</i>
HIBTR	<i>Hibiscus trionum</i>
LAMPU	<i>Lamium purpureum</i>
MATCH	<i>Matricaria chamomilla</i>
MATSS	<i>Matricaria sp.</i>
MATIN	<i>Tripleurospermum inodorum</i>
MERAN	<i>Mercurialis annua</i>
PANDI	<i>Panicum dichotomiflorum</i>
PANVI	<i>Panicum virgatum</i>
POAAN	<i>Poa annua</i>
POLAV	<i>Polygonum aviculare</i>
POLCO	<i>Polygonum convolvulus</i>
POLLA	<i>Polygonum lapathifolia</i>
POLPE	<i>Polygonum persicaria</i>
POROL	<i>Portulaca oleracea</i>
RAPRA	<i>Raphanus raphanistrum</i>
SETPU	<i>Setaria pumilum</i>
SETVI	<i>Setaria viridis</i>
SOLNI	<i>Solanum nigrum</i>
SONAR	<i>Sonchus arvensis</i>
SORHA	<i>Sorghum halepensis</i>
SPRAR	<i>Spergula arvensis</i>
STAPA	<i>Stachys palustris</i>
STEME	<i>Stellaria media</i>
THLAR	<i>Thlaspi arvense</i>
URTUR	<i>Urtica urens</i>
VERPE	<i>Veronica persicaria</i>
VIOAR	<i>Viola arvense</i>
XANST	<i>Xanthium strumarium</i>

GF-3969 is intended to be applied in maize. Maize is a major crop throughout the Central registration zone. Accordingly, number of trials per EPPO zones were conducted under GEP.

**Table 3.2-5: Major/ minor status of intended uses (for all cMS and zRMS).**

Crop and/or situation	Crop status		Pests or group of pests controlled	Pest status	
	Major	minor		Major	minor
Maize (ZEAMX) - field grain and silage	AT, BE, DE, CZ/SK, HU, IE, NL, LU, RO, PL, UK		Annual and perennial grass weeds	AT, BE, DE, CZ/SK, HU, IE, NL, LU, RO, PL, UK	-
			Annual broadleaf weeds	AT, BE, DE, CZ/SK, HU, IE, NL, LU, RO, PL, UK	-

### Compliance with the Uniform Principles

Data to support the label claims, and which are summarized in this biological dossier, were generated in trials carried out by DuPont or contract companies which follow the EPPO standards and are officially recognized by the competent authorities to carry out field registration trials in accordance with the

principles of Good Experimental Practice (GEP) and following the published EPPO guidelines standards, PP 1/50 (Weeds in maize), PP 1/152 (Design and analysis of efficacy evaluation trials), PP 1/135 (Phytotoxic assessment), PP 1/181 (Conduct and reporting of efficacy evaluation trials including good experimental practice), PP 1/214 (Principles of acceptable efficacy) and PP 1/225 (Minimum effective dose).

The confirmation of trial conductance by officially recognized organisations under GEP is available in the material and method chapter of the efficacy section.

### Information on trials submitted (3.1 Efficacy data)

A total of 37 trials were conducted across various countries and years to support the different chapters of this biological assessment dossier. Trial details are revealed in the upcoming tables.

Applications were done between BBCH 11 and BBCH 18 of the maize using randomized complete block design, 4 replicates, plot sizes between 15 and 30 m<sup>2</sup> in various commercial maize hybrids between 2017 and 2018. Thereby, multiple target weeds in densities >5 individuals per m<sup>2</sup> were assessed until ~50 days after the treatment. Usually the final assessment was taken into consideration and is presented in the upcoming section(s). Trials were carried out by contract companies which follow the EPPO standards and are officially recognized by the competent authorities to carry out field registration trials in accordance with the principles of Good Experimental Practice (GEP) and following the published EPPO guidelines standards, PP 1/50 (Weeds in maize), PP 1/152 (Design and analysis of efficacy evaluation trials), PP 1/135 (Phytotoxic assessment), PP 1/181 (Conduct and reporting of efficacy evaluation trials including good experimental practice), PP 1/214 (Principles of acceptable efficacy) and PP 1/225 (Minimum effective dose).

**Table 3.2-6: Presentation of trials (efficacy trials, preliminary trials.)**

Targets	EPPO Zone	Country	2017	2018	Type of Trial	Total EPPO Zone
Annual monocotyledonous weeds (TTTMS), Annual dicotyledonous weeds (TTTDS), Perennial grass weeds (GGGPE) in post-emergence situations in maize.	Maritime	Austria	1	1	P, MED, E	19
		Belgium	2	3	P, MED, E	
		Czech Republic	2	2	P, MED, E	
		Germany	3	3	P, MED, E	
		Netherlands	1		P, MED, E	
		United Kingdom		1	P, MED, E	
	<b>Maritime Total</b>		<b>9</b>	<b>10</b>		
	North East	Poland	4	4	P, MED, E	8
	<b>North East Total</b>		<b>4</b>	<b>4</b>		
	South East	Hungary	1	3	P, MED, E	10
		Romania	2	2	P, MED, E	
		Slovakia	1	1	P, MED, E	
	<b>South East Total</b>		<b>4</b>	<b>6</b>		

**Table 3.2-7: Presentation of reference standards used in trials (efficacy trials, preliminary trials)**

Reference (trademark)	Form. Type	Form. concentration	Active substance	Application timing	Rate used in reported trials (g a.s./ha)	Rate used in reported trials (L or kg f.p./ha)
Equip™ ultra	SC	22.5 g/L 22.5 g/L	Foramsulfuron Isoxadifen-ethyl	Post-emergence	120(N)*	2.67 L/ha
Laudis®	OD	44 g/L 22 g/L	Tembotrione Isoxadifen-ethyl	Post-emergence	148.5(N)	2.25 L/ha

\*90 g (N) as/ha in CZF-18-141, CZI-18-141, SKF-18-141

**Figure 3-1: Location map of the 37 efficacy trials (color grouping per country)**



This map was created using trial location details, <https://de.batchgeo.com/> and google maps.

### 3.2.1 Preliminary tests (KCP 6.1)

To address the preliminary section, a total of 37 field trials were conducted and summarized in this Section. To justify each of the different actives, single products were applied between BBCH 11 and BBCH 18 using randomized complete block design, 4 replicates, plot sizes between 15 and 30 m<sup>2</sup> in various commercial maize hybrids between 2017 and 2018 (Table 3.2-8). Thereby, multiple target weeds in densities >5 individuals per m<sup>2</sup> were assessed until ~50 days after the treatment. Usually the final assessment was taken into consideration and is presented in the upcoming section(s). Trials were carried out by contract companies which follow the EPPO standards and are officially recognized by the competent authorities to carry out field registration trials in accordance with the principles of Good Experimental Practice (GEP) and following the published EPPO guidelines standards, PP 1/50 (Weeds in maize), PP 1/152 (Design and analysis of efficacy evaluation trials), PP 1/135 (Phytotoxic assessment), PP 1/181 (Conduct and reporting of efficacy evaluation trials including good experimental practice), PP 1/214 (Principles of acceptable efficacy) and PP 1/225 (Minimum effective dose).

In parallel of the field trial program, in-vivo studies under control conditions have been carried out to evaluate the efficacy of rimsulfuron and thifensulfuron methyl as contained in GF-3969 for the control of broadleaf and grass weeds in corn. All these bio assays have been managed under growth chambers

internally at the DuPont European Research & Development Center and contracted out to IdentXX GmbH and the University of Hohenheim<sup>3</sup>.

#### Active justification:

The necessity of rimsulfuron is clearly demonstrated by an efficient grass control such as for AGRRE (85%), DIGSA (82%), ECHCG (94%), SETVI (87%) and SORHA (93%, see Table 3.2-8).

The value of thifensulfuron methyl at 12.5 g a.s./ha can clearly be demonstrated by the efficient control of major broad leaf weeds in maize such as CHEAL (95%), CHEPO (94%), DATST (81%), and the *Polygonum species* (POLCO, POLLA & POLPE at 81%, 98% and 87%, respectively – see Table 3.2-9).

According to the presented field trial results, GF-3969 provided better control than the single active substance products against AMBEL (89%), HELAN (81%) and HIBTR (96%).

In addition to field results, growth chamber analyses as presented in Table 3.2-10 and Table 3.2-11 demonstrate the dose response for each of the active substances as contained in GF-3969, hence justifying the selected ratio of actives within the product to achieve the optimum efficacy of the final formulated product. Results confirm that the doses (i.e.: the ratio), that most effectively control major weeds in maize, are those proposed on the final GF-3969 formulation. For rimsulfuron, 20 g a.s./ha are required to provide sufficient control on DIGSA, SETVE and SETVI. For thifensulfuron methyl, 12.5 g a.s./ha are required to reach sufficient efficacy against ABUTH, CHEAL, POLAV, POROL and XANST. Statistical differences can be seen in report PEH-18-101 (3).

#### Safener justification - efficacy

According to Table 3.2-12, GF-3969 with safener provided equivalent control compared to GF-3969 without safener against all major target weeds. Therefore, it is concluded that the safener isoxadifen ethyl did not significantly reduce the % control compared to the tank mix of GF-3969 without isoxadifen ethyl (safener). Moreover, it can already be mentioned that isoxadifen protects the crop from injury that could lead otherwise to yield effects and/or damaged maize crops. The protection of the crop is discussed and presented in the selectivity section of this report.

#### Surfactant justification

The benefit of adding a non-ionic surfactant to GF-3969 can clearly be seen on selected major target weeds as presented in Table 3.2 13.

### Summary and conclusions on the preliminary trials

Overall it was demonstrated that the inclusion of rimsulfuron as contained in GF-3969 was clearly justified by grass control, whereas thifensulfuron methyl provided broad leaf weed control in maize. A non-ionic surfactant clearly increased the efficacy of GF-3969 against all major target weeds in maize whereas the inclusion of isoxadifen did not affect efficacy at all. The ratio for both actives as contained within GF-3969 were chosen to provide highest and most reliable control to the farmer against all major target weeds in maize under various climatic conditions.

---

<sup>3</sup> Notter JS (2018): Growth chamber studies to justify each rate of active ingredients in GF-3969 (rimsulfuron + thifensulfuron + isoxadifen) on major corn weeds (2017 & 2018 studies). DuPont ERDC PEH-18-101.

**Table 3.2-8: Efficacy of each single active substance as contained in GF-3969 against grasses (Central regulatory zone summary, field trials)**

Grasses	Number of trials	Infestation of the untreated control (unit)		%Control					
				GF-3969 at N rate		rimsulfuron+isoxadifen+surfactant		Thifensulfuron-methyl+isoxadifen+surfactant	
				[E9636+M6316+X4145+KG691] [20 gA/ha+12.5 gA/ha+15 gA/ha+0.2% v/v]		[E9636+X4145+KG691] [20 gA/ha+15 gA/ha+0.2% v/v]		[M6316+X4145+KG691] [12.5 gA/ha+15 gA/ha+0.2% v/v]	
				Mean	Min-Max	Mean	Min-Max	Mean	Min-Max
AGRRE	8	28.4	5-101.5	89.3	73.8-98.3	89	78.8-96.8	22.3	0-76.3
DIGSA	6	59.8	10-160	81.3	48.8-99.5	82	66.3-99.8	3.8	0-12.5
ECHCG	<del>25</del> 26	31.7	5-129.5	97.2	72.8-100	<del>94.2</del> 94.4	42.5-100	17.4	0-97.8
PANDI	1	8.5	-	90	-	99	-	0	-
PANVI	1	19	-	95	-	95	-	0	-
POAAN	3	7.3	5-10	97.5	92.5-100	95.8	87.5-100	59.2	15-100
SETPF	1	7.1	-	98.8	-	98	-	79.8	-
SETPU	1	22.5	-	100	-	100	-	0	-
SETVI	4	12.8	4.5-17.6	89.1	57.5-100	86.6	47.5-100	13.8	0-35
SORHA	3	12	6-24	92.8	86.8-97.5	93	88.5-96.3	5.8	0-10

**Table 3.2-9: Efficacy of each single active substance as contained in GF-3969 against broad leaf weeds (Central regulatory zone summary, field trials)**

Target	Number of trials	Infestation of the untreated control (unit)		%Control						
				GF-3969 at N rate		rimsulfuron+isoxadifen+surfactant		Thifensulfuron-methyl+isoxadifen+surfactant		
				[E9636+M6316+X4145+KG691] [20 gA/ha+12.5 gA/ha+15 gA/ha+0.2% v/v]		[E9636+X4145+KG691] [20 gA/ha+15 gA/ha+0.2% v/v]		[M6316+X4145+KG691] [12.5 gA/ha+15 gA/ha+0.2% v/v]		
				Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean
BLW	ABUTH	3	36.7	4.5-100	75	65-87.5	87.4	82.3-90	27.1	0-81.3
	AMALI	1	5	-	100	-	97.3	-	99	-
	AMARE	10	32.8	4.5-230	98.6	95-100	97.7	92.5-100	97.7	90-100
	AMBEL	6	27.1	10-48.5	89.4	80-100	34.6	0-73.8	58	26.3-94
	ATXHO	1	7	-	97.8	-	65	-	95	-
	BRSNN	1	5.5	-	100	-	100	-	100	-
	BRSNW	1	5	-	98.8	-	100	-	91.3	-
	CHEAL	27	21.6	5.5-83.5	95.4	77.5-100	<del>51.8</del> 53.7	0-100	95.1	80-100
	CHEHG	1	6	-	99.3	-	0	-	99.3	-
	CHEPO	4	20.1	5-56.8	93.9	80-100	67	15-100	93.6	83.8-99.8
	CIRAR	2	6	5-7	85.6	81.3-90	77.5	75-80	55	52.5-57.5
DATST	6	39.5	6.5-125	67.8	26.3-88	18.3	0-50	80.9	67.5-91.3	

Target	Number of trials	Infestation of the untreated control (unit)		%Control					
				GF-3969 at N rate		rimsulfuron+isoxadifen+surfactant		Thifensulfuron-methyl+isoxadifen+surfactant	
				[E9636+M6316+X4145+KG691] [20 gA/ha+12.5 gA/ha+15 gA/ha+0.2% v/v]		[E9636+X4145+KG691] [20 gA/ha+15 gA/ha+0.2% v/v]		[M6316+X4145+KG691] [12.5 gA/ha+15 gA/ha+0.2% v/v]	
				Mean	Min-Max	Mean	Min-Max	Mean	Min-Max
<del>ECGCH</del>	<del>1</del>	<del>12</del>	<del>-</del>	<del>75</del>	<del>-</del>	<del>80</del>	<del>-</del>	<del>70</del>	<del>-</del>
EROCI	1	5	-	80	-	62.5	-	65	-
FUMOF	1	8	-	92.5	-	87.5	-	70	-
GAETE	1	19.5	-	100	-	100	-	100	-
GALAP	2	6.3	6-6.5	70.6	42.5-98.8	76.3	72.5-80	48.8	12.5-85
GASCI	1	58.3	-	99.5	-	85	-	87.5	-
GASPA	3	27.9	14.5-48	96.7	91.5-100	86.3	75-95	90.4	78.8-97.5
GERPU	2	9.5	7-12	90	80-100	90	80-100	86.3	72.5-100
<b>HELAN</b>	<b>5</b>	<b>5.5</b>	<b>4-7</b>	<b>80.7</b>	<b>30-100</b>	<b>72.7</b>	<b>30-100</b>	<b>50.5</b>	<b>7.5-100</b>
<b>HIBTR</b>	<b>3</b>	<b>18.2</b>	<b>13.6-26</b>	<b>96.3</b>	<b>93.8-100</b>	<b>70</b>	<b>36.3-100</b>	<b>84.2</b>	<b>81.3-88.8</b>
LAMPU	2	10.1	6-14.1	100	100-100	100	100-100	100	100-100
MATCH	2	33.2	30.1-36.3	100	100-100	100	100-100	100	100-100
MATIN	3	6	5-7	98.3	95-100	97	91.3-100	94	85-99.5
MERAN	2	6.5	6.5-6.5	56.9	26.3-87.5	89.4	86.3-92.5	77.5	67.5-87.5
POLAV	2	6.8	6-7.5	100	100-100	47.5	0-95	97.5	95-100
<b>POLCO</b>	<b>10</b>	<b>14.9</b>	<b>4.5-64</b>	<b>86.7</b>	<b>37.5-100</b>	<b>54.4</b>	<b>0-90</b>	<b>80.5</b>	<b>35-97.5</b>
<b>POLLA</b>	<b>3</b>	<b>9.5</b>	<b>5.5-12</b>	<b>99.7</b>	<b>99-100</b>	<b>67.8</b>	<b>45-96</b>	<b>98</b>	<b>95-100</b>
<b>POLPE</b>	<b>6</b>	<b>14.5</b>	<b>4.5-31.7</b>	<b>88.5</b>	<b>60-100</b>	<b>49.1</b>	<b>33-75</b>	<b>87</b>	<b>52.5-100</b>
RAPRA	1	5	-	100	-	100	-	100	-
SOLNI	4	6.2	4.2-10.5	<del>58.1</del> 49.4	37.5-82.5 55.0	<del>56.6</del> 42.2	20.0-56.3 42.5-77.5	<del>55.9</del> 45.6	45-61.3 60.0
SONAR	1	16	-	87.5	-	90	-	83.8	-
SPRAR	1	5	-	100	-	96.3	-	100	-
STAPA	1	11.5	-	80	-	75	-	72.5	-
STEME	<del>3</del> 4	<del>19.2</del> 15.8	<del>8.5-35</del> 5.0-37	100	100-100	<del>100</del> 99.4	<del>100</del> 97.5-100	<del>100</del> 99.4	<del>100</del> 97.5-100
THLAR	2	21.5	17-26	100	100-100	100	100-100	100	100-100
URTUR	1	52.4	-	97.5	-	95	-	85	-
VERPE	5	6.3	5-8.5	80.1	40-99	39	<del>0-10</del> 10-80	74.4	30-99.8
VIOAR	2	29.8	7-52.5	90.6	82.5-98.8	47.5	30-65	84.4	78.8-90

Target	Number of trials	Infestation of the untreated control (unit)		%Control					
				GF-3969 at N rate		rimsulfuron+isoxadifen+surfactant		Thifensulfuron-methyl+isoxadifen+surfactant	
				[E9636+M6316+X4145+KG691] [20 gA/ha+12.5 gA/ha+15 gA/ha+0.2% v/v]		[E9636+X4145+KG691] [20 gA/ha+15 gA/ha+0.2% v/v]		[M6316+X4145+KG691] [12.5 gA/ha+15 gA/ha+0.2% v/v]	
				Mean	Min-Max	Mean	Min-Max	Mean	Min-Max
XANST	2	10.8	6-15.6	97.5	95-100	65.6	31.3-100	86.3	85-87.5

NOTE: E9636 = rimsulfuron, X4145 = isoxadifen-ethyl, M6316= thifensulfuron methyl, KG691= adjuvant, non-ionic surfactant

**Table 3.2-10: Efficacy of Rimsulfuron under controlled conditions (bio assays) at final assessment (28 days after application)**

Target	Number of trials (4 replications)	% control					
		Rimsulfuron 5 g a.s./ha + Isoxadifen 15 g a.s./ha + KG691 0.2%		Rimsulfuron 10 g a.s./ha + Isoxadifen 15 g a.s./ha + KG691 0.2%		Rimsulfuron 20 g a.s./ha + Isoxadifen 15 g a.s./ha + KG691 0.2%	
		Mean	Min. & Max.	Mean	Min. & Max.	Mean	Min. & Max.
DIGSA	1	32	18-47	63	58-73	73	71-80
SETVE	1	78	75-81	91	84-99	94	93-95
SETVI	1	69	55-85	66	56-82	91	83-96

Statistical differences are presented in PEH-18-101 pg.7 ff

**Table 3.2-11: Efficacy of Thifensulfuron under controlled conditions (bio assays) at final assessment (28 days after application)**

Target	Number of trials (4 replications)	% control					
		Thifensulfuron 3 g a.s./ha + Isoxadifen 15 g a.s./ha + KG691 0.2%		Thifensulfuron 6 g a.s./ha + Isoxadifen 15 g a.s./ha + KG691 0.2%		Thifensulfuron 12.5 g a.s./ha + Isoxadifen 15 g a.s./ha + KG691 0.2%	
		Mean	Min. & Max.	Mean	Min. & Max.	Mean	Min. & Max.
ABUTH	1	24	20-30	53	49-60	72	70-74
CHEAL	1	71	68-76	77	74-81	83	81-85
POLAV	1	-	-	97	92-100	99	95-100
POROL	1	-	-	95	92-98	98	98-98

Target	Number of trials (4 replications)	% control					
		Thifensulfuron 3 g a.s./ha + Isoxadifen 15 g a.s./ha + KG691 0.2%		Thifensulfuron 6 g a.s./ha + Isoxadifen 15 g a.s./ha + KG691 0.2%		Thifensulfuron 12.5 g a.s./ha + Isoxadifen 15 g a.s./ha + KG691 0.2%	
		Mean	Min. & Max.	Mean	Min. & Max.	Mean	Min. & Max.
Statistical differences are presented in PEH-18-101 pg.7 ff							

**Table 3.2-12: Efficacy of GF-3969 with & without safener (Central zone summary)**

CENTRAL ZONE								
Target	Number of trials	Infestation of the untreated control (unit)		%Control				
				GF-3969 at N rate		GF-3969 without Isoxadifen		
				[E9636+M6316+X4145+KG691] [20 gA/ha+12.5 gA/ha+15 gA/ha+0.2% v/v]		[E9636+M6316+KG691] [20 gA/ha+12.5 gA/ha+0.2% v/v]		
		Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	
ABUTH	3	36.7	4.5-100	75	65-87.5	89.4	88.3-90	
AMALI	1	5	-	100	-	97	-	
<b>AMARE</b>	<b>10</b>	<b>32.8</b>	<b>4.5-230</b>	<b>98.6</b>	<b>95-100</b>	<b>98.9</b>	<b>97-100</b>	
AMBEL	6	27.1	10-48.5	89.4	80-100	86.2	73.8-98	
ATXHO	1	7	-	97.8	-	93.8	-	
BRSNN	1	5.5	-	100	-	100	-	
BRSNW	1	5	-	98.8	-	100	-	
<b>CHEAL</b>	<b>27</b>	<b>21.6</b>	<b>5.5-83.5</b>	<b>95.4</b>	<b>77.5-100</b>	<b>94.1</b>	<b>66.3-100</b>	
CHEHG	1	6	-	99.3	-	99.5	-	
CHEPO	4	20.1	5-56.8	93.9	80-100	94.6	82.5-100	
CIRAR	2	6	5-7	85.6	81.3-90	45	15-75	
DATST	6	39.5	6.5-125	67.8	26.3-88	64.8	17.5-87.3	
<del>ECGCH</del>	<del>4</del>	<del>12</del>	<del>-</del>	<del>75</del>	<del>-</del>	<del>70</del>	<del>-</del>	
EROCI	1	5	-	80	-	90	-	
FUMOF	1	8	-	92.5	-	76.3	-	
GAETE	1	19.5	-	100	-	90	-	
GALAP	2	6.3	6-6.5	70.6	42.5-98.8	83.1	70-96.3	
GASCI	1	58.3	-	99.5	-	98.3	-	
GASPA	3	27.9	14.5-48	96.7	91.5-100	96.7	90.5-100	
GERPU	2	9.5	7-12	90	80-100	93.8	87.5-100	
HELAN	5	5.5	4-7	80.7	30-100	68	0-100	
HIBTR	3	18.2	13.6-26	96.3	93.8-100	92.1	88.8-93.8	
LAMPU	2	10.1	6-14.1	100	100-100	100	100-100	
MATCH	2	33.2	30.1-36.3	100	100-100	100	100-100	

CENTRAL ZONE								
Target	Number of trials	Infestation of the untreated control (unit)		%Control				
				GF-3969 at N rate		GF-3969 without Isoxadifen		
				[E9636+M6316+X4145+KG691] [20 gA/ha+12.5 gA/ha+15 gA/ha+0.2% v/v]		[E9636+M6316+KG691] [20 gA/ha+12.5 gA/ha+0.2% v/v]		
		Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	
MATIN	3	6	5-7	98.3	95-100	99.9	99.8-100	
MERAN	2	6.5	6.5-6.5	56.9	26.3-87.5	41.3	17.5-65	
POLAV	2	6.8	6-7.5	100	100-100	100	100-100	
<b>POLCO</b>	<b>10</b>	<b>14.9</b>	<b>4.5-64</b>	<b>86.7</b>	<b>37.5-100</b>	<b>87.7</b>	<b>47.5-100</b>	
<b>POLLA</b>	<b>3</b>	<b>9.5</b>	<b>5.5-12</b>	<b>99.7</b>	<b>99-100</b>	<b>98</b>	<b>95-100</b>	
<b>POLPE</b>	<b>6</b>	<b>14.5</b>	<b>4.5-31.7</b>	<b>88.5</b>	<b>60-100</b>	<b>87.4</b>	<b>60-100</b>	
RAPRA	1	5	-	100	-	100	-	
SOLNI	4	6.2	4.2-10.5	<del>58.1</del> 49.4	37.5- <del>82.5</del> 55.0	60.3	52.5-76.3	
SONAR	1	16	-	87.5	-	80	-	
SPRAR	1	5	-	100	-	100	-	
STAPA	1	11.5	-	80	-	80	-	
STEME	3	19.2	8.5-35	100	100-100	100	100-100	
THLAR	2	21.5	17-26	100	100-100	100	100-100	
URTUR	1	52.4	-	97.5	-	100	-	
VERPE	5	6.3	5-8.5	80.1	40-99	70.1	25-95	
VIOAR	2	29.8	7-52.5	90.6	82.5-98.8	88.8	77.5-100	
XANST	2	10.8	6-15.6	97.5	95-100	90	87.5-92.5	
Grasses	<b>AGRRE</b>	<b>8</b>	<b>28.4</b>	<b>5-101.5</b>	<b>89.3</b>	<b>73.8-98.3</b>	<b>88.8</b>	<b>71.3-100</b>
	<b>DIGSA</b>	<b>6</b>	<b>59.8</b>	<b>10-160</b>	<b>81.3</b>	<b>48.8-99.5</b>	<b>80.3</b>	<b>32.5-99.8</b>
	<b>ECHCG</b>	<del>25</del> <b>26</b>	<b>31.7</b>	<b>5-129.5</b>	<b>97.2</b>	<b>72.8-100</b>	<b>96.5</b>	<b>66.3-100</b>
	PANDI	1	8.5	-	90	-	91.3	-
	PANVI	1	19	-	95	-	95	-
	POAAN	3	7.3	5-10	97.5	92.5-100	97.9	93.8-100
	SETPF	1	7.1	-	98.8	-	88	-
	SETPU	1	22.5	-	100	-	100	-
	<b>SETVI</b>	<b>4</b>	<b>12.8</b>	<b>4.5-17.6</b>	<b>89.1</b>	<b>57.5-100</b>	<b>87.4</b>	<b>55-100</b>
<b>SORHA</b>	<b>3</b>	<b>12</b>	<b>6-24</b>	<b>92.8</b>	<b>86.8-97.5</b>	<b>89.8</b>	<b>86.8-94</b>	

NOTE: E9636 = rimsulfuron, X4145 = isoxadifen-ethyl, M6316= thifensulfuron methyl, KG691= adjuvant, non-ionic surfactant

**Table 3.2-13: Efficacy of GF-3969 with & without DPX-KG691 (non-ionic surfactant)**

CENTRAL ZONE								
Target	Number of trials	Infestation of the untreated control (unit)		%Control				
				GF-3969 at N rate		GF-3969 without KG691		
				[E9636+M6316+X4145+KG691] [20 gA/ha+12.5 gA/ha+15 gA/ha+0.2% v/v]		[E9636+M6316+X4145] [20 gA/ha+12.5 gA/ha+15 gA/ha]		
		Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	
BLW	AMARE	10	32.8	4.5-230	98.6	95-100	97.9	93.5-100
	AMBEL	6	27.1	10-48.5	89.4	80-100	65	30-90
	CHEAL	27	21.6	5.5-83.5	95.4	77.5-100	51.1	0-100
	CHEPO	4	20.1	5-56.8	93.9	80-100	75.3	15-99
	DATST	6	39.5	6.5-125	67.8	26.3-88	61.3	37.5-77.5
	HELAN	5	5.5	4-7	80.7	30-100	57.2	7.5-99.8
	HIBTR	3	18.2	13.6-26	96.3	93.8-100	65.4	43.8-81.3
	LAMPU	2	10.1	6-14.1	100	100-100	100	100-100
	MATIN	3	6	5-7	98.3	95-100	74.8	35-99.5
	POLCO	10	14.9	4.5-64	86.7	37.5-100	86.3	47.5-100
	POLLA	3	9.5	5.5-12	99.7	99-100	98	95-100
POLPE	6	14.5	4.5-31.7	88.5	60-100	88.4	55-100	
VERPE	5	6.3	5-8.5	80.1	40-99	72.6	25-100	
Grasses	AGRRE	8	28.4	5-101.5	89.3	73.8-98.3	72.1	0-96
	DIGSA	6	59.8	10-160	81.3	48.8-99.5	64.5	0-92.3
	ECHCG	25 26	31.7	5-129.5	97.2	72.8-100	76.9	0-100
	POAAN	3	7.3	5-10	97.5	92.5-100	94.2	82.5-100
	SETPU	1	22.5	-	100	-	100	-
	SETVI	4	12.8	4.5-17.6	89.1	57.5-100	82.9	57.8-100
SORHA	3	12	6-24	92.8	86.8-97.5	82.3	75-89.5	

NOTE: E9636 = rimsulfuron, X4145 = isoxadifen-ethyl, M6316= thifensulfuron methyl, KG691= adjuvant, non-ionic surfactant

#### Comments of zRMS:

The preliminary tests have been included in the 37 field efficacy trials. To justify each of the different actives and ingredients, single products were tested and compared to GF-3969 in the full dose rate (135 g fp/ha).

The benefit of mix of rimsulfuron with isoxadifen and surfactant was visible in control of almost all target grass weeds: AGRRE (89%), DIGSA (82%), ECHCG (94,4%), PANDI (99%), PANVI (95%), POAAN (95,8%), SETPU (100%), SETVI (86,6%) and SORHA (93%). This actives is also effective in control of broad leaf weeds: ABUTH (87,4%), CIRAR (77,5%), GALAP (76,3%) and HELAN (72,7%) but on the lower level.

The benefit of mix of thifensulfuron methyl with isoxadifen and surfactant was visible in control of most target dicotyledonous weeds: ATHHO (95%), CHEAL (95,1%), CHEHG (99,3%), CHEPO (93,6%), DATST (80,9%), POLAV (97,5%), POLCO (80,5%), POLLA (98%), POLPE (87%), VERPE (74,4%), VIOAR (84,4%) and XANST (86,3%).

The addition of safener isoxadifen-ethyl in GF-3969 caused increase effectiveness of some weed species control: CIRAR (the average efficacy with safener was 85,6% and without safener was 45%), FUMOF (92,5% vs 76,3%), HELAN (80,7% vs 68%), VERPE (80,1% vs 70,1%).

The significant differences have been achieved between objects with and without non-ionic surfactant. The addition of adjuvant caused increase effectiveness of important weed species control in maize: AMBEL (the average efficacy with adjuvant was 89,4% and without adjuvant was 65%), CHEAL (95,4% vs 51,1%), CHEPO (93,9% vs 75,3%), HELAN (80,7% vs 57,2%), HIBTR (96,3% vs 65,4%), MATIN (98,3% vs 74,8%), AGREE (89,3% vs 72,1%), DIGSA (81,3% vs 64,5%) and ECHCG (97,2% vs 76,9%).

The submitted test results show that all ingredients included in GF-3969 are justified. Rimsulfuron is necessity to control of grass weeds, whereas thifensulfuron methyl is effective to control of all major dicotyledonous weeds in maize. The addition of safener isoxadifen-ethyl and a non-ionic surfactant significantly improves the effectiveness of some weed species control.

### 3.2.2 Minimum effective dose tests (KCP 6.2)

37 field trials were established to determine the minimum effective dose of GF-3969 for the control of annual monocotyledonous weeds, annual dicotyledonous weeds and perennial grass weeds in maize. GF-3969 was tested at 67.5 g fp/ha, 101.25 g fp/ha and 135 g fp/ha (target rate) in maize for the control of major target weeds. The rates tested reflect, respectively, 50%, 75% and 100% of the full recommended rate of GF-3969 in accordance with the EPPO standard PP 1/225 'Minimum effective dose'. Reference products to validate the trials were applied according to their respective national rates as presented in Table 3.2-18.

#### Maize, Post-emergence application (BBCH 11-18)

The EPPO guideline PP 1/050(3) was followed in all trials, visual assessments were conducted approximately 2, 4, and 8 weeks after application. The percentage of visual control was estimated on a 0-100 linear scale with: 0% = no control and 100% = plant death. Data were analysed using the Tukey mean comparison test (P=0.05). No statistical analysis was performed on visual assessments (% visual). A minimum of 5 plants per m<sup>2</sup> at the time of application was taken to validate the assessment.

Highest control against major grasses in maize is provided once the maximum claimed dose rate of 135 g fp/ha is applied. Important grasses such as: AGRRE (89%), DIGSA (81%), ECHCG (97%), SETVI (89%) and SORHA (93%) are reliably controlled if the highest dose of GF-3969 is applied (Table 3.2-14). For broad leaf weeds (Table 3.2-15), it is clearly demonstrated that, amongst other dicots, the following major target weeds (with n ≥ 3 trials) clearly benefit from the application of 135 g fp/ha as minimum effective dose rate for GF-3969: AMBEL (89%), CHEAL (95%), CHEPO (94%), GASPA (97-95%), HELAN (81%), HIBTR (96%), MATIN (98%), POLCO (87%), POLPE (89-87%), VERPE (80%) and XANST (98%). It should be mentioned that reducing the dose of GF-3969 to 67.5 g fp/ha still achieved >90% for CHEAL, GASPA and MATIN.

A summary of the dose response results is provided in Table 3.2-14 & Table 3.2-15.

**Table 3.2-14: Minimum effective dose. Efficacy of GF-3969 at 50%, 75% and maximum proposed label rate on major grass weeds in maize.**

Grasses	EPPO and/or Administrative Zone	N° of trials	Infestation of the untreated control (pl/m <sup>2</sup> )		% control with GF-3969											
					GF-3969 at 67.5 g fp/ha		GF-3969 at 101.25 g fp/ha		GF-3969 at 135 g fp/ha							
					[E9636+M6316+X4145+KG691] [10 gA/ha+6.25 gA/ha+7.5 gA/ha+0.2% v/v]		[E9636+M6316+X4145+KG691] [15 gA/ha+9.375 gA/ha+11.255 gA/ha+0.2% v/v]		[E9636+M6316+X4145+KG691] [20 gA/ha+12.5 gA/ha+15 gA/ha+0.2% v/v]							
		Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max							
AGRRE	Maritime	8	29.5	5-118	76.9	45-93.8	85.3	63.8-95.8	89.3	73.8-98.3						
<b>All AGRRE</b>	<b>Central Zone</b>	<b>8</b>	<b>29.5</b>	<b>5-118</b>	<b>76.9</b>	<b>45-93.8</b>	<b>85.3</b>	<b>63.8-95.8</b>	<b>89.3</b>	<b>73.8-98.3</b>						
DIGSA	Maritime	5	66.4	10-150	67.1	37.5-86.3	74.4	41.3-93.8	77.6	48.8-96.8						
DIGSA	South East	1	26.0	-	93.5	-	99.3	-	99.5	-						
<b>All DIGSA</b>	<b>Central Zone</b>	<b>6</b>	<b>59.7</b>	<b>10-150</b>	<b>71.5</b>	<b>37.5-93.5</b>	<b>78.5</b>	<b>41.3-99.3</b>	<b>81.3</b>	<b>48.8-99.5</b>						
ECHCG	Maritime	10	54.3	49.8	104-121	89.6	90.5	71.3-100	91.1	91.9	62.5-100	96.8	97.1	87.3-100		
ECHCG	North East	6	6.1	5-10	88.5	53.8-100	92.1	64.5-100	94.2	72.8-100						
ECHCG	South East	9	19.5	5-75	90.4	77.5-100	95.6	87.5-100	99.2	97.5-100						
<b>All ECHCG</b>	<b>Central Zone</b>	<b>25</b>	<b>26</b>	<b>30.3</b>	<b>29.2</b>	<b>5</b>	<b>4-121</b>	<b>89.6</b>	<b>90.0</b>	<b>53.8-100</b>	<b>93.0</b>	<b>93.2</b>	<b>62.5-100</b>	<b>97.0</b>	<b>97.2</b>	<b>72.8-100</b>
PANDI	South East	1	7.0	-	35.0	-	87.5	-	90.0	-						
All PANDI	Central Zone	1	7.0	-	35.0	-	87.5	-	90.0	-						
PANVI	Maritime	1	19	-	80.0	-	97.5	-	95.0	-						
All PANVI	Central Zone	1	19	-	80.0	-	97.5	-	95.0	-						
POAAN	Maritime	3	7.5	5-10	93	88.8	77.5-100	92	87.5	75-100	98	96.3	92.5-100			
All POAAN	Central Zone	3	7.5	5-10	92.5	88.8	77.5-100	91.7	87.5	75-100	97.5	96.3	92.5-100			
SETPF	North East	1	6.25	-	81.8	-	89.3	-	98.8	-						
All SETPF	Central Zone	1	6.25	-	81.8	-	89.3	-	98.8	-						
SETPU	Maritime	1	25.0	-	96.3	-	100.0	-	100.0	-						
All SETPU	Central Zone	1	25.0	-	96.3	-	100.0	-	100.0	-						
SETVI	Maritime	1	10.0	-	35.0	--	51.3	-	57.5	-						
SETVI	South East	3	12.3	4-16.5	90.8	82.5-100	97.3	93.8-100	99.7	99-100						
<b>All SETVI</b>	<b>Central Zone</b>	<b>4</b>	<b>11.8</b>	<b>4-16.5</b>	<b>76.9</b>	<b>35-100</b>	<b>85.8</b>	<b>51.3-100</b>	<b>89.1</b>	<b>57.5-100</b>						
SORHA	South East	3	12.0	6-24	59.8	0-90	76.3	42.5-93.8	92.8	86.8-97.5						
<b>All SORHA</b>	<b>Central Zone</b>	<b>3</b>	<b>12.0</b>	<b>6-24</b>	<b>59.8</b>	<b>0-90</b>	<b>76.3</b>	<b>42.5-93.8</b>	<b>92.8</b>	<b>86.8-97.5</b>						

NOTE: E9636 = rimsulfuron, X4145 = isoxadifen-ethyl, M6316= thifensulfuron methyl, KG691= adjuvant, non-ionic surfactant

**Table 3.2-15: Minimum effective dose. Efficacy of GF-3969 at 50%, 75% and maximum proposed label rate on dicotyledonous target weeds in maize**

Dicots	EPP0 and/or Administrative Zone	N° of trials	Infestation of the untreated control (pl/m <sup>2</sup> )		% control with GF-3969					
					GF-3969 at 67.5 g fp/ha		GF-3969 at 101.25 g fp/ha		GF-3969 at 135 g fp/ha	
					[E9636+M6316+X4145+KG691] [10 gA/ha+6.25 gA/ha+7.5 gA/ha+0.2% v/v]		[E9636+M6316+X4145+KG691] [15 gA/ha+9.375 gA/ha+11.255 gA/ha+0.2% v/v]		[E9636+M6316+X4145+KG691] [20 gA/ha+12.5 gA/ha+15 gA/ha+0.2% v/v]	
			Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max
ABUTH	Maritime	1	90.0	-	71.3	-	89.0	-	87.5	-
ABUTH	South East	2	4.5	4-5	18.3	1.5-35	35.0	35-35	68.8	65-72.5
All ABUTH	Central Zone	3	33.0	4-90	35.9	1.5-71.3	53.0	35-89	75.0	65-87.5
AMALI	Maritime	1	5.00	-	95.0	-	99.0	-	100.0	-
All AMALI	Central Zone	1	5.00	-	95.0	-	99.0	-	100.0	-
AMARE	Maritime	3	92.3	9-230	99.5	98.5-100	99.7	99-100	99.8	99.3-100
AMARE	North East	6	5.7	4-7	96.7	92.5-99.8	97.8	94.8-99.8	97.8	95-99
AMARE	South East	1	12.5	-	100.0	-	100.0	-	100.0	-
All AMARE	Central Zone	10	32.4	4-230	97.9	92.5-100	98.6	94.8-100	98.6	95-100
AMBEL	South East	6	27	10-48	71.3	57.5-95	82.3	73.8-98	89.4	80-100
<b>All AMBEL</b>	<b>Central Zone</b>	<b>6</b>	<b>26.8</b>	<b>10-48</b>	<b>71.3</b>	<b>57.5-95</b>	<b>82.3</b>	<b>73.8-98</b>	<b>89.4</b>	<b>80-100</b>
ATXHO	Maritime	1	7.0	-	77.5	-	91.3	-	97.8	-
All ATXHO	Central Zone	1	7.0	-	77.5	-	91.3	-	97.8	-
BRSNN	North East	1	5.0	-	100.0	-	100.0	-	100.0	-
All BRSNN	Central Zone	1	5.0	-	100.0	-	100.0	-	100.0	-
BRSNW	Maritime	1	5.0	-	99.5	-	98.8	-	98.8	-
All BRSNW	Central Zone	1	5.0	-	99.5	-	98.8	-	98.8	-
CHEAL	Maritime	14	31.4	9.5-83	94.3	67.5-100	95.5	71.3-100	96.8	77.5-100
CHEAL	North East	8	9.5	5-18	82.4	67.5-95	87.4	72.5-97.5	90.9	77.5-98.5
CHEAL	South East	5	12.4	5-19	94.1	83.8-100	95.9	91.3-100	99.0	96.5-100
<b>All CHEAL</b>	<b>Central Zone</b>	<b>27</b>	<b>21.4</b>	<b>5-83</b>	<b>90.7</b>	<b>67.5-100</b>	<b>93.2</b>	<b>71.3-100</b>	<b>95.4</b>	<b>77.5-100</b>
CHEHG	South East	1	6.0	-	96.5	-	98.5	-	99.3	-
All CHEHG	Central Zone	1	6.0	-	96.5	-	98.5	-	99.3	-
CHEPO	Maritime	4	19.2	5-56.3	84.6	60-98.5	92.1	76.3-98.8	93.9	80-100
<b>All CHEPO</b>	<b>Central Zone</b>	<b>4</b>	<b>19.2</b>	<b>5-56.3</b>	<b>84.6</b>	<b>60-98.5</b>	<b>92.1</b>	<b>76.3-98.8</b>	<b>93.9</b>	<b>80-100</b>
CIRAR	Maritime	1	7.0	-	85.0	-	90.0	-	90.0	-
CIRAR	North East	1	5.0	-	92.5	-	95.0	-	81.3	-
All CIRAR	Central Zone	2	6.0	5-7	88.8	85-92.5	92.5	90-95	85.6	81.3-90
DATST	Maritime	2	71.5	33-110	56.3	45-67.5	68.1	63.8-72.5	68.1	60-76.3
DATST	South East	4	19.0	6-48	64.4	50-81.5	57.9	8.8-84.3	67.7	26.3-88
All DATST	Central Zone	6	36.5	6-110	61.7	45-81.5	61.3	8.8-84.3	67.8	26.3-88
EROCI	Maritime	1	5.0	-	72.5	-	65.0	-	80.0	-
All EROCI	Central Zone	1	5.0	-	72.5	-	65.0	-	80.0	-

Dicots	EPP0 and/or Administrative Zone	N° of trials	Infestation of the untreated control (pl/m2)		% control with GF-3969					
					GF-3969 at 67.5 g fp/ha		GF-3969 at 101.25 g fp/ha		GF-3969 at 135 g fp/ha	
					[E9636+M6316+X4145+KG691] [10 gA/ha+6.25 gA/ha+7.5 gA/ha+0.2% v/v]		[E9636+M6316+X4145+KG691] [15 gA/ha+9.375 gA/ha+11.255 gA/ha+0.2% v/v]		[E9636+M6316+X4145+KG691] [20 gA/ha+12.5 gA/ha+15 gA/ha+0.2% v/v]	
		Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	
FUMOF	Maritime	1	8.0	-	87.5	-	90.0	-	92.5	-
All FUMOF	Central Zone	1	8.0	-	87.5	-	90.0	-	92.5	-
GAETE	Maritime	1	19.0	-	100.0	-	100.0	-	100.0	-
All GAETE	Central Zone	1	19.0	-	100.0	-	100.0	-	100.0	-
GALAP	North East	2	6.0	6-6	69.4	40-98.8	69.4	40-98.8	70.6	42.5-98.8
All GALAP	Central Zone	2	6.0	6-6	69.4	40-98.8	69.4	40-98.8	70.6	42.5-98.8
GASCI	Maritime	1	49.8	-	96.3	-	98.3	-	99.5	-
All GASCI	Central Zone	1	49.8	-	96.3	-	98.3	-	99.5	-
GASPA	Maritime	2	27.0	13-48	93.4 90.1	86.5-100 93.8	93.8 90.6	90-100 91.3	96.7 95.0	91.5-100 98.5
All GASPA	Central Zone	2	27.0	13-48	93.4 90.1	86.5-100 93.8	93.8 90.6	90-100 91.3	96.7 95.0	91.5-100 98.5
GERPU	Maritime	2	9.5	7-12	85.0	72.5-97.5	91.3	82.5-100	90.0	80-100
All GERPU	Central Zone	2	9.5	7-12	85.0	72.5-97.5	91.3	82.5-100	90.0	80-100
HELAN	Maritime	1	5.0	-	77.5	-	85.0	-	90.0	-
HELAN	North East	1	6.0	-	27.5	-	32.5	-	30.0	-
HELAN	South East	3	5.3	4-7	70.7	12.5-100	91.2	73.8-100	94.5	83.5-100
All HELAN	Central Zone	5	5.4	4-7	63.4	12.5-100	78.2	32.5-100	80.7	30-100
HIBTR	South East	3	17.7	13-26	84.2	81.3-86.3	89.2	87.5-91.3	96.3	93.8-100
All HIBTR	Central Zone	3	17.7	13-26	84.2	81.3-86.3	89.2	87.5-91.3	96.3	93.8-100
LAMPU	Maritime	2	8.3	6-10.5	100.0	100-100	99.9	99.8-100	100.0	100-100
All LAMPU	Central Zone	2	8.3	6-10.5	100.0	100-100	99.9	99.8-100	100.0	100-100
MATCH	Maritime	2	25.0	19.3-30.8	99.9	99.8-100	100.0	100-100	100.0	100-100
All MATCH	Central Zone	2	25.0	19.3-30.8	99.9	99.8-100	100.0	100-100	100.0	100-100
MATIN	Maritime	2	6.5	6-7	89.4	87.5-91.3	94.3	92.5-96	97.5	95-100
MATIN	North East	1	5.0	-	95.0	-	100.0	-	100.0	-
All MATIN	Central Zone	3	6.0	5-7	91.3	87.5-95	96.2	92.5-100	98.3	95-100
MERAN	South East	2	6.0	6-6	55.0	35-75	50.0	17.5-82.5	56.9	26.3-87.5
All MERAN	Central Zone	2	6.0	6-6	55.0	35-75	50.0	17.5-82.5	56.9	26.3-87.5
POLAV	Maritime	1	6.0	-	100.0	-	100.0	-	100.0	-
POLAV	South East	1	7.0	-	85.0	-	92.5	-	100.0	-
All POLAV	Central Zone	2	6.5	6-7	92.5	85-100	96.3	92.5-100	100.0	100-100
POLCO	Maritime	5	23.8	5-63	72.3	32.5-93.8	83.0	55-95	91.5	75-96.8
POLCO	North East	4	5.8	4-7	78.1	30-100	83.1	42.5-100	80.9	37.5-100
POLCO	South East	1	5.0	-	72.5	-	84.3	-	85.8	-
All POLCO	Central Zone	10	14.7	4-63	74.6	30-100	83.2	42.5-100	86.7	37.5-100

Dicots	EPPO and/or Administrative Zone	N° of trials	Infestation of the untreated control (pl/m2)		% control with GF-3969					
					GF-3969 at 67.5 g fp/ha		GF-3969 at 101.25 g fp/ha		GF-3969 at 135 g fp/ha	
					[E9636+M6316+X4145+KG691] [10 gA/ha+6.25 gA/ha+7.5 gA/ha+0.2% v/v]		[E9636+M6316+X4145+KG691] [15 gA/ha+9.375 gA/ha+11.255 gA/ha+0.2% v/v]		[E9636+M6316+X4145+KG691] [20 gA/ha+12.5 gA/ha+15 gA/ha+0.2% v/v]	
		Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	
POLLA	Maritime	3	7.7	5-9	98.0	95-100	99.7	99-100	99.7	99-100
All POLLA	Central Zone	3	7.7	5-9	98.0	95-100	99.7	99-100	99.7	99-100
POLPE	Maritime	4	14.8 11.5	3-28.2 25	77.9 72.9	59.3-97.5 95.0	80.3 77.4	57-100	86.2 83.3	60-100
POLPE	North East	1	6.0	-	100.0	-	95.0	-	100.0	-
<b>All POLPE</b>	<b>Central Zone</b>	<b>6-5</b>	<b>13.4 10.4</b>	<b>3-28.2 25</b>	<b>81.5 78.4</b>	<b>59.3-100</b>	<b>82.8 80.9</b>	<b>57-100</b>	<b>88.5 86.7</b>	<b>60-100</b>
RAPRA	Maritime	1	5.0	-	100.0	-	100.0	-	100.0	-
All RAPRA	Central Zone	1	5.0	-	100.0	-	100.0	-	100.0	-
SOLNI	Maritime	3	6.4	4.1-10	56.7 41.7	42.5-77.5 32.5-50.0	55.9 42.9	33.8-79 55.0	58.3 46.7	37.5-82.5 55.0
SOLNI	North East	1	5.0	-	27.5	-	42.5	-	57.5	-
All SOLNI	Central Zone	4	6.0	4.1-10	49.4 38.1	27.5-77.5 50.0	52.6 42.8	33.8-79 55.0	58.1 49.4	37.5-82.5 57.5
SONAR	Maritime	1	16.0	-	77.5	-	62.5	-	87.5	-
All SONAR	Central Zone	1	16.0	-	77.5	--	62.5	-	87.5	-
SPRAR	Maritime	1	5.0	-	100.0	-	100.0	-	100.0	-
All SPRAR	Central Zone	1	5.0	-	100.0	-	100.0	-	100.0	-
STAPA	Maritime	1	11.0	-	85.0	-	87.5	--	80.0	-
All STAPA	Central Zone	1	11.0	-	85.0	-	87.5	-	80.0	-
STEME	Maritime	2	24.5	16-33	100.0	100-100	100.0	100-100	100.0	100-100
STEME	North East	2	8.0 6	4.0-8.0	100.0 99.3	98.5-100	100.0	100-100	100.0	100-100
All STEME	Central Zone	4	19.0 15.3	4.0-33	100.0 99.6	98.5-100	100.0	100-100	100.0	100-100
THLAR	Maritime	2	21.5	17-26	100.0	100-100	100.0	100-100	100.0	100-100
All THLAR	Central Zone	2	21.5	17-26	100.0	100-100	100.0	100-100	100.0	100-100
URTUR	Maritime	1	49.6	-	85.0	-	96.0	-	97.5	-
All URTUR	Central Zone	1	49.6	-	85.0	-	96.0	-	97.5	-
VERPE	Maritime	2	5.0	5-5	95.9	93.8-98	98.1	97.3-99	98.3	97.5-99
VERPE	North East	3	6.4	5.3-8	58.8	30-75	60.4	32.5-75	67.9	40-88.8
<b>All VERPE</b>	<b>Central Zone</b>	<b>5</b>	<b>5.9</b>	<b>5-8</b>	<b>73.6</b>	<b>30-98</b>	<b>75.5</b>	<b>32.5-99</b>	<b>80.1</b>	<b>40-99</b>
VIOAR	Maritime	1	54.0	-	95.0	-	90.0	-	98.8	-
VIOAR	North East	1	7.0	-	76.3	-	81.3	-	82.5	-
All VIOAR	Central Zone	2	30.5	7-54	85.6	76.3-95	85.6	81.3-90	90.6	82.5-98.8
XANST	South East	2	10.5	6-15	86.3	85-87.5	93.1	88.8-97.5	97.5	95-100
<b>All XANST</b>	<b>Central Zone</b>	<b>2</b>	<b>10.5</b>	<b>6-15</b>	<b>86.3</b>	<b>85-87.5</b>	<b>93.1</b>	<b>88.8-97.5</b>	<b>97.5</b>	<b>95-100</b>

NOTE: E9636 = rimsulfuron, X4145 = isoxadifen-ethyl, M6316= thifensulfuron methyl, KG691= adjuvant, non-ionic surfactant

## Summary and conclusions on the minimum effective dose

According to the presented results, the dose of 135 g fp/ha of GF-3969 + surfactant provided the optimum overall control across different years and climatic conditions and should therefore be considered as minimum effective dose rate against a broad range of major weeds, for which activity of GF-3969 is claimed.

### Comments of zRMS:

37 field trials has been submitted to determine the minimum efficacy dose rate. GF-3969 was tested at the three dose rates: 67,5 g fp/ha (0,5N), 101,25 g fp/ha (0,75N) and 135 g fp/ha (1N) plus a surfactant. The clear dose response was visible in case of control of grasses and dicotyledonous weed species.

In the Maritime EPPO climatic zone, the dose rate of 67,5 g fp/ha achieved the compare effectiveness to the higher dose rates of 101,25 g fp/ha and 135 g fp/ha in control of most weed species: ECHCG, POAAN, SETPU, AMALI, AMARE, BRSNW, CHEAL, CIRAR, DATST, EROCI, FUMOF, GAETE, GASCI, GASPA, GERPU, LAMPU, MATCH, MATIN, POLAV, POLLA, SOLNI, SPRAR, STAPA, STEME, THLAR, VERPE and VIOAR. However, the better results have been achieved in control of AGRRE, DIGSA, PANVI, SETVI, ABUTH, ATXHO, CHEPO, HELAN, POLCO and SONAR after application of GF-3969 at the full dose rate (1N). **The dose rate of 135 g fp/ha can be determine as MED.**

In the North-East EPPO climatic zone, the dose rate of 67,5 g fp/ha achieved the compare effectiveness to the higher dose rates 0,75N and 1N in control of ECHCG, AMARE, BRSNW, CIRAR, GALAP, HELAN, MATIN, POLCO, POLPE, STEME and VIOAR. However, the better results have been achieved in control of SETPF, CHEAL and VERPE after application of GF-3969 at 135 g fp/ha. **The dose rate of 135 g fp/ha can be determine as MED.**

In the South-East EPPO climatic zone, the dose rate of 67,5 g fp/ha achieved the compare effectiveness to the higher dose rates of 101,25 g fp/ha and 135 g fp/ha in control of DIGSA, ECHCG, SETVI, AMARE, CHEAL, CHEHG, DATST, MERAN, POLAV and XANST. However, the better results have been achieved in control of PANDI, SORHA, ABUTH, AMBEL, HELAN, HIBTR and POLCO after application of GF-3969 at the full dose rate (1N). **The dose rate of 135 g fp/ha can be determine as MED.**

According to the trial results, it can be concluded that **consider the dose rate of 135 g fp/ha as minimum effective dose rate to control of dicotyledonous and grass weeds in maize.** ~~is the most effective to control of all weed species submitted in this dossier.~~ Taking into account that the dose range of 67,5-135 g fp/ha is the **indicated intended** doses for Belgium, Netherlands, Luxemburg, Hungary, Romania and Slovakia, ~~it can be concluded that 67,5 g fp/ha is the minimum effective dose rate of GF-3969.~~ **the zRMS proposes to include recommendation to the product label:**

***“The lower dose rate is recommended to control of early growing target weeds or occurring to less severity in maize”.***

### 3.2.3 Efficacy tests (KCP 6.2)

There were 37 field trials conducted across ten countries within the Central Regulatory zone between 2017 and 2018 to determine the efficacy and weed spectrum of GF-3969 + surfactant in maize ( Table 3.2-17). Trials were carried out by contractor companies, all of which follow the EPPO standards and are officially recognized by the competent authorities to carry out field registration trials in accordance with the principles of Good Experimental Practice (GEP). Only trials with significant weed infestation were considered and included in the analysis in this report.

The zonal GAP envelope for CEU countries foresees the application of 135 g fp/ha GF-3969 (20 g a.s./ha rimsulfuron + 12.5 g a.s./ha thifensulfuron methyl + 15 g a.s./ha isoxadifen ethyl) plus a surfactant (non-ionic or vegetable oil) between BBCH11-18 of maize. Certain countries (BE, HU, LU, NL, RO, and SK) apply for a dose range, which is why also lower doses (67.5 g fp/ha) are presented within this efficacy section. Furthermore, split application of GF-3969 in the ratio of 50:50 (67.5 g fp/ha GF-3969 per application: AT, BE, CZ, DE, HU, LU, NL, PL, RO, SK) and/or as 60:40 **63:37** (85 g fp/ha first application, 50 g fp/ha second application: AT, CZ and DE) is intended.

The biological performance of GF-3969 was evaluated for post-emergence application at the proposed label rate of 135 g f.p./ha and was compared with the most important commercial reference products available in the market at the time of trial execution, such as Equip Ultra™ and Laudis®. (Table 3.2-18).

Assessments were carried out according to the EPPO guidelines PP 1/135 “Phytotoxicity assessment”, PP 1/152 “Design and analysis of field evaluation trials”, PP 1/50 “weeds in maize” and PP 1/181 “Conduct and reporting of efficacy evaluation trials including good experimental practice”. The EPPO guideline PP 1/050(3) was followed in all trials, visual assessments were conducted approximately 2, 4, and 8 weeks after application. The percentage of visual control was estimated on a 0-100 linear scale with: 0% = no control and 100% = plant death.

**Table 3.2-16: Details on trial methodology**

<b>Experimental design</b>	Plot design	RCBD (37)
	Plot size	15 - 30 m <sup>2</sup>
	Number of replications	4 (37)
<b>Crop</b>	Trials per crop	Maize (37)
	Varieties per crop	Albatros, Aurelius, Bergxxon, Chapalu, Crossmann, DK 5007, DKC <del>3532</del> 3523, DKC 4490 (2), DKC 4590, Es Fato, Evgeni, Falkone, Fortop, Kamelias, KWS 2376, Legion, LG 30.215, LG 30.260, LG 31.255, LG 30.217, MAS 26K, Metronom, Nimba, Opoka, P0725, P83.33, P8989, Pioneer, PR38A75, RGT Ferarix Duo, Ronaldinio, Scafort, SL Magello, SY Campona, Sybilis, Ultrane
	Sowing period	Spring 2017 & Spring 2018
<b>Application</b>	Crop stage (BBCH) at application	BBCH 11-18 (BBCH30*)
	Timing Pest stage at application (1)	Post-emergence AGRRE (12-31), DIGIS (12-31), ECHCG (11-31), PANDI (12-14), POAAN (12-22), SETPU (12-30), SETVI (10-20), SORHA (12-24).  ABUTH (11-14), AMALI (12-14), AMARE (12-40), AMBEL (12-16), ATXHO (12-31), BRNSp (14-16), CAPBP (10-25), CHEAL (11-51 including CHEHY/CHEPO), CIRAR (14-30), DATST (10-16), EROCI (12-16), FUMOF (19-51), GAETE (12-16), GALAP (14-51), GASCI/GASPA (12-30), GERPU (12-16), HELAN (12-19), HIBTR (12-14), LAMPU (12-39), MATsp (12-51), MERAN (14-16), POLAV (12-23), POLCO (10-51), POLLA (12-19), POLPE (12-40), RAPRA (12-13), SOLNI (11-30), SONAR (12-30), SPRAR (12-30), STAPA (12-14), STEME (12-50), THLAR (154-61), URTUR (12-14), VERPE (12-51), VIOAR (11-21), XANST (12-14)
	Spray volumes	200 - 400 L/ha
	Number of appl.	37 trials with 2 applications
	Interval between appl.	6-13 days interval between the applications
<b>At application</b>	Plant densities (pl/m <sup>2</sup> )	Grasses: 5-150 plants/m <sup>2</sup> ; Dicots: 4-90 plants/m <sup>2</sup>
	Pressure	165-510 kPa
	Temperature	13-30°C
<b>Soil</b>	Temperature	10-29°C
	Humidity	23-89%
	Soil type	(1) clay, (8) clay loam, (9) 4) Loam L, (4) silt loam, (12) Silt Clay SCL, (3) silty clay loam, (1) sand, (1) sandy clay loam, (14-15) Sandy Loam SL
	pH	4.5-8.2
	% OM	1.4-10.5%
	Tillage type	CONTIL, FPC, MUCTIL
<b>Assessment</b>	Assessment types	% control, number of weeds/m <sup>2</sup> , severity (general phytotox, chlorosis, necrosis, deformation, stunting).

	Assessment dates	Up to 70DAT
* there was a single Hungarian trial applied at BBCH 30. Since the first application was conducted at BBCH 16, this trial is considered valid.		

**Table 3.2-17: Efficacy of GF-3969 in maize: Trial distribution throughout EPPO zones across years.**

EPPO Zone	Country	2017	2018	Total EPPO zone
Maritime	Austria	1	1	19
	Belgium	2	3	
	Czech Republic	2	2	
	Germany	3	3	
	Netherlands	1	1	
	United Kingdom	1	1	
<b>Maritime Total</b>		<b>9</b>	<b>10</b>	
North East	Poland	4	4	8
<b>North East Total</b>		<b>4</b>	<b>4</b>	<b>8</b>
South East	Hungary	1	3	10
	Romania	2	2	
	Slovakia	1	1	
<b>South East Total</b>		<b>4</b>	<b>6</b>	
<b>TOTAL</b>		<b>17</b>	<b>20</b>	<b>37</b>

**Guidelines**

Guideline No.	Guideline Type	Guideline Type 2
EUH-01-050	EMA SOP	EMA SOP
PP 1/135(4)	EPPO Guideline	EPPO Guideline
PP 1/152(4)	EPPO Guideline	EPPO Guideline
PP 1/181(4)	EPPO Guideline	EPPO Guideline
PP 1/50(3)	EPPO Guideline	EPPO Guideline

**Table 3.2-18: Reference products tested to validate trials conducted on GF-3969 in maize**

Reference (trademark)	Form. Type	Form. concentration	Active substance	Application timing	Rate used in reported trials (g a.s./ha)	Rate used in reported trials (L or Kg f.p./ha)
Equip Ultra™	SC	22.5 g/L 22.5 g/L	Foramsulfuron Isoxadifen-ethyl	Post-emergence	120*	2.67 L/ha
Laudis®	OD	44 g/L 22 g/L	Tembotrione Isoxadifen-ethyl	Post-emergence	148.5	2.25 L/ha
*90 g (N) as/ha in CZF-18-141, CZI-18-141, SKF-18-141						

**Figure 3-2: Location map of the 37 efficacy trials (colour grouping per country)**



This map was created using trial location details, <https://de.batchgeo.com/> and google maps.

The following susceptibility classes were drawn according to SANCO/10055/2013 Rev.4.

**Table 3.2-19: Proposed efficacy scale for herbicides to be used in efficacy section according to SANCO/10055/2013 Rev.4**

Weed species susceptibility	Proposed EU scale for zonal BAD and labels
Highly Susceptible (HS)	95 - 100%
Susceptible (S)	85 - 94.9%
Moderately Susceptible (MS)	70 - 84.9%
Moderately Tolerant (MT)	50 - 69.9%
Tolerant (T)	0 - 49.9%

**Table 3.2-20: Efficacy of GF-3969 on target weeds at dose rates between 67.5 g fp/ha and 135 g fp/ha in maize across central registration zone**

Susceptibility	GF-3969 + surfactant		
	at 135 g fp/ha	at 101.25 g fp/ha	at 67.5 g fp/ha
<b>Highly susceptible (HS) species:</b> efficacy from 95 to 100%	AMALI, AMARE, ATXHO, BRSNN, BRSNW, CHEAL, CHEHG, ECHCG, GAETE, GASCI, GASPA, HIBTR, LAMPU, MATCH, MATIN, POAAN, PANVI, POLAV, POLLA, RAPRA, SETPF, SETPU, SPRAR, STEME, THLAR, URTUR, XANST	AMALI, AMARE, BRSNN, BRSNW, CHEHG, GAETE, GASCI, LAMPU, MATCH, MATIN, PANVI, POLAV, POLLA, RAPRA, SETPU, SPRAR, STEME, THLAR, URTUR	AMALI, AMARE, BRSNN, BRSNW, CHEHG, GAETE, GASCI, LAMPU, MATCH, POLLA, RAPRA, SETPU, SPRAR, STEME, THLAR,
<b>Susceptible (S) species:</b> efficacy from 85 to 94.9%	AGRRE, AMBEL, CHEPO, CIRAR, FUMOF, GERPU, PANDI, POLCO,	AGRRE, ATXHO, CHEAL, CHEPO, CIRAR, ECHCG, FUMOF, GASPA,	CHEAL, CIRAR, ECHCG, FUMOF, GASPA, GERPU, MATIN, POAAN,

	POLPE, SETVI, SONAR, SORHA, VIOAR,	GERPU, HIBTR, POAAN, SETVI, SETPF, STAPA, VIOAR, XANST	POLAV, STAPA, URTUR, VIOAR, XANST
<b>Moderately susceptible (MS) species:</b> efficacy from 70 to 84.9%	ABUTH, DIGSA, EROCI, HELAN, GALAP, STAPA, VERPE,	AMBEL, DIGSA, EROCI, HELAN, PANDI, POLCO, POLPE, SONAR, SORHA, STAPA, VERPE,	AGRRE, AMBEL, ATXHO, CHEPO, DIGSA, EROCI, HIBTR, PANVI, POLCO, POLPE, SETVI, SETPF, SONAR, STAPA, VERPE,
<b>Moderately tolerant (MT):</b> efficacy from 50-69.9%	DATST, MERAN, SOLNI	ABUTH, DATST, EROCI, GALAP, MERAN, SOLNI, SONAR	DATST, EROCI, HELAN, GALAP, MERAN, SONAR, SORHA
<b>Tolerant (T):</b> efficacy from 0-49.9%	SOLNI	SOLNI	ABUTH, PANDI, SOLNI

### Maize – single application of GF-3969 at dose ranges between 67.5 g fp/ha – 135 g fp/ha

At full rate of 135 g fp/ha, GF-3969 efficiently controls **grasses** such as AGRRE (89%, Maritime data only, Table 3.2-21), DIGSA (81%), ECHCG (97%), SETVI (89%) and SORHA (93%, South East data only, Table 3.2-21). It is therefore concluded that GF-3969 provide high an efficient control of major target grasses in maize if the maximum claimed dose rate of 135 g fp/ha was applied.

The dose rate of 67.5 g fp/ha, which is claimed as minimum claimed dose rate of GF-3969 in BE, HU, LU, NL, RO, and SK, provided sufficient control against major target grasses such as ECHCG (90%) and POAAN (92 89%) in maize. It should be noted that this level of efficacy is at least comparable, if not superior compared to the included reference product Laudis® (93% and 69% respectively).

**Major broad leaf weed control after applying GF-3969 at full rate of 135 g fp/ha is presented in** AMARE (99% across zones), CHEAL (95%), POLCO (87%), POLLA (100%), and POLPE (89%). Notably, GF-3969 outperformed the reference products in terms of Polygonia control. Overall, it is therefore concluded that GF-3969 provides an efficient tool for broad leaf weed control in maize across different climatic regions.

The dose rate of 67.5 g fp/ha which is claimed as minimum dose rate of GF-3969 in BE, HU, LU, NL, RO, and SK, provided remarkable control of AMARE (98%), CHEAL (91%), POLAV (n=2 with 93%), POLLA (98%) and STEME (100%) and proved to provide a flexible tool for the control of certain weeds at a lower dose rate.

The data package demonstrated the flexible control of GF-3969 against major targets weeds in maize across different climatic conditions and clearly justified the intended dose rate range between 67.5 g fp/ha and 135 g fp/ha.

**Table 3.2-21: Summary efficacy of GF-3969 at 67.5 g fp/ha and 135 g fp/ha against grasses in maize across different climatic regions**

Target Grasses	EPPO <del>or</del> and Administrative Zone	N° of trials	Infestation in the untreated control (pl/m2)		% Control							
					GF-3969 (67.5 g fp/ha) (minimum claimed dose rate for BE, HU, LU, NL, RO and SK)		GF-3969 (135 g fp/ha) (maximum claimed dose rate for all CEU countries)		[EQUIP ULTRA] [90 gA/ha]/ [120 gA/ha]		[LAUDIS] [148.5 gA/ha]	
					[E9636+M6316+X4145+KG691] [10 gA/ha+6.25 gA/ha+7.5 gA/ha+0.2% v/v]		[E9636+M6316+X4145+ KG691] [20 gA/ha+12.5 gA/ha+15 gA/ha+0.2% v/v]					
					Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max
AGRRE	Maritime	8	29.5	5-118	76.9	45-93.8	89.3	73.8-98.3	87.8	72.5-100	45	0-82.5
	<b>Central Zone</b>	<b>8</b>	<b>29.5</b>	<b>5-118</b>	<b>76.9</b>	<b>45-93.8</b>	<b>89.3</b>	<b>73.8-98.3</b>	<b>87.8</b>	<b>72.5-100</b>	<b>45</b>	<b>0-82.5</b>
DIGSA	Maritime	5	66.4	10-150	67.1	37.5-86.3	77.6	48.8-96.8	75.6	50-90.8	88.8	71.3-98
	South East	1	26	-	93.5	-	99.5	-	94.5	-	99.3	-
	<b>Central Zone</b>	<b>6</b>	<b>59.7</b>	<b>10-150</b>	<b>71.5</b>	<b>37.5-93.5</b>	<b>81.3</b>	<b>48.8-99.5</b>	<b>79.4</b>	<b>50-94.5</b>	<b>90.5</b>	<b>71.3-99.3</b>
ECHCG	Maritime	<del>10</del> <b>11</b>	<del>54.3</del> <b>49.8</b>	<del>4-121</del> <b>4-121</b>	<del>89.6</del> <b>90.5</b>	71.3-100	<del>96.8</del> <b>97.1</b>	87.3-100	<del>92.8</del> <b>93.4</b>	82.5-100	<del>88.4</del> <b>88.4</b>	22.5-100
	North East	6	6.1	5-10	88.5	53.8-100	94.2	72.8-100	96.7	90-100	97.1	92.3-100
	South East	9	19.5	5-75	90.4	77.5-100	99.2	97.5-100	99.1	97.8-100	95.1	83.8-99.3
	<b>Central Zone</b>	<del>25</del> <b>26</b>	<del>30.2</del> <b>29.2</b>	<del>5-4-121</del> <b>5-4-121</b>	<del>89.6</del> <b>90.0</b>	<b>53.8-100</b>	<b>97.2</b>	<b>72.8-100</b>	<del>96</del> <b>92.3</b>	<b>82.5-100</b>	<del>92.8</del> <b>92.7</b>	<b>22.5-100</b>
PANDI	South East	1	7	-	35	-	90	-	88.3	-	97.8	-
	<b>Central Zone</b>	<b>1</b>	<b>7</b>	<b>-</b>	<b>35</b>	<b>-</b>	<b>90</b>	<b>-</b>	<b>88.3</b>	<b>-</b>	<b>97.8</b>	<b>-</b>
PANVI	Maritime	1	19	-	80	-	95	-	80	-	90	-
	<b>Central Zone</b>	<b>1</b>	<b>19</b>	<b>-</b>	<b>80</b>	<b>-</b>	<b>95</b>	<b>-</b>	<b>80</b>	<b>-</b>	<b>90</b>	<b>-</b>
POAAN	Maritime	3	7	5-10	92.5	77.5-100	97.5	92.5-100	96.7	90-100	68.8	37.5-100
	<b>Central Zone</b>	<b>3</b>	<b>7</b>	<b>5-10</b>	<b>92.5</b>	<b>77.5-100</b>	<b>97.5</b>	<b>92.5-100</b>	<b>96.7</b>	<b>90-100</b>	<b>68.8</b>	<b>37.5-100</b>
SETPF	North East	1	6.3	-	81.8	-	98.8	-	97.8	-	88.8	-
	<b>Central Zone</b>	<b>1</b>	<b>6.3</b>	<b>-</b>	<b>81.8</b>	<b>-</b>	<b>98.8</b>	<b>-</b>	<b>97.8</b>	<b>-</b>	<b>88.8</b>	<b>-</b>

Target Grasses	EPPO <del>or</del> and Administrative Zone	N° of trials	Infestation in the untreated control (pl/m2)		% Control							
					GF-3969 (67.5 g fp/ha) (minimum claimed dose rate for BE, HU, LU, NL, RO and SK)		GF-3969 (135 g fp/ha) (maximum claimed dose rate for all CEU countries)		[EQUIP ULTRA] [90 gA/ha]/ [120 gA/ha]		[LAUDIS] [148.5 gA/ha]	
					[E9636+M6316+X4145+KG691] [10 gA/ha+6.25 gA/ha+7.5 gA/ha+0.2% v/v]		[E9636+M6316+X4145+ KG691] [20 gA/ha+12.5 gA/ha+15 gA/ha+0.2% v/v]					
					Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max
SETPU	Maritime	1	25	-	96.3	-	100	-	100	-	97.5	-
	<b>Central Zone</b>	<b>1</b>	<b>25</b>	-	<b>96.3</b>	-	<b>100</b>	-	<b>100</b>	-	<b>97.5</b>	-
SETVI	Maritime	1	10	-	35	-	57.5	-	30	-	99	-
	South East	3	12.3	4-16.5	90.8	82.5-100	99.7	99-100	99.5	98.5-100	93.3	90-98.8
	<b>Central Zone</b>	<b>4</b>	<b>11.8</b>	<b>4-16.5</b>	<b>76.9</b>	<b>35-100</b>	<b>89.1</b>	<b>57.5-100</b>	<b>82.1</b>	<b>30-100</b>	<b>94.8</b>	<b>90-99</b>
SORHA	South East	3	12	6-24	59.8	0-90	92.8	86.8-97.5	91.1	88-93.8	42.9	10-81.3
	<b>Central Zone</b>	<b>3</b>	<b>12</b>	<b>6-24</b>	<b>59.8</b>	<b>0-90</b>	<b>92.8</b>	<b>86.8-97.5</b>	<b>91.1</b>	<b>88-93.8</b>	<b>42.9</b>	<b>10-81.3</b>
SPRAR	Maritime	1	5	-	100	-	100	-	100	-	100	-
	<b>Central Zone</b>	<b>1</b>	<b>5</b>	-	<b>100</b>	-	<b>100</b>	-	<b>100</b>	-	<b>100</b>	-

NOTE: E9636 = rimsulfuron, X4145 = isoxadifen-ethyl, M6316= thifensulfuron methyl, KG691= adjuvant, non-ionic surfactant

**Table 3.2-22: Summary efficacy of GF-3969 at 67.5 g fp/ha and 135 g fp/ha against broadleaf weeds in maize across different zones**

Target BLW	EPPO <del>98</del> and administrative Zone	N° of trials	Infestation in the untreated control (pl/m <sup>2</sup> )		% Control							
					GF-3969 (67.5 g fp/ha) (minimum claimed dose rate for BE, HU, LU, NL, RO and SK)		GF-3969 (135 g fp/ha) (maximum claimed dose rate for all CEU countries)		[EQUIP ULTRA] [90 gA/ha]/ [120 gA/ha]		[LAUDIS] [148.5 gA/ha]	
					[E9636+M6316+X4145+KG691] [10 gA/ha+6.25 gA/ha+7.5 gA/ha+0.2% v/v]		[E9636+M6316+X4145+KG691] [20 gA/ha+12.5 gA/ha+15 gA/ha+0.2% v/v]					
					Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max
ABUTH	Maritime	1	90	-	71.3	-	87.5	-	91.3	-	95.5	-
	South East	2	4.5	4-5	18.3	1.5-35	68.8	65-72.5	75	75-75	99.3	99-99.5
	<b>Central Zone</b>	<b>3</b>	<b>33</b>	<b>4-90</b>	<b>35.9</b>	<b>1.5-71.3</b>	<b>75</b>	<b>65-87.5</b>	<b>80.4</b>	<b>75-91.3</b>	<b>98</b>	<b>95.5-99.5</b>
AMALI	Maritime	1	5	-	95	-	100	-	99	-	100	-
	<b>Central Zone</b>	<b>1</b>	<b>5</b>	-	<b>95</b>	-	<b>100</b>	-	<b>99</b>	-	<b>100</b>	-
AMARE	Maritime	3	92.3	9-230	99.5	98.5-100	99.8	99.3-100	99.6	98.8-100	99	97-100
	North East	6	5.7	4-7	96.7	92.5-99.8	97.8	95-99	98.3	95-100	99.3	96.8-100
	South East	1	12.5	-	100	-	100	-	100	-	100	-
	<b>Central Zone</b>	<b>10</b>	<b>32.4</b>	<b>4-230</b>	<b>97.9</b>	<b>92.5-100</b>	<b>98.6</b>	<b>95-100</b>	<b>98.9</b>	<b>95-100</b>	<b>99.3</b>	<b>96.8-100</b>
AMBEL	South East	6	<del>26.8</del> 27.0	10-48	71.3	57.5-95	89.4	80-100	91.3	71.3-100	99.3	97.3-100
	<b>Central Zone</b>	<b>6</b>	<del>26.8</del> <b>27.0</b>	<b>10-48</b>	<b>71.3</b>	<b>57.5-95</b>	<b>89.4</b>	<b>80-100</b>	<b>91.3</b>	<b>71.3-100</b>	<b>99.3</b>	<b>97.3-100</b>
ATXHO	Maritime	1	7	-	77.5	-	97.8	-	86.3	-	100	-
	<b>Central Zone</b>	<b>1</b>	<b>7</b>	-	<b>77.5</b>	-	<b>97.8</b>	-	<b>86.3</b>	-	<b>100</b>	-
BRSNN	North East	1	5	-	100	-	100	-	100	-	100	-
	<b>Central Zone</b>	<b>1</b>	<b>5</b>	-	<b>100</b>	-	<b>100</b>	-	<b>100</b>	-	<b>100</b>	-
BRSNW	Maritime	1	5	-	99.5	-	98.8	-	100	-	97	-
	<b>Central Zone</b>	<b>1</b>	<b>5</b>	-	<b>99.5</b>	-	<b>98.8</b>	-	<b>100</b>	-	<b>97</b>	-
CHEAL	Maritime	14	31.4	9.5-83	94.3	67.5-100	96.8	77.5-100	89.7	66.3-100	95.8	73.8-100
	North East	8	9.5	5-18	82.4	67.5-95	90.9	77.5-98.5	83.3	30-98.3	97.9	90-100

Target BLW	EPPO <del>or</del> and administrative Zone	N° of trials	Infestation in the untreated control (pl/m <sup>2</sup> )		% Control									
					GF-3969 (67.5 g fp/ha) (minimum claimed dose rate for BE, HU, LU, NL, RO and SK)		GF-3969 (135 g fp/ha) (maximum claimed dose rate for all CEU countries)		[EQUIP ULTRA] [90 gA/ha]/ [120 gA/ha]		[LAUDIS] [148.5 gA/ha]			
			[E9636+M6316+X4145+KG691] [10 gA/ha+6.25 gA/ha+7.5 gA/ha+0.2% v/v]		[E9636+M6316+X4145+KG691] [20 gA/ha+12.5 gA/ha+15 gA/ha+0.2% v/v]		Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max
			Mean	Min-Max	Mean	Min-Max								
	South East	5	12.4	5-19	94.1	83.8-100	99	96.5-100	92.2	83.8-99.3	99.4	97.3-100		
	<b>Central Zone</b>	<b>27</b>	<b>21.4</b>	<b>5-83</b>	<b>90.7</b>	<b>67.5-100</b>	<b>95.4</b>	<b>77.5-100</b>	<b>88.2</b>	<b>30-100</b>	<b>97.1</b>	<b>73.8-100</b>		
CHEHG	South East	1	6	-	96.5	-	99.3	-	97.5	-	99	-		
	<b>Central Zone</b>	<b>1</b>	<b>6</b>	<b>-</b>	<b>96.5</b>	<b>-</b>	<b>99.3</b>	<b>-</b>	<b>97.5</b>	<b>-</b>	<b>99</b>	<b>-</b>		
CHEPO	Maritime	4	19.2	5-56.3	84.6	60-98.5	93.9	80-100	99.6	99-100	99.8	99-100		
	<b>Central Zone</b>	<b>4</b>	<b>19.2</b>	<b>5-56.3</b>	<b>84.6</b>	<b>60-98.5</b>	<b>93.9</b>	<b>80-100</b>	<b>99.6</b>	<b>99-100</b>	<b>99.8</b>	<b>99-100</b>		
CIRAR	Maritime	1	7	-	85	-	90	-	88.8	-	75	-		
	North East	1	5	-	92.5	-	81.3	-	30	-	95	-		
	<b>Central Zone</b>	<b>2</b>	<b>6</b>	<b>5-7</b>	<b>88.8</b>	<b>85-92.5</b>	<b>85.6</b>	<b>81.3-90</b>	<b>59.4</b>	<b>30-88.8</b>	<b>85</b>	<b>75-95</b>		
DATST	Maritime	2	71.5	33-110	56.3	45-67.5	68.1	60-76.3	89	86.3-91.8	87.1	82.5-91.8		
	South East	4	19	6-48	64.4	50-81.5	67.7	26.3-88	73.6	35-95.5	97.1	92.5-100		
	<b>Central Zone</b>	<b>6</b>	<b>36.5</b>	<b>6-110</b>	<b>61.7</b>	<b>45-81.5</b>	<b>67.8</b>	<b>26.3-88</b>	<b>78.7</b>	<b>35-95.5</b>	<b>93.8</b>	<b>82.5-100</b>		
ECGCH	Maritime	1	12	-	70	-	75	-	67.5	-	80	-		
	<b>Central Zone</b>	<b>1</b>	<b>12</b>	<b>-</b>	<b>70</b>	<b>-</b>	<b>75</b>	<b>-</b>	<b>67.5</b>	<b>-</b>	<b>80</b>	<b>-</b>		
EROCI	Maritime	1	5	-	72.5	-	80	-	62.5	-	0	-		
	<b>Central Zone</b>	<b>1</b>	<b>5</b>	<b>-</b>	<b>72.5</b>	<b>-</b>	<b>80</b>	<b>-</b>	<b>62.5</b>	<b>-</b>	<b>0</b>	<b>-</b>		
FUMOF	Maritime	1	8	-	87.5	-	92.5	-	62.5	-	0	-		
	<b>Central Zone</b>	<b>1</b>	<b>8</b>	<b>-</b>	<b>87.5</b>	<b>-</b>	<b>92.5</b>	<b>-</b>	<b>62.5</b>	<b>-</b>	<b>0</b>	<b>-</b>		
GAETE	Maritime	1	19	-	100	-	100	-	77.5	-	100	-		
	<b>Central Zone</b>	<b>1</b>	<b>19</b>	<b>-</b>	<b>100</b>	<b>-</b>	<b>100</b>	<b>-</b>	<b>77.5</b>	<b>-</b>	<b>100</b>	<b>-</b>		
GALAP	North East	2	6	6-6	69.4	40-98.8	70.6	42.5-98.8	95	90-100	84.4	83.8-85		

Target BLW	EPPO <del>9F</del> and administrative Zone	N° of trials	Infestation in the untreated control (pl/m <sup>2</sup> )		% Control									
					GF-3969 (67.5 g fp/ha) (minimum claimed dose rate for BE, HU, LU, NL, RO and SK)		GF-3969 (135 g fp/ha) (maximum claimed dose rate for all CEU countries)		[EQUIP ULTRA] [90 gA/ha]/ [120 gA/ha]		[LAUDIS] [148.5 gA/ha]			
			[E9636+M6316+X4145+KG691] [10 gA/ha+6.25 gA/ha+7.5 gA/ha+0.2% v/v]		[E9636+M6316+X4145+KG691] [20 gA/ha+12.5 gA/ha+15 gA/ha+0.2% v/v]		Mean	Min- Max	Mean	Min- Max	Mean	Min- Max	Mean	Min- Max
			Mean	Min- Max	Mean	Min- Max								
	<b>Central Zone</b>	<b>2</b>	<b>6</b>	<b>6-6</b>	<b>69.4</b>	<b>40-98.8</b>	<b>70.6</b>	<b>42.5-98.8</b>	<b>95</b>	<b>90-100</b>	<b>84.4</b>	<b>83.8-85</b>		
GASCI	Maritime	1	49.8	-	96.3	-	99.5	-	100	-	100	-		
	<b>Central Zone</b>	<b>1</b>	<b>49.8</b>	<b>-</b>	<b>96.3</b>	<b>-</b>	<b>99.5</b>	<b>-</b>	<b>100</b>	<b>-</b>	<b>100</b>	<b>-</b>		
GASPA	Maritime	3	27	13-48	93.4	86.5-100	96.7	91.5-100	91	90.5-91.3	99.3	98.8-100		
	<b>Central Zone</b>	<b>3</b>	<b>27</b>	<b>13-48</b>	<b>93.4</b>	<b>86.5-100</b>	<b>96.7</b>	<b>91.5-100</b>	<b>91</b>	<b>90.5-91.3</b>	<b>99.3</b>	<b>98.8-100</b>		
GERPU	Maritime	2	9.5	7-12	85	72.5-97.5	90	80-100	90	80-100	33.8	0-67.5		
	<b>Central Zone</b>	<b>2</b>	<b>9.5</b>	<b>7-12</b>	<b>85</b>	<b>72.5-97.5</b>	<b>90</b>	<b>80-100</b>	<b>90</b>	<b>80-100</b>	<b>33.8</b>	<b>0-67.5</b>		
HELAN	Maritime	1	5	-	77.5	-	90	-	65	-	90	-		
	North East	1	6	-	27.5	-	30	-	32.5	-	35	-		
	South East	3	5.3	4-7	70.7	12.5-100	94.5	83.5-100	96.2	89.5-99.8	99.8	99.5-100		
	<b>Central Zone</b>	<b>5</b>	<b>5.4</b>	<b>4-7</b>	<b>63.4</b>	<b>12.5-100</b>	<b>80.7</b>	<b>30-100</b>	<b>77.2</b>	<b>32.5-99.8</b>	<b>84.9</b>	<b>35-100</b>		
HIBTR	South East	3	17.7	13-26	84.2	81.3-86.3	96.3	93.8-100	95	90-100	82.9	60-97.5		
	<b>Central Zone</b>	<b>3</b>	<b>17.7</b>	<b>13-26</b>	<b>84.2</b>	<b>81.3-86.3</b>	<b>96.3</b>	<b>93.8-100</b>	<b>95</b>	<b>90-100</b>	<b>82.9</b>	<b>60-97.5</b>		
LAMPU	Maritime	2	8.3	6-10.5	100	100-100	100	100-100	100	100-100	100	100-100		
	<b>Central Zone</b>	<b>2</b>	<b>8.3</b>	<b>6-10.5</b>	<b>100</b>	<b>100-100</b>	<b>100</b>	<b>100-100</b>	<b>100</b>	<b>100-100</b>	<b>100</b>	<b>100-100</b>		
MATCH	Maritime	2	25	19.3-30.8	99.9	99.8-100	100	100-100	87.5	75-100	100	100-100		
	<b>Central Zone</b>	<b>2</b>	<b>25</b>	<b>19.3-30.8</b>	<b>99.9</b>	<b>99.8-100</b>	<b>100</b>	<b>100-100</b>	<b>87.5</b>	<b>75-100</b>	<b>100</b>	<b>100-100</b>		

Target BLW	EPPO <del>EF</del> and administrative Zone	N° of trials	Infestation in the untreated control (pl/m <sup>2</sup> )		% Control									
					GF-3969 (67.5 g fp/ha) (minimum claimed dose rate for BE, HU, LU, NL, RO and SK)		GF-3969 (135 g fp/ha) (maximum claimed dose rate for all CEU countries)		[EQUIP ULTRA] [90 gA/ha]/ [120 gA/ha]		[LAUDIS] [148.5 gA/ha]			
			[E9636+M6316+X4145+KG691] [10 gA/ha+6.25 gA/ha+7.5 gA/ha+0.2% v/v]		[E9636+M6316+X4145+KG691] [20 gA/ha+12.5 gA/ha+15 gA/ha+0.2% v/v]		Mean	Min- Max	Mean	Min- Max	Mean	Min- Max	Mean	Min- Max
			Mean	Min- Max	Mean	Min- Max								
MATIN	Maritime	2	6.5	6-7	89.4	87.5-91.3	97.5	95-100	75	67.5- 82.5	72.5	60- 85		
	North East	1	5	-	95	-	100	-	100	-	91.3	-		
	<b>Central Zone</b>	<b>3</b>	<b>6</b>	<b>5-7</b>	<b>91.3</b>	<b>87.5-95</b>	<b>98.3</b>	<b>95-100</b>	<b>83.3</b>	<b>67.5- 100</b>	<b>78.8</b>	<b>60- 91.3</b>		
MERAN	South East	2	6	6-6	55	35-75	56.9	26.3-87.5	93.1	92.5- 93.8	91.6	87.5- 95.8		
	<b>Central Zone</b>	<b>2</b>	<b>6</b>	<b>6-6</b>	<b>55</b>	<b>35-75</b>	<b>56.9</b>	<b>26.3-87.5</b>	<b>93.1</b>	<b>92.5- 93.8</b>	<b>91.6</b>	<b>87.5- 95.8</b>		

Target BLW	EPPO <del>9F</del> and administrative Zone	N° of trials	Infestation in the untreated control (pl/m <sup>2</sup> )		% Control									
					GF-3969 (67.5 g fp/ha) (minimum claimed dose rate for BE, HU, LU, NL, RO and SK)		GF-3969 (135 g fp/ha) (maximum claimed dose rate for all CEU countries)		[EQUIP ULTRA] [90 gA/ha]/ [120 gA/ha]		[LAUDIS] [148.5 gA/ha]			
			[E9636+M6316+X4145+KG691] [10 gA/ha+6.25 gA/ha+7.5 gA/ha+0.2% v/v]		[E9636+M6316+X4145+KG691] [20 gA/ha+12.5 gA/ha+15 gA/ha+0.2% v/v]		Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max
			Mean	Min-Max	Mean	Min-Max								
POLAV	Maritime	1	6	-	100	-	100	-	87.5	-	100	-		
	South East	1	7	-	85	-	100	-	0	-	97.5	-		
	<b>Central Zone</b>	<b>2</b>	<b>6.5</b>	<b>6-7</b>	<b>92.5</b>	<b>85-100</b>	<b>100</b>	<b>100-100</b>	<b>43.8</b>	<b>0-87.5</b>	<b>98.8</b>	<b>97.5-100</b>		
POLCO	Maritime	5	23.8	5-63	72.3	32.5-93.8	91.5	75-96.8	32.8	0-83.8	59.8	0-93.8		
	North East	4	5.8	4-7	78.1	30-100	80.9	37.5-100	50.9	27.5-71.3	65	15-91.3		
	South East	1	5	-	72.5	-	85.8	-	88.3	-	94.5	-		
	<b>Central Zone</b>	<b>10</b>	<b>14.7</b>	<b>4-63</b>	<b>74.6</b>	<b>30-100</b>	<b>86.7</b>	<b>37.5-100</b>	<b>47</b>	<b>0-88.3</b>	<b>65.3</b>	<b>0-94.5</b>		
POLLA	Maritime	3	7.7	5-9	98	95-100	99.7	99-100	85.5	57.5-100	96.3	90-100		
	<b>Central Zone</b>	<b>3</b>	<b>7.7</b>	<b>5-9</b>	<b>98</b>	<b>95-100</b>	<b>99.7</b>	<b>99-100</b>	<b>85.5</b>	<b>57.5-100</b>	<b>96.3</b>	<b>90-100</b>		
POLPE	Maritime	5	14.8	3-28.2	77.9	59.3-97.5	86.2	60-100	59.6	33-90	79.2	45-97.5		
	North East	1	6	-	100	-	100	-	75	-	98.8	-		
	<b>Central Zone</b>	<b>6</b>	<b>13.4</b>	<b>3-28.2</b>	<b>81.5</b>	<b>59.3-100</b>	<b>88.5</b>	<b>60-100</b>	<b>62.2</b>	<b>33-90</b>	<b>82.4</b>	<b>45-98.8</b>		
RAPRA	Maritime	1	5	-	100	-	100	-	100	-	100	-		
	<b>Central Zone</b>	<b>1</b>	<b>5</b>	<b>-</b>	<b>100</b>	<b>-</b>	<b>100</b>	<b>-</b>	<b>100</b>	<b>-</b>	<b>100</b>	<b>-</b>		
SOLNI	Maritime	3	6.4	4.1-10	<del>56.7</del> 41.7	<del>42.5-77.5</del> 32.5-50	<del>58.3</del> 46.7	<del>37.5-82.5</del> 55	97.8	96.3-100	97.5	95-100		
	North East	1	5	-	27.5	-	57.5	-	99.5	-	100	-		
	<b>Central Zone</b>	<b>4</b>	<b>6</b>	<b>4.1-10</b>	<del>49.4</del> 38.1	<del>27.5-77.5</del> 50	<del>58.1</del> 49.4	<del>37.5-82.5</del> 57.5	<b>98.2</b>	<b>96.3-100</b>	<b>98.1</b>	<b>95-100</b>		
SONAR	Maritime	1	16	-	77.5	-	87.5	-	65	-	65	-		
	<b>Central Zone</b>	<b>1</b>	<b>16</b>	<b>-</b>	<b>77.5</b>	<b>-</b>	<b>87.5</b>	<b>-</b>	<b>65</b>	<b>-</b>	<b>65</b>	<b>-</b>		
SPRAR	Maritime	1	5	-	100	-	100	-	100	-	100	-		

Target BLW	EPPO <del>or</del> and administrative Zone	N° of trials	Infestation in the untreated control (pl/m <sup>2</sup> )		% Control							
					GF-3969 (67.5 g fp/ha) (minimum claimed dose rate for BE, HU, LU, NL, RO and SK)		GF-3969 (135 g fp/ha) (maximum claimed dose rate for all CEU countries)		[EQUIP ULTRA] [90 gA/ha]/ [120 gA/ha]		[LAUDIS] [148.5 gA/ha]	
			[E9636+M6316+X4145+KG691] [10 gA/ha+6.25 gA/ha+7.5 gA/ha+0.2% v/v]		[E9636+M6316+X4145+KG691] [20 gA/ha+12.5 gA/ha+15 gA/ha+0.2% v/v]							
			Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max
	<b>Central Zone</b>	<b>1</b>	<b>5</b>	-	<b>100</b>	-	<b>100</b>	-	<b>100</b>	-	<b>100</b>	-
STAPA	Maritime	1	11	-	85	-	80	-	82.5	-	90	-
	<b>Central Zone</b>	<b>1</b>	<b>11</b>	-	<b>85</b>	-	<b>80</b>	-	<b>82.5</b>	-	<b>90</b>	-
STEME	Maritime	2	24.5	16-33	100	100-100	100	100-100	100	100-100	100	100-100
	North East	2	6.5	5-8	99.3	98.5-100	100	100-100	100	100-100	100	100-100
	<b>Central Zone</b>	<b>4</b>	<b>15.5</b>	<b>5-33</b>	<b>99.6</b>	<b>98.5-100</b>	<b>100</b>	<b>100-100</b>	<b>100</b>	<b>100-100</b>	<b>100</b>	<b>100-100</b>
THLAR	Maritime	2	21.5	17-26	100	100-100	100	100-100	100	100-100	98.1	96.3-100
	<b>Central Zone</b>	<b>2</b>	<b>21.5</b>	<b>17-26</b>	<b>100</b>	<b>100-100</b>	<b>100</b>	<b>100-100</b>	<b>100</b>	<b>100-100</b>	<b>98.1</b>	<b>96.3-100</b>
URTUR	Maritime	1	49.6	-	85	-	97.5	-	97	-	77.5	-
	<b>Central Zone</b>	<b>1</b>	<b>49.6</b>	-	<b>85</b>	-	<b>97.5</b>	-	<b>97</b>	-	<b>77.5</b>	-
VERPE	Maritime	2	5	5-5	95.9	93.8-98	98.3	97.5-99	49	0-98	93.9	88.8-99
	North East	3	6.4	5.3-8	58.8	30-75	67.9	40-88.8	30	May-50	50	25-82.5
	<b>Central Zone</b>	<b>5</b>	<b>5.9</b>	<b>5-8</b>	<b>73.6</b>	<b>30-98</b>	<b>80.1</b>	<b>40-99</b>	<b>37.6</b>	<b>0-98</b>	<b>67.6</b>	<b>25-99</b>
VIOAR	Maritime	1	54	-	95	-	98.8	-	95	-	95	-
	North East	1	7	-	76.3	-	82.5	-	81.3	-	35	-
	<b>Central Zone</b>	<b>2</b>	<b>30.5</b>	<b>7-54</b>	<b>85.6</b>	<b>76.3-95</b>	<b>90.6</b>	<b>82.5-98.8</b>	<b>88.1</b>	<b>81.3-95</b>	<b>65</b>	<b>35-95</b>
XANST	South East	2	10.5	6-15	86.3	85-87.5	97.5	95-100	85.6	76.3-95	100	100-100
	<b>Central Zone</b>	<b>2</b>	<b>10.5</b>	<b>6-15</b>	<b>86.3</b>	<b>85-87.5</b>	<b>97.5</b>	<b>95-100</b>	<b>85.6</b>	<b>76.3-95</b>	<b>100</b>	<b>100-100</b>

NOTE: E9636 = rimsulfuron, X4145 = isoxadifen-ethyl, M6316= thifensulfuron methyl, KG691= adjuvant, non-ionic surfactant

### **Maize – application of GF-3969 using non-ionic surfactant and vegetable oil**

GF-3969 + KG691 provided equal control compared to GF-3969 + Codacide (vegetable oil) for major grasses (Table 3.2-23) such as: AGRRE (89% - 88%), ECHCG (97% - 94%), POAAN (98% - ~~98~~ 99%) and SORHA (93% - 92%). Control of SETVI was equivalent between GF-3969 + KG691, GF-3969 + Actirob and GF-3969 + Codacide at 89%, 89% and 84%, respectively.

Equal broad leaf weed control (Table 3.2-24) gained by the different surfactants can be demonstrated for major targets in maize such as: AMARE, AMBEL, CHEAL, CHEPO, GASPA, POLCO, POLPE and STEME. Since the clear majority of comparisons demonstrated equal control gained by the different surfactants, it is concluded that GF-3969 can either be recommended with a non-ionic surfactant, or with a vegetable oil.

**Table 3.2-23: Summary efficacy of GF-3969 at 135 g fp/ha using different (non-ionic and vegetable oil) surfactants – grasses across climatic regions**

Target grasses	EPP0 and administrative Zone	N° of trials	Infestation in the untreated control (pl/m <sup>2</sup> )		% Control												
					GF-3969 (135 g fp/ha)		GF-3969 (+ACTIRB)		GF-3969 (+ATPOLANBIO)		GF-3969 (+CODACI)		[EQUIPULT RA] [90 gA/ha]/ [120 gA/ha]		[LAUDIS] [148.5 gA/ha]		
					[E9636+M6316+X4145 +KG691] [20 gA/ha+12.5 gA/ha+15 gA/ha+0.2% v/v]		[E9636+M6316+X4145+ ACTIRB] [20 gA/ha+12.5 gA/ha+15 gA/ha+812/840/842 gA/ha]		[E9636+M6316+X4145+ATP OLANBIO] [20 gA/ha+12.5 gA/ha+15 gA/ha+1200 gA/ha]		[E9636+M6316+X4145+ CODACI] [20 gA/ha+12.5 gA/ha+15 gA/ha+1296 gA/ha]		Mean	Min-Max	Mean	Min-Max	
					Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	
AGRE	Maritime	8	29.5	5-118	89.3	73.8-98.3	66.3	50-82.5	83.8	83.8-83.8	88.1	65-97	87.8	72.5-100	45	0-82.5	
	<b>Central Zone</b>	<b>8</b>	<b>29.5</b>	<b>5-118</b>	<b>89.3</b>	<b>73.8-98.3</b>	<b>66.3</b>	<b>50-82.5</b>	<b>83.8</b>	<b>83.8-83.8</b>	<b>88.1</b>	<b>65-97</b>	<b>87.8</b>	<b>72.5-100</b>	<b>45</b>	<b>0-82.5</b>	
DIGSA	Maritime	5	66.4	10-150	77.6	48.8-96.8	63.8	38.8-88.8	93.3	93.3-93.3	89.6	86.3-94.3	75.6	50-90.8	88.8	71.3-98	
	South East	1	26	-	99.5	-	-	-	-	-	98.8	-	94.5	-	99.3	-	
	<b>Central Zone</b>	<b>6</b>	<b>59.7</b>	<b>10-150</b>	<b>81.3</b>	<b>48.8-99.5</b>	<b>63.8</b>	<b>38.8-88.8</b>	<b>93.3</b>	<b>93.3-93.3</b>	<b>91.5</b>	<b>86.3-98.8</b>	<b>79.4</b>	<b>50-94.5</b>	<b>90.5</b>	<b>71.3-99.3</b>	
ECHCG	Maritime	11	49.8	104-121	96.8	97.1	87.3-100	71.9	71.9-71.9	91	91-91	97.2	90.4-100	92.8	82.5-100	88	22.5-100
	North East	6	6.1	5-10	94.2	72.8-100	-	-	84.8	22.5-100	83.9	20-100	96.7	90-100	97.1	92.3-100	
	South East	9	19.5	5-75	99.2	97.5-100	86.3	72.5-100	94.4	88.8-100	97.7	91.3-100	99.1	97.8-100	95.1	83.8-99.3	
	<b>Central Zone</b>	<b>26</b>	<b>29.2</b>	<b>5-121</b>	<b>97.2</b>	<b>72.8-100</b>	<b>81.5</b>	<b>71.9-100</b>	<b>87.6</b>	<b>22.5-100</b>	<b>94.2</b>	<b>20-100</b>	<b>96</b>	<b>82.5-100</b>	<b>92.8</b>	<b>22.5-100</b>	
PAN DI	South East	1	7	-	90	-	-	-	-	-	96.5	-	88.3	-	97.8	-	
	<b>Central Zone</b>	<b>1</b>	<b>7</b>	<b>-</b>	<b>90</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>96.5</b>	<b>-</b>	<b>88.3</b>	<b>-</b>	<b>97.8</b>	<b>-</b>	
PAN VI	Maritime	1	19	-	95	-	-	-	-	-	80	-	80	-	90	-	
	<b>Central Zone</b>	<b>1</b>	<b>19</b>	<b>-</b>	<b>95</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>80</b>	<b>-</b>	<b>80</b>	<b>-</b>	<b>90</b>	<b>-</b>	
POAN	Maritime	3	7	5-10	97.5	92.5-100	100	100-100	100	100-100	98.8	97.5-100	96.7	90-100	68.8	37.5-100	
	<b>Central Zone</b>	<b>3</b>	<b>7</b>	<b>5-10</b>	<b>97.5</b>	<b>92.5-100</b>	<b>100</b>	<b>100-100</b>	<b>100</b>	<b>100-100</b>	<b>98.8</b>	<b>97.5-100</b>	<b>96.7</b>	<b>90-100</b>	<b>68.8</b>	<b>37.5-100</b>	
SETP F	North East	1	6.3	-	98.8	-	-	-	97	-	97.3	-	97.8	-	88.8	-	

Target grasses	Eppo and administrative Zone	N° of trials	Infestation in the untreated control (pl/m <sup>2</sup> )		% Control											
					GF-3969 (135 g fp/ha)		GF-3969 (+ACTIRB)		GF-3969 (+ATPOLANBIO)		GF-3969 (+CODACI)		[EQUIPULT RA] [90 gA/ha]/ [120 gA/ha]		[LAUDIS] [148.5 gA/ha]	
					[E9636+M6316+X4145 +KG691] [20 gA/ha+12.5 gA/ha+15 gA/ha+0.2% v/v]		[E9636+M6316+X4145+ACTIRB] [20 gA/ha+12.5 gA/ha+15 gA/ha+812/840/842 gA/ha]		[E9636+M6316+X4145+ATPOLANBIO] [20 gA/ha+12.5 gA/ha+15 gA/ha+1200 gA/ha]		[E9636+M6316+X4145+CODACI] [20 gA/ha+12.5 gA/ha+15 gA/ha+1296 gA/ha]		Mean	Min-Max	Mean	Min-Max
					Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max
	Central Zone	1	6.3	-	98.8	-	-	-	97	-	97.3	-	97.8	-	88.8	-
SETP U	Maritime	1	25	-	100	-	92.5	-	-	-	-	-	100	-	97.5	-
	Central Zone	1	25	-	100	-	92.5	-	-	-	-	-	100	-	97.5	-
SET VI	Maritime	1	10	-	57.5	-	-	-	-	-	45	-	30	-	99	-
	South East	3	12.3	4-16.5	99.7	99-100	89.4	78.8-100	96.9	93.8-100	97	93.8-100	99.5	98.5-100	93.3	90-98.8
	Central Zone	4	11.8	4-16.5	89.1	57.5-100	89.4	78.8-100	96.9	93.8-100	84	45-100	82.1	30-100	94.8	90-99
SONAR	Maritime	1	16	-	87.5	-	-	-	-	-	75	-	65	-	65	-
	Central Zone	1	16	-	87.5	-	-	-	-	-	75	-	65	-	65	-
SOR HA	South East	3	12	6-24	92.8	86.8-97.5	-	-	-	-	92	84.5-98.8	91.1	88-93.8	42.9	10-81.3
	Central Zone	3	12	6-24	92.8	86.8-97.5	-	-	-	-	92	84.5-98.8	91.1	88-93.8	42.9	10-81.3

NOTE: E9636 = rimsulfuron, X4145 = isoxadifen-ethyl, M6316= thifensulfuron methyl, KG691= adjuvant, non-ionic surfactant

**Table 3.2-24: Summary efficacy of GF-3969 at 135 g fp/ha using different (non-ionic and vegetable oil) surfactants – broad leaf weeds across climatic regions**

Target BLW	EPPO and administrative Zone	N° of trials	Infestation in the untreated control (pl/m2)		% Control											
					GF-3969 (135 g fp/ha)		GF-3969 (+ACTIRB)		GF-3969 (+ATPOLANBIO)		GF-3969 (+CODACI)		[EQUIPUL TRA] [90 gA/ha]/ [120 gA/ha]		[LAUDIS] [148.5 gA/ha]	
					Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max
ABU TH	Maritime	1	90	-	87.5	-	-	-	-	-	91	-	91.3	-	95.5	-
	South East	2	4.5	4-5	68.8	65-72.5	-	-	-	-	63.8	35-92.5	75	75-75	99.3	99-99.5
	<b>Central Zone</b>	<b>3</b>	<b>33</b>	<b>4-90</b>	<b>75</b>	<b>65-87.5</b>	-	-	-	-	<b>72.8</b>	<b>35-92.5</b>	<b>80.4</b>	<b>75-91.3</b>	<b>98</b>	<b>95.5-99.5</b>
AMALI	Maritime	1	5	-	100	-	-	-	-	98	-	99	-	100	-	
	<b>Central Zone</b>	<b>1</b>	<b>5</b>	-	<b>100</b>	-	-	-	-	<b>98</b>	-	<b>99</b>	-	<b>100</b>	-	
AMARE	Maritime	3	92.3	9-230	99.8	99.3-100	-	-	-	-	99.2	97.5-100	99.6	98.8-100	99	97-100
	North East	6	5.7	4-7	97.8	95-99	-	-	99.4	98.5-100	98.4	96-99.8	98.3	95-100	99.3	96.8-100
	South East	1	12.5	-	100	-	100	-	100	-	100	-	100	-	100	-
	<b>Central Zone</b>	<b>10</b>	<b>32.4</b>	<b>4-230</b>	<b>98.6</b>	<b>95-100</b>	<b>100</b>	<b>100-100</b>	<b>99.5</b>	<b>98.5-100</b>	<b>98.8</b>	<b>96-100</b>	<b>98.9</b>	<b>95-100</b>	<b>99.3</b>	<b>96.8-100</b>
AMB EL	South East	6	26.8	10-48	89.4	80-100	86.3	86.3	87.5	87.5-87.5	83.9	66.3-98	91.3	71.3-100	99.3	97.3-100
	<b>Central Zone</b>	<b>6</b>	<b>26.8</b>	<b>10-48</b>	<b>89.4</b>	<b>80-100</b>	<b>86.3</b>	<b>86.3</b>	<b>87.5</b>	<b>87.5-87.5</b>	<b>83.9</b>	<b>66.3-98</b>	<b>91.3</b>	<b>71.3-100</b>	<b>99.3</b>	<b>97.3-100</b>
ATX HO	Maritime	1	7	-	97.8	-	93.3	-	96	-	40	-	86.3	-	100	-
	<b>Central Zone</b>	<b>1</b>	<b>7</b>	-	<b>97.8</b>	-	<b>93.3</b>	-	<b>96</b>	-	<b>40</b>	-	<b>86.3</b>	-	<b>100</b>	-
BRS NN	North East	1	5	-	100	-	-	-	100	-	100	-	100	-	100	-
	<b>Central Zone</b>	<b>1</b>	<b>5</b>	-	<b>100</b>	-	-	-	<b>100</b>	-	<b>100</b>	-	<b>100</b>	-	<b>100</b>	-
	Maritime	1	5	-	98.8	-	-	-	-	-	100	-	100	-	97	-

Target BLW	Eppo and administrative Zone	N° of trials	Infestation in the untreated control (pl/m2)		% Control												
					GF-3969 (135 g fp/ha)		GF-3969 (+ACTIRB)		GF-3969 (+ATPOLANBIO)		GF-3969 (+CODACI)		[EQUIPULTRA] [90 gA/ha]/ [120 gA/ha]		[LAUDIS] [148.5 gA/ha]		
					Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	
BRS NW	Central Zone	1	5	-	98.8	-	-	-	-	-	-	100	-	100	-	97	-

Target BLW	EPPO and administrative Zone	N° of trials	Infestation in the untreated control (pl/m2)		% Control											
					GF-3969 (135 g fp/ha)		GF-3969 (+ACTIRB)		GF-3969 (+ATPOLANBIO)		GF-3969 (+CODACI)		[EQUIPUL TRA] [90 gA/ha]/ [120 gA/ha]		[LAUDIS] [148.5 gA/ha]	
					Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max
CHEAL	Maritime	4	31.4	9.5-83	96.8	77.5-100	91	63.8-99.5	98.5	98-99	92	40-100	89.7	66.3-100	95.8	73.8-100
	North East	8	9.5	5-18	90.9	77.5-98.5	-	-	95.5	86.3-100	86.1	47.5-97.5	83.3	30-98.3	97.9	90-100
	South East	5	12.4	5-19	99	96.5-100	-	-	-	-	95	87.5-100	92.2	83.8-99.3	99.4	97.3-100
	<b>Central Zone</b>	<b>7</b>	<b>21.4</b>	<b>5-83</b>	<b>95.4</b>	<b>77.5-100</b>	<b>91</b>	<b>63.8-99.5</b>	<b>96.1</b>	<b>86.3-100</b>	<b>90.7</b>	<b>40-100</b>	<b>88.2</b>	<b>30-100</b>	<b>97.1</b>	<b>73.8-100</b>
CHEHG	South East	1	6	-	99.3	-	-	-	-	-	99.8	-	97.5	-	99	-
	<b>Central Zone</b>	<b>1</b>	<b>6</b>	<b>-</b>	<b>99.3</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>99.8</b>	<b>-</b>	<b>97.5</b>	<b>-</b>	<b>99</b>	<b>-</b>
CHEPO	Maritime	4	19.2	5-56.3	93.9	80-100	-	-	-	-	92.4	71.3-100	99.6	99-100	99.8	99-100
	<b>Central Zone</b>	<b>4</b>	<b>19.2</b>	<b>5-56.3</b>	<b>93.9</b>	<b>80-100</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>92.4</b>	<b>71.3-100</b>	<b>99.6</b>	<b>99-100</b>	<b>99.8</b>	<b>99-100</b>
CIRAR	Maritime	1	7	-	90	-	-	-	-	-	80	-	88.8	-	75	-
	North East	1	5	-	81.3	-	-	60	-	92.5	-	30	-	95	-	
	<b>Central Zone</b>	<b>2</b>	<b>6</b>	<b>5-7</b>	<b>85.6</b>	<b>81.3-90</b>	<b>-</b>	<b>-</b>	<b>60</b>	<b>60-60</b>	<b>86.3</b>	<b>80-92.5</b>	<b>59.4</b>	<b>30-88.8</b>	<b>85</b>	<b>75-95</b>
DATST	Maritime	2	71.5	33-110	68.1	60-76.3	-	-	-	-	74.4	70-78.8	89	86.3-91.8	87.1	82.5-91.8
	South East	4	19	6-48	67.7	26.3-88	-	-	-	-	54.4	17.5-89	73.6	35-95.5	97.1	92.5-100
	<b>Central Zone</b>	<b>6</b>	<b>36.5</b>	<b>6-110</b>	<b>67.8</b>	<b>26.3-88</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>61.1</b>	<b>17.5-89</b>	<b>78.7</b>	<b>35-95.5</b>	<b>93.8</b>	<b>82.5-100</b>
ECGCH	Maritime	4	12	-	75	-	-	-	-	-	75	-	67.5	-	80	-
	<b>Central Zone</b>	<b>4</b>	<b>12</b>	<b>-</b>	<b>75</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>75</b>	<b>-</b>	<b>67.5</b>	<b>-</b>	<b>80</b>	<b>-</b>

Target BLW	Eppo and administrative Zone	N° of trials	Infestation in the untreated control (pl/m2)		% Control											
					GF-3969 (135 g fp/ha)		GF-3969 (+ACTIRB)		GF-3969 (+ATPOLANBIO)		GF-3969 (+CODACI)		[EQUIPUL TRA] [90 gA/ha]/ [120 gA/ha]		[LAUDIS] [148.5 gA/ha]	
					Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max
ERO CI	Maritime	1	5	-	80	-	-	-	-	-	70	-	62.5	-	0	-
	Central Zone	1	5	-	80	-	-	-	-	-	70	-	62.5	-	0	-
FUM OF	Maritime	1	8	-	92.5	-	-	-	-	-	77.5	-	62.5	-	0	-
	Central Zone	1	8	-	92.5	-	-	-	-	-	77.5	-	62.5	-	0	-
GAE TE	Maritime	1	19	-	100	-	-	-	-	-	95	-	77.5	-	100	-
	Central Zone	1	19	-	100	-	-	-	-	-	95	-	77.5	-	100	-

Target BLW	Eppo and administrative Zone	N° of trials	Infestation in the untreated control (pl/m2)		% Control										[EQUIPUL TRA] [90 gA/ha]/ [120 gA/ha]		[LAUDIS] [148.5 gA/ha]	
					GF-3969 (135 g fp/ha)		GF-3969 (+ACTIRB)		GF-3969 (+ATPOLANBIO)		GF-3969 (+CODACI)							
					Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max				
GAL AP	North East	2	6	6-6	70.6	42.5-98.8	-	-	76.9	55-98.8	41.3	40-42.5	95	90-100	84	83.8-85		
	<b>Central Zone</b>	<b>2</b>	<b>6</b>	<b>6-6</b>	<b>70.6</b>	<b>42.5-98.8</b>	<b>-</b>	<b>-</b>	<b>76.9</b>	<b>55-98.8</b>	<b>41.3</b>	<b>40-42.5</b>	<b>95</b>	<b>90-100</b>	<b>84</b>	<b>83.8-85</b>		
GAS CI	Maritime	1	49.8	-	99.5	-	-	-	-	98.5	-	100	-	100	-			
	<b>Central Zone</b>	<b>1</b>	<b>49.8</b>	<b>-</b>	<b>99.5</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>98.5</b>	<b>-</b>	<b>100</b>	<b>-</b>	<b>100</b>	<b>-</b>			
GAS PA	Maritime	3	27	13-48	96.7	91.5-100	100	100-100	-	-	95	91.3-98.8	91	90.5-91.3	99	98.8-100		
	<b>Central Zone</b>	<b>3</b>	<b>27</b>	<b>13-48</b>	<b>96.7</b>	<b>91.5-100</b>	<b>100</b>	<b>100-100</b>	<b>-</b>	<b>-</b>	<b>95</b>	<b>91.3-98.8</b>	<b>91</b>	<b>90.5-91.3</b>	<b>99</b>	<b>98.8-100</b>		
GER PU	Maritime	2	9.5	7-12	90	80-100	-	-	-	-	90	80-100	90	80-100	33	0-67.5		
	<b>Central Zone</b>	<b>2</b>	<b>9.5</b>	<b>7-12</b>	<b>90</b>	<b>80-100</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>90</b>	<b>80-100</b>	<b>90</b>	<b>80-100</b>	<b>33</b>	<b>0-67.5</b>		
HEL AN	Maritime	1	5	-	90	-	-	-	-	80	-	65	-	90	-			
	North East	1	6	-	30	-	-	22.5	-	30	-	32.5	-	35	-			
	South East	3	5.3	4-7	94.5	83.5-100	-	-	-	-	95.3	86-100	96	89.5-99.8	99	99.5-100		
	<b>Central Zone</b>	<b>5</b>	<b>5.4</b>	<b>4-7</b>	<b>80.7</b>	<b>30-100</b>	<b>-</b>	<b>-</b>	<b>22.5</b>	<b>22.5-22.5</b>	<b>79.2</b>	<b>30-100</b>	<b>77.2</b>	<b>32.5-99.8</b>	<b>84</b>	<b>35-100</b>		
HIBT R	South East	3	17.7	13-26	96.3	93.8-100	91.3	91.3-91.3	100	100-100	93.8	87.5-100	95	90-100	82	60-97.5		
	<b>Central Zone</b>	<b>3</b>	<b>17.7</b>	<b>13-26</b>	<b>96.3</b>	<b>93.8-100</b>	<b>91.3</b>	<b>91.3-91.3</b>	<b>100</b>	<b>100-100</b>	<b>93.8</b>	<b>87.5-100</b>	<b>95</b>	<b>90-100</b>	<b>82</b>	<b>60-97.5</b>		
LAM PU	Maritime	2	8.3	6-10.5	100	100-100	-	-	-	-	100	100-100	100	100-100	10	100-100		
	<b>Central Zone</b>	<b>2</b>	<b>8.3</b>	<b>6-10.5</b>	<b>100</b>	<b>100-100</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>100</b>	<b>100-100</b>	<b>100</b>	<b>100-100</b>	<b>10</b>	<b>100-100</b>		
MAT CH	Maritime	2	25	19.3-30.8	100	100-100	-	-	-	-	100	100-100	87	75-100	10	100-100		

Target	BLW and administrative Zone	N° of trials	Infestation in the untreated control (pl/m2)		% Control											
					GF-3969 (135 g fp/ha)		GF-3969 (+ACTIRB)		GF-3969 (+ATPOLANBIO)		GF-3969 (+CODACI)		[EQUIPUL TRA] [90 gA/ha]/ [120 gA/ha]		[LAUDIS] [148.5 gA/ha]	
					Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max
	Central Zone	2	25	19.3-30.8	100	100-100	-	-	-	-	100	100-100	87.5	75-100	100	100-100
MAT IN	Maritime	2	6.5	6-7	97.5	95-100	-	-	-	-	99.4	98.8-100	75	67.5-82.5	72	60-85
	North East	1	5	-	100	-	-	-	-	100	-	100	-	91	.3	-
	Central Zone	3	6	5-7	98.3	95-100	-	-	100	100-100	99.6	98.8-100	83.3	67.5-100	78.8	60-91.3

Target BLW	Eppo and administrative Zone	N° of trials	Infestation in the untreated control (pl/m2)		% Control											
					GF-3969 (135 g fp/ha)		GF-3969 (+ACTIRB)		GF-3969 (+ATPOLANBIO)		GF-3969 (+CODACI)		[EQUIPUL TRA] [90 gA/ha]/ [120 gA/ha]		[LAUDIS] [148.5 gA/ha]	
					Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max
MERA N	South East	2	6	6-6	56.9	26.3-87.5	-	-	-	-	53.8	17.5-90	93.1	92.5-93.8	91.6	87.5-95.8
	<b>Central Zone</b>	<b>2</b>	<b>6</b>	<b>6-6</b>	<b>56.9</b>	<b>26.3-87.5</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>53.8</b>	<b>17.5-90</b>	<b>93.1</b>	<b>92.5-93.8</b>	<b>91.6</b>	<b>87.5-95.8</b>
POL AV	Maritime	1	6	-	100	-	-	-	-	100	-	87.5	-	10	0	-
	South East	1	7	-	100	-	-	-	-	100	-	0	-	97.5	-	-
	<b>Central Zone</b>	<b>2</b>	<b>6.5</b>	<b>6-7</b>	<b>100</b>	<b>100-100</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>100</b>	<b>100-100</b>	<b>43.8</b>	<b>0-87.5</b>	<b>98.8</b>	<b>97.5-100</b>	
POL CO	Maritime	5	23.8	5-63	91.5	75-96.8	99.5	99.5-99.5	96	96-96	79.2	35-97	32.8	0-83.8	59.8	0-93.8
	North East	4	5.8	4-7	80.9	37.5-100	-	-	78.9	30-98.8	85.1	60-98	50.9	27.5-71.3	65	15-91.3
	South East	1	5	-	85.8	-	-	-	-	-	85.8	-	88.3	-	94.5	-
	<b>Central Zone</b>	<b>10</b>	<b>14.7</b>	<b>4-63</b>	<b>86.7</b>	<b>37.5-100</b>	<b>99.5</b>	<b>99.5-99.5</b>	<b>82.4</b>	<b>30-98.8</b>	<b>82.2</b>	<b>35-98</b>	<b>47</b>	<b>0-88.3</b>	<b>65.3</b>	<b>0-94.5</b>
POL LA	Maritime	3	7.7	5-9	99.7	99-100	-	-	-	-	98	95-100	85.5	57.5-100	96.3	90-100
	<b>Central Zone</b>	<b>3</b>	<b>7.7</b>	<b>5-9</b>	<b>99.7</b>	<b>99-100</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>98</b>	<b>95-100</b>	<b>85.5</b>	<b>57.5-100</b>	<b>96.3</b>	<b>90-100</b>
POL PE	Maritime	5	14.8	3-28.2	86.2	60-100	86.5	57.5-100	79	60-98	42.5	37.5-47.5	59.6	33-90	79.2	45-97.5
	North East	1	6	-	100	-	-	-	97.5	-	96.3	-	75	-	98.8	-
	<b>Central Zone</b>	<b>6</b>	<b>13.4</b>	<b>3-28.2</b>	<b>88.5</b>	<b>60-100</b>	<b>86.5</b>	<b>57.5-100</b>	<b>85.2</b>	<b>60-98</b>	<b>60.4</b>	<b>37.5-96.3</b>	<b>62.2</b>	<b>33-90</b>	<b>82.4</b>	<b>45-98.8</b>
RAP RA	Maritime	1	5	-	100	-	100	-	100	-	100	-	100	-	10	0
	<b>Central Zone</b>	<b>1</b>	<b>5</b>	<b>-</b>	<b>100</b>	<b>-</b>	<b>100</b>	<b>-</b>	<b>100</b>	<b>-</b>	<b>100</b>	<b>-</b>	<b>100</b>	<b>-</b>	<b>10</b>	<b>0</b>

Target BLW	Eppo and administrative Zone	N° of trials	Infestation in the untreated control (pl/m2)		% Control											
					GF-3969 (135 g fp/ha)		GF-3969 (+ACTIRB)		GF-3969 (+ATPOLANBIO)		GF-3969 (+CODACI)		[EQUIPUL TRA] [90 gA/ha]/ [120 gA/ha]		[LAUDIS] [148.5 gA/ha]	
					Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max
SOL NI	Maritime	3	6.4	4.1-10	58.3 46.7	37.5-82.5 55.0	58.3	38.8-78.8	60	60-60	57.5	57.5-57.5	97.8	96.3-100	97.5	95-100
	North East	1	5	-	57.5	-	-	-	45	-	37.5	-	99.5	-	100	-
	<b>Central Zone</b>	<b>4</b>	<b>6</b>	<b>4.1-10</b>	<b>58.1 49.4</b>	<b>37.5-82.5 57.5</b>	<b>58.3</b>	<b>38.8-78.8</b>	<b>52.5</b>	<b>45-60</b>	<b>47.5</b>	<b>37.5-57.5</b>	<b>98.2</b>	<b>96.3-100</b>	<b>98.1</b>	<b>95-100</b>
SON AR	Maritime	1	16	-	87.5	-	-	-	-	-	75	-	65	-	65	-
	<b>Central Zone</b>	<b>1</b>	<b>16</b>	-	<b>87.5</b>	-	-	-	-	-	<b>75</b>	-	<b>65</b>	-	<b>65</b>	-
SPR AR	Maritime	1	5	-	100	-	-	-	-	-	100	-	100	-	100	-
	<b>Central Zone</b>	<b>1</b>	<b>5</b>	-	<b>100</b>	-	-	-	-	-	<b>100</b>	-	<b>100</b>	-	<b>100</b>	-
STA PA	Maritime	1	11	-	80	-	-	-	-	-	82.5	-	82.5	-	90	-
	<b>Central Zone</b>	<b>1</b>	<b>11</b>	-	<b>80</b>	-	-	-	-	-	<b>82.5</b>	-	<b>82.5</b>	-	<b>90</b>	-
STE ME	Maritime	2	24.5	16-33	100	100-100	100	100-100	100	100-100	100	100-100	100	100-100	100	100-100
	North East	2	6.5	5-8	100	100-100	-	-	100	-	100	-	100	100-100	100	100-100
	<b>Central Zone</b>	<b>4</b>	<b>15.5</b>	<b>5-33</b>	<b>100</b>	<b>100-100</b>	<b>100</b>	<b>100-100</b>	<b>100</b>	<b>100-100</b>	<b>100</b>	<b>100-100</b>	<b>100</b>	<b>100-100</b>	<b>100</b>	<b>100-100</b>
THL AR	Maritime	2	21.5	17-26	100	100-100	-	-	-	-	100	100-100	100	100-100	98.1	96.3-100
	<b>Central Zone</b>	<b>2</b>	<b>21.5</b>	<b>17-26</b>	<b>100</b>	<b>100-100</b>	-	-	-	-	<b>100</b>	<b>100-100</b>	<b>100</b>	<b>100-100</b>	<b>98.1</b>	<b>96.3-100</b>
URT UR	Maritime	1	49.6	-	97.5	-	97.5	-	-	-	-	-	97	-	77.5	-
	<b>Central Zone</b>	<b>1</b>	<b>49.6</b>	-	<b>97.5</b>	-	<b>97.5</b>	-	-	-	-	-	<b>97</b>	-	<b>77.5</b>	-
VER PE	Maritime	2	5	5-5	98.3	97.5-99	-	-	-	-	95.8	92.5-99	49	0-98	93.9	88.8-99

Target BLW	EPPO and administrative Zone	N° of trials	Infestation in the untreated control (pl/m2)		% Control											
					GF-3969 (135 g fp/ha)		GF-3969 (+ACTIRB)		GF-3969 (+ATPOLANBIO)		GF-3969 (+CODACI)		[EQUIPUL TRA] [90 gA/ha]/ [120 gA/ha]		[LAUDIS] [148.5 gA/ha]	
					Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max
Target BLW	North East	3	6.4	5.3-8	67.9	40-88.8	-	-	70.7	37.5-88.8	61.3	35-86.3	30	5-50	50	25-82.5
	<b>Central Zone</b>	<b>5</b>	<b>5.9</b>	<b>5-8</b>	<b>80.1</b>	<b>40-99</b>	-	-	<b>70.7</b>	<b>37.5-88.8</b>	<b>75.1</b>	<b>35-99</b>	<b>37.6</b>	<b>0-98</b>	<b>67.6</b>	<b>25-99</b>
	VIO AR	1	54	-	98.8	-	-	-	-	100	-	95	-	95	-	
VIO AR	North East	1	7	-	82.5	-	-	87.5	-	88.8	-	81.3	-	35	-	
	<b>Central Zone</b>	<b>2</b>	<b>30.5</b>	<b>7-54</b>	<b>90.6</b>	<b>82.5-98.8</b>	-	-	<b>87.5</b>	<b>87.5-87.5</b>	<b>94.4</b>	<b>88.8-100</b>	<b>88.1</b>	<b>81.3-95</b>	<b>65</b>	<b>35-95</b>
XAN ST	South East	2	10.5	6-15	97.5	95-100	97.5	97.5	100	100-100	93.8	87.5-100	85.6	76.3-95	100	100-100
	<b>Central Zone</b>	<b>2</b>	<b>10.5</b>	<b>6-15</b>	<b>97.5</b>	<b>95-100</b>	<b>97.5</b>	<b>97.5</b>	<b>100</b>	<b>100-100</b>	<b>93.8</b>	<b>87.5-100</b>	<b>85.6</b>	<b>76.3-95</b>	<b>100</b>	<b>100-100</b>

NOTE: E9636 = rimsulfuron, X4145 = isoxadifen-ethyl, M6316= thifensulfuron methyl, KG691= adjuvant, non-ionic surfactant

### Maize – split application of GF-3969

The benefit of applying GF-3969 + surfactant as split application is demonstrated for grasses and broadleaf weeds in the following tables.

Split application of GF-3969 can either be done in the ratio of 50:50 (67.5 g fp/ha GF-3969 per shot: AT, BE, CZ, DE, HU, NL, LU, PL, RO, SK) or as ~~60:40~~ 63:37 (85 g fp/ha first application, 50 g fp/ha second application) for AT, CZ, and DE.

Table 3.2-25 demonstrates that either of the split application scenario (60-40 or 50-50) may further increase the control of major grasses such as ECHCG, DIGSA and SETVI compared to single applications of GF-3969 + surfactant. In particular, the maritime and northeast dataset for ECHCG and the maritime dataset for DIGSA indicate that a second application of GF-3969 + surfactant ensures a long-lasting control of these major target grasses in maize. It is therefore concluded that the split application of GF-3969 + surfactant can clearly be justified and provides an efficient tool for farmers to better control certain grasses in maize across the different climatic regions.

Additionally, the benefit of either of the split application schemes of GF-3969 + surfactant can be justified for broadleaf weeds as depicted in Table 3.2-26. In particular: ABUTH, AMBEL, CHEAL, DATST, HELAN, HIBTR, POLCO and POLPE demonstrated increased susceptibility after applying a second application of GF-3969. Notably after split application of GF-3969 + surfactant, the control of ABUTH and DATST was increased by 20% compared to the single application. Also, POLPE and POLCO control was increased after a second application of GF-3969 + surfactant.

Overall it is therefore concluded that either of the split application schemes of GF-3969 + surfactant across the CEU regulatory zone can clearly be justified.

**Table 3.2-25: Efficacy comparison of GF-3969 applied as single or split application (at 2\*67.5 g fp/ha or as 85 + 50 g fp/ha application) on grasses in maize across climatic regions**

Target	EPPo or administrative Zone	N° of trials	Infestation in the untreated control (pl/m <sup>2</sup> ) at 1st applic.				Infestation in the untreated control (pl/m <sup>2</sup> ) at 2nd applic.				% Control							
			Mean	Min-Max	Mean	Min-Max	GF-3969 + Surfactant (N)		GF-3969 + surfactant (60:40 63:37)		GF-3969 + surfactant (50:50)		[EQUIP ULTRA] [90 gA/ha]/ [120 gA/ha]		[LAUDIS] [148.5 gA/ha]		[ARIGO+TRE 90] [127.5 gA/ha+0.2% v/v]	
							Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max
AGRRE	Maritime	8	29.5	5-118	27.3	5-85	89.3	73.8-98.3	90.3	79.8-99.8	91.6	83.8-100	87.8	72.5-100	45	0-82.5	-	-
	Central Zone	8	29.5	5-118	27.3	5-85	89.3	73.8-98.3	90.3	79.8-99.8	91.6	83.8-100	87.8	72.5-100	45	0-82.5	-	-
DIGSA	Maritime	5	66.4	10-150	66.4	10-170	77.6	48.8-96.8	82.8 83.2	43.8-97.1	86.9	62.5-96	75.6	50-90.8	88.8	71.3-98	72.5	72.5-72.5
	South East	1	26	-	27	-	99.5	-	99.8	-	99.5	-	94.5	-	99.3	-	-	-
	Central Zone	6	59.7	10-150	59.8	10-170	81.3	48.8-99.5	85.6 85.9	43.8-99.8	89	62.5-99.5	79.4	50-94.5	90.5	71.3-99.3	72.5	72.5-72.5
ECHCG	Maritime	11	54.3	10-121	60.8	10-138	96.8 97.1	87.3-100	98	92.5-100	98.5	94.8-100	92.8 93.4	82.5-100	88.4	22.5-100	-	-
	North East	6	6.1	5-10	6.6	5-11	94.2	72.8-100	-	-	97.8	93.8-100	96.7	90-100	97.1	92.3-100	-	-
	South East	9	19.5	5-32	13.3	5-35	99.1	97.5-100	99.3	97.8-100	98.3	92.5-100	99.2 99.1	97.8-100	94.6 95.1	83.8-99.3	-	-
	Central Zone	24	30.2	5-121	31.4	5-138	96.9 97.2	72.8-100	98.4	92.5-100	98.3	92.5-100	95.9 92.3	82.5-100	92.5 92.7	22.5-100	-	-
PANDI	South East	1	7	-	10	-	90	-	85	-	95.8	-	88.3	-	97.8	-	-	-
	Central Zone	1	7	-	10	-	90	-	85	-	95.8	-	88.3	-	97.8	-	-	-
PANVI	Maritime	1	19	-	19	-	95	-	98.8	-	98.8	-	80	-	90	-	-	-
	Central Zone	1	19	-	19	-	95	-	98.8	-	98.8	-	80	-	90	-	-	-
POAAN	Maritime	3	8.7	6.5-10	8.8	7.5-10	100 97.5	100 92.5-100	100 93.3	100 80-100	100	100-100	100 96.7	100 90-100	68.8	37.5-100	-	-
	Central Zone	3	8.7	6.5-10	8.8	7.5-10	100 97.5	100 92.5-100	100 93.3	100 80-100	100	100-100	100 96.7	100 100-100	68.8	37.5-100	-	-
SETPF	North East	1	6.3	-	8	-	98.8	-	-	-	96.5	-	97.8	-	88.8	-	-	-
	Central Zone	1	6.3	-	8	-	98.8	-	-	-	96.5	-	97.8	-	88.8	-	-	-

Target	Eppo or administrative Zone	N° of trials	Infestation in the untreated control (pl/m <sup>2</sup> ) at 1st applic.		Infestation in the untreated control (pl/m <sup>2</sup> ) at 2nd applic.		% Control											
							GF-3969 + Surfactant (N)		GF-3969 + surfactant (60:40 63:37)		GF-3969 + surfactant (50:50)		[EQUIP ULTRA] [90 gA/ha]/ [120 gA/ha]		[LAUDIS] [148.5 gA/ha]		[ARIGO+TRE 90] [127.5 gA/ha+0.2% v/v]	
							Mean	Min-Max	Mean	Min-Max	Mean	Min-Max						
SETP U	Maritime	1	25	-	20	-	100	-	100	-	100	-	100	-	97.5	-	-	-
	Central Zone	1	25	-	20	-	100	-	100	-	100	-	100	-	97.5	-	-	-
SETVI	Maritime	1	10	-	13	-	57.5	-	89.5	-	95	-	30	-	99	-	-	-
	South East	3	12.3	4-16.5	14.2	5-18.8	99.7	99-100	99.6	98.8-100	99.4	98.3-100	99.5	98.5-100	93.3	90-98.8	-	-
	Central Zone	4	11.8	4-16.5	13.9	5-18.8	89.1	57.5-100	97.1	89.5-100	98.3	95-100	82.1	30-100	94.8	90-99	-	-
SORH A	South East	3	12	6-24	12	6-24	92.8	86.8-97.5	91.3	88.5-94	89	76.8-96.3	91.1	88-93.8	42.9	10-81.3	-	-
	Central Zone	3	12	6-24	12	6-24	92.8	86.8-97.5	91.3	88.5-94	89	76.8-96.3	91.1	88-93.8	42.9	10-81.3	-	-

NOTE: E9636 = rimsulfuron, X4145 = isoxadifen-ethyl, M6316= thifensulfuron methyl, KG691= adjuvant, non-ionic surfactant

**Table 3.2-26: Efficacy comparison of GF-3969 applied as single or split application (at 2\*67.5 g fp/ha or as 85 + 50 g fp/ha application) on broad leaf weeds in maize across climatic regions**

Target	Eppo or administrative Zone	N° of trials	Infestation in the untreated control (pl/m <sup>2</sup> ) at 1st applic.		Infestation in the untreated control (pl/m <sup>2</sup> ) at 2nd applic.		% Control											
							GF-3969 (N)		GF-3969 (60:40 63:37)		GF-3969 (50:50)		[EQUIP ULTRA] [90 gA/ha]/ [120 gA/ha]		[LAUDIS] [148.5 gA/ha]		[ARIGO+TR E90] [127.5 gA/ha+0.2% v/v]	
							Mean	Min-Max	Mean	Min-Max	Mean	Min-Max						
ABUTH	Maritime	1	90	-	110	-	87.5	-	94.8	-	97.3	-	91.3	-	95.5	-	-	-
	South East	2	4.5	4-5	5.5	5-6	68.8	65-72.5	98.8	98.8-98.8	98.5	98.5-98.5	75	75-75	99.3	99-99.5	-	-
	Central Zone	3	33	4-90	40.3	5-110	75	65-87.5	96.8	94.8-98.8	98.1	97.3-98.5	80.4	75-91.3	98	95.5-99.5	-	-
AMALI	Maritime	1	5	-	5	-	100	-	99.5	-	100	-	99	-	100	-	-	-
	Central Zone	1	5	-	5	-	100	-	99.5	-	100	-	99	-	100	-	-	-

Target	EPP0 or administrative Zone	N° of trials	Infestation in the untreated control (pl/m2) at 1st applic.		Infestation in the untreated control (pl/m2) at 2nd applic.		% Control														
							GF-3969 (N)		GF-3969 (50:40 63:37)		GF-3969 (50:50)		[EQUIP ULTRA] [90 gA/ha]/ [120 gA/ha]		[LAUDIS] [148.5 gA/ha]		[ARIGO+TR E90] [127.5 gA/ha+0.2% v/v]				
							[E9636+M6316+X4145+KG691] [20 gA/ha+12.5 gA/ha+15 gA/ha+0.2% v/v]		2[E9636+M6316+X4145+KG691] [12 gA/ha+7.5 gA/ha+9 gA/ha+0.2% v/v] [8 gA/ha+5 gA/ha+6 gA/ha+0.2% v/v]		2[E9636+M6316+X4145+KG691] 2[10 gA/ha+6.25 gA/ha+7.5 gA/ha+0.2% v/v]										
							Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	
AMARE	Maritime	3	92.3	9-230	93.3	10-230	99.8	99.3-100	99.8	99.5-100	100	100-100	99.6	98.8-100	99	97-100	-	-			
	North East	6	5.7	4-7	6.5	5-8	97.8	95-99	-	-	98.9	98.8	96.8-100	98.3	95-100	99.3	96.8-100	-	-		
	South East	1	12.5	-	14.3	-	100	-	100	-	100	-	100	-	100	-	-	-	-		
	<b>Central Zone</b>	<b>10</b>	<b>32.4</b>	<b>4-230</b>	<b>33.3</b>	<b>5-230</b>	<b>98.6</b>	<b>95-100</b>	<b>99.9</b>	<b>99.5-100</b>	<b>99.4</b>	<b>96.8-100</b>	<b>98.9</b>	<b>95-100</b>	<b>99.3</b>	<b>96.8-100</b>	-	-			
AMBEL	South East	5	27.2	10-48	28	10-49	90.4	89.4	80-100	96	88.5-100	88.8	89.2	72.5-100	90.2	91.3	71.3-100	99.3	97.3-100	-	-
	<b>Central Zone</b>	<b>5</b>	<b>27.2</b>	<b>10-48</b>	<b>28</b>	<b>10-49</b>	<b>90.4</b>	<b>89.4</b>	<b>80-100</b>	<b>96</b>	<b>88.5-100</b>	<b>88.8</b>	<b>89.2</b>	<b>72.5-100</b>	<b>90.2</b>	<b>91.3</b>	<b>71.3-100</b>	<b>99.3</b>	<b>97.3-100</b>	-	-
ATXHO	Maritime	1	7	-	7	-	97.8	-	-	91.3	-	96.8	-	86.3	-	100	-	-	-	-	
	<b>Central Zone</b>	<b>1</b>	<b>7</b>	<b>-</b>	<b>7</b>	<b>-</b>	<b>97.8</b>	<b>-</b>	<b>-</b>	<b>91.3</b>	<b>-</b>	<b>96.8</b>	<b>-</b>	<b>86.3</b>	<b>-</b>	<b>100</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	
BRSN	North East	1	5	-	6	-	100	-	-	-	-	100	-	100	-	100	-	-	-	-	
	<b>Central Zone</b>	<b>1</b>	<b>5</b>	<b>-</b>	<b>6</b>	<b>-</b>	<b>100</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>100</b>	<b>-</b>	<b>100</b>	<b>-</b>	<b>100</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	
BRSN	Maritime	1	5	-	5	-	98.8	-	100	-	100	-	100	-	97	-	-	-	-		
	<b>Central Zone</b>	<b>1</b>	<b>5</b>	<b>-</b>	<b>5</b>	<b>-</b>	<b>98.8</b>	<b>-</b>	<b>100</b>	<b>-</b>	<b>100</b>	<b>-</b>	<b>100</b>	<b>-</b>	<b>97</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>		
CHEAL	Maritime	14	31.4	9.5-83	31.7	10-84	96.8	77.5-100	99.3	94.5-100	99.6	97.5-100	89.7	66.3-100	95.8	73.8-100	99.5	99.5			
	North East	8	9.5	5-18	10.2	6-17	90.9	77.5-98.5	-	-	87.4	27.5-98.5	83.3	30-98.3	97.9	90-100	-	-			
	South East	4	10.8	12.4	5-19	11.5	6-19	98.8	99	96.5-100	98.8	98.8	90.4	83.8-96.5	99.3	99.4	97.3-100	-	-		
	<b>Central Zone</b>	<b>26</b>	<b>21.5</b>	<b>21.4</b>	<b>5-83</b>	<b>22</b>	<b>6-84</b>	<b>95.3</b>	<b>95.4</b>	<b>77.5-100</b>	<b>99.3</b>	<b>94.5-100</b>	<b>95.8</b>	<b>27.5-100</b>	<b>88.2</b>	<b>30-100</b>	<b>97.1</b>	<b>73.8-100</b>	<b>99.5</b>	<b>99.5</b>	
CHEHG	South East	1	6	-	6	-	99.3	-	100	-	99.8	-	97.5	-	99	-	-	-	-		
	<b>Central Zone</b>	<b>1</b>	<b>6</b>	<b>-</b>	<b>6</b>	<b>-</b>	<b>99.3</b>	<b>-</b>	<b>100</b>	<b>-</b>	<b>99.8</b>	<b>-</b>	<b>97.5</b>	<b>-</b>	<b>99</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>		
CHEPO	Maritime	4	19.2	5-56.3	21	5-57.3	93.9	80-100	95.1	81.3-100	91.6	67.5-100	99.6	99-100	99.8	99-100	-	-			
	<b>Central Zone</b>	<b>4</b>	<b>19.2</b>	<b>5-56.3</b>	<b>21</b>	<b>5-57.3</b>	<b>93.9</b>	<b>80-100</b>	<b>95.1</b>	<b>81.3-100</b>	<b>91.6</b>	<b>67.5-100</b>	<b>99.6</b>	<b>99-100</b>	<b>99.8</b>	<b>99-100</b>	<b>-</b>	<b>-</b>			

Target	EPP0 or administrative Zone	N° of trials	Infestation in the untreated control (pl/m2) at 1st applic.		Infestation in the untreated control (pl/m2) at 2nd applic.		% Control											
							GF-3969 (N)		GF-3969 (50:40 63:37)		GF-3969 (50:50)		[EQUIP ULTRA] [90 gA/ha]/ [120 gA/ha]		[LAUDIS] [148.5 gA/ha]		[ARIGO+TR E90] [127.5 gA/ha+0.2% v/v]	
							[E9636+M6316+X4145+KG691] [20 gA/ha+12.5 gA/ha+15 gA/ha+0.2% v/v]		2[E9636+M6316+X4145+KG691] [12 gA/ha+7.5 gA/ha+9 gA/ha+0.2% v/v] [8 gA/ha+5 gA/ha+6 gA/ha+0.2% v/v]		2[E9636+M6316+X4145+KG691] 2[10 gA/ha+6.25 gA/ha+7.5 gA/ha+0.2% v/v]							
							Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max
CIRAR	Maritime	1	7	-	7	-	90	-	93.8	-	80	-	88.8	-	75	-	-	-
	North East	1	5	-	5	-	81.3	-	-	-	57.5	-	30	-	95	-	-	-
	Central Zone	2	6	5-7	6	5-7	85.6	81.3-90	93.8	93.8-93.8	68.8	57.5-80	59.4	30-88.8	85	75-95	-	-
DATS	Maritime	2	71.5	33-110	86	32-140	68.1	60-76.3	80.6	80-81.3	83.4	83-83.8	89	86.3-91.8	87.1	82.5-91.8	-	-
	South East	3-4	29.7-19.0	6-48	23	7-52	61.4-67.7	26.3-88	90.4	87.5-93.3	90.5	82.5-96.8	72.3-73.6	35-95.5	96.1-97.1	92.5-99.3	100	-
	Central Zone	5-6	41-36.5	6-110	48.2	7-140	64.1-67.8	26.3-88	85.5	80-93.3	87.7	82.5-96.8	79-78.7	35-95.5	92.5-93.8	82.5-99.3	100	-
ECCGH	Maritime	1	42	-	42	-	75	-	90	-	67.5	-	67.5	-	80	-	-	-
	Central Zone	1	42	-	42	-	75	-	90	-	67.5	-	67.5	-	80	-	-	-
EROCI	Maritime	1	5	-	5	-	80	-	95	-	95	-	62.5	-	0	-	-	-
	Central Zone	1	5	-	5	-	80	-	95	-	95	-	62.5	-	0	-	-	-
FUMOF	Maritime	1	8	-	8	-	92.5	-	93.8	-	98.5	-	62.5	-	0	-	-	-
	Central Zone	1	8	-	8	-	92.5	-	93.8	-	98.5	-	62.5	-	0	-	-	-
GAETE	Maritime	1	19	-	20	-	100	-	100	-	100	-	77.5	-	100	-	-	-
	Central Zone	1	19	-	20	-	100	-	100	-	100	-	77.5	-	100	-	-	-
GALAP	North East	2	6	6-6	6.5	6-7	70.6	42.5-98.8	-	-	86.3	75-97.5	95	90-100	84.4	83.8-85	-	-
	Central Zone	2	6	6-6	6.5	6-7	70.6	42.5-98.8	-	-	86.3	75-97.5	95	90-100	84.4	83.8-85	-	-
GASCI	Maritime	1	49.8	-	66.8	-	99.5	-	100	-	100	-	100	-	100	-	-	-
	Central Zone	1	49.8	-	66.8	-	99.5	-	100	-	100	-	100	-	100	-	-	-

Target	EPP0 or administrative Zone	N° of trials	Infestation in the untreated control (pl/m2) at 1st applic.		Infestation in the untreated control (pl/m2) at 2nd applic.		% Control											
							GF-3969 (N)		GF-3969 (50:40 63:37)		GF-3969 (50:50)		[EQUIP ULTRA] [90 gA/ha]/ [120 gA/ha]		[LAUDIS] [148.5 gA/ha]		[ARIGO+TR E90] [127.5 gA/ha+0.2% v/v]	
							[E9636+M6316+X4145+KG691] [20 gA/ha+12.5 gA/ha+15 gA/ha+0.2% v/v]		2[E9636+M6316+X4145+KG691] [12 gA/ha+7.5 gA/ha+9 gA/ha+0.2% v/v] [8 gA/ha+5 gA/ha+6 gA/ha+0.2% v/v]		2[E9636+M6316+X4145+KG691] 2[10 gA/ha+6.25 gA/ha+7.5 gA/ha+0.2% v/v]							
							Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max
GASP A	Maritime	3	27	13-48	28.8	16-48	96.7	91.5-100	95.8	90.5-100	96.7	91.3-100	91	90.5-91.3	99.3	98.8-100	-	-
	Central Zone	3	27	13-48	28.8	16-48	96.7	91.5-100	95.8	90.5-100	96.7	91.3-100	91	90.5-91.3	99.3	98.8-100	-	-
GERP U	Maritime	2	9.5	7-12	9.5	7-12	90	80-100	100	100-100	100	100-100	90	80-100	33.8	0-67.5	-	-
	Central Zone	2	9.5	7-12	9.5	7-12	90	80-100	100	100-100	100	100-100	90	80-100	33.8	0-67.5	-	-
HELAN	Maritime	1	5	-	5	-	90	-	93.8	-	90	-	65	-	90	-	-	-
	North East	1	6	-	7	-	30	-	-	-	20	-	32.5	-	35	-	-	-
	South East	2	4.5	5.3	4.5	4.5	91.8	94.5	83.5-100	93.9	87.8-100	93.9	95.9	87.8-100	94.6	89.5-99.8	99.8	99.5-100
	Central Zone	4	5.4	4-6	5.3	4-7	75.9	80.7	30-100	93.8	87.8-100	74.4	20-100	77.2	32.5-99.8	84.9	35-100	-
HIBTR	South East	3	17.7	13-26	18.8	14.3-26	96.3	93.8-100	100	100-100	91.7	82.5-100	95	90-100	82.9	60-97.5	-	-
	Central Zone	3	17.7	13-26	18.8	14.3-26	96.3	93.8-100	100	100-100	91.7	82.5-100	95	90-100	82.9	60-97.5	-	-
LAMP U	Maritime	2	8.3	6-10.5	11.9	6-17.8	100	100-100	100	100-100	100	100-100	100	100-100	100	100-100	-	-
	Central Zone	2	8.3	6-10.5	11.9	6-17.8	100	100-100	100	100-100	100	100-100	100	100-100	100	100-100	-	-
MATCH	Maritime	2	25	19.3-30.8	41	29.5-53.3	100	100-100	100	100-100	100	100-100	87.5	75-100	100	100-100	-	-
	Central Zone	2	25	19.3-30.8	41	29.5-53.3	100	100-100	100	100-100	100	100-100	87.5	75-100	100	100-100	-	-
MATIN	Maritime	2	6.5	6-7	6.5	6-7	97.5	95-100	100	100-100	100	100-100	75	67.5-82.5	72.5	60-85	-	-
	Central Zone	3	6	5-7	6	5-7	98.3	95-100	100	100-100	100	100-100	83.3	67.5-100	78.8	60-91.3	-	-
MERAN	South East	2	6	6-6	7	7-7	56.9	26.3-87.5	96.5	96.5-96.5	96.1	95-97.3	93.1	92.5-93.8	91.6	87.5-95.8	-	-
	Central Zone	2	6	6-6	7	7-7	56.9	26.3-87.5	96.5	96.5-96.5	96.1	95-97.3	93.1	92.5-93.8	91.6	87.5-95.8	-	-
	Maritime	+	19	-	19	-	95	-	98.8	-	98.8	-	80	-	90	-	-	-

Target	EPP0 or administrative Zone	N° of trials	Infestation in the untreated control (pl/m2) at 1st applic.		Infestation in the untreated control (pl/m2) at 2nd applic.		% Control											
							GF-3969 (N)		GF-3969 (50:40 63:37)		GF-3969 (50:50)		[EQUIP ULTRA] [90 gA/ha]/ [120 gA/ha]		[LAUDIS] [148.5 gA/ha]		[ARIGO+TR E90] [127.5 gA/ha+0.2% v/v]	
							Mean	Min-Max	Mean	Min-Max	Mean	Min-Max						
PANV ‡	Central Zone	‡	19	-	19	-	95	-	98.8	-	98.8	-	80	-	90	-	-	-



Target	EPP0 or administrative Zone	N° of trials	Infestation in the untreated control (pl/m2) at 1st applic.		Infestation in the untreated control (pl/m2) at 2nd applic.		% Control											
							GF-3969 (N)		GF-3969 (50:40 63:37)		GF-3969 (50:50)		[EQUIP ULTRA] [90 gA/ha]/ [120 gA/ha]		[LAUDIS] [148.5 gA/ha]		[ARIGO+TR E90] [127.5 gA/ha+0.2% v/v]	
							[E9636+M6316+X4145+KG691] [20 gA/ha+12.5 gA/ha+15 gA/ha+0.2% v/v]		2[E9636+M6316+X4145+KG691] [12 gA/ha+7.5 gA/ha+9 gA/ha+0.2% v/v] [8 gA/ha+5 gA/ha+6 gA/ha+0.2% v/v]		2[E9636+M6316+X4145+KG691] 2[10 gA/ha+6.25 gA/ha+7.5 gA/ha+0.2% v/v]							
							Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max	Mean	Min-Max
SPRARR	Central Zone	1	5	-	5	-	100	-	100	-	100	-	100	-	100	-	-	-
STAP A	Maritime	1	11	-	12	-	80	-	95	-	92.5	-	82.5	-	90	-	-	-
	Central Zone	1	11	-	12	-	80	-	95	-	92.5	-	82.5	-	90	-	-	-
STEME	Maritime	2	24.5	16-33	24.5	12-37	100	100-100	100	100-100	100	100-100	100	100-100	100	100-100	-	-
	North East	2	6.5	5-8	9	-	100	100-100	-	-	100	100-100	100	100-100	100	100-100	-	-
	Central Zone	3	15.5	5-33	19.3	9-37	100	100-100	100	100-100	100	100-100	100	100-100	100	100-100	-	-
THLAR	Maritime	2	21.5	17-26	21.5	17-26	100	100-100	100	100-100	100	100-100	100	100-100	98.1	96.3-100	-	-
	Central Zone	2	21.5	17-26	21.5	17-26	100	100-100	100	100-100	100	100-100	100	100-100	98.1	96.3-100	-	-
URTUR	Maritime	1	49.6	-	55.3	-	97.5	-	98.8	-	100	-	97	-	77.5	-	-	-
	Central Zone	1	49.6	-	55.3	-	97.5	-	98.8	-	100	-	97	-	77.5	-	-	-
VERPE	Maritime	2	5	5-5	5.5	5-6	98.3	97.5-99	95.8	92.5-99	96.9	94.8-99	49	0-98	93.9	88.8-99	-	-
	North East	3	6.4	5.3-8	7.7	6-9	67.9	40-88.8	-	-	62.4	40-91	30	5-50	50	25-82.5	-	-
	Central Zone	5	5.9	5-8	6.8	5-9	80.1	40-99	95.8	92.5-99	76.2	40-99	37.6	0-98	67.6	25-99	-	-
VIOARR	Maritime	1	54	-	51	-	98.8	-	95	-	98.8	-	95	-	95	-	-	-
	North East	1	7	-	7	-	82.5	-	-	-	86.3	-	81.3	-	35	-	-	-
	Central Zone	2	30.5	7-54	29	7-51	90.6	82.5-98.8	95	95-95	92.5	86.3-98.8	88.1	81.3-95	65	35-95	-	-
XANST	South East	2	10.5	6-15	11.1	6-16.3	97.5	95-100	100	100-100	90.6	81.3-100	85.6	76.3-95	100	100-100	-	-
	Central Zone	2	10.5	6-15	11.1	6-16.3	97.5	95-100	100	100-100	90.6	81.3-100	85.6	76.3-95	100	100-100	-	-

NOTE: E9636 = rimsulfuron, X4145 = isoxadifen-ethyl, M6316= thifensulfuron methyl, KG691= adjuvant, non-ionic surfactant

## Yield (and relevant quality indicators), from efficacy trials (in the presence of challenging pest populations)

Efficacy trials were not taken to yield. Instead, specific selectivity trials are presented in the respective section hereafter to demonstrate crop selectivity of GF-3969 in maize.

## Summary and conclusion

The data package demonstrated GF-3969 at 67.5 g fp/ha and 135 g fp/ha providing flexible control against major target weeds in maize across different climatic conditions. GF-3969 can either be applied with a non-ionic surfactant, or with a vegetable oil. Either of the split application schemes of GF-3969 + surfactant across the CEU regulatory zone were demonstrated to be effective against major target weeds across different climatic conditions of maize cultivation. All label claims can therefore be justified if GF-3969 was applied according to label recommendations.

### Comments of zRMS:

37 field efficacy trials have been conducted in the three EPP0 climatic zones: Maritime, North-East and South-East. GF-3969 was tested in two schemes: single application (at dose range between 67.5 g fp/ha – 135 g fp/ha) and in split dose (in the ratio of ~~60:40~~ 63:37 or 50:50).

A total of 19 efficacy trials were carried out in **the Maritime EPP0 climatic zone** in the following countries: Austria (2 trials), Belgium (5 trials), Czech Republic (4 trials), Germany (6 trials), Netherlands (1 trial) and United Kingdom (1 trial). Very limited number of valid trials was estimated for the following weeds (only 1 trial): PANVI, SETPU, SETVI, ABUTH, AMALI, ATXHO, BRSNW, CIRAR, EROCI, FUMOF, GAETE, GASCI, HELAN, POLAV, RAPRA, SONAR, SPRAR, STAPA, URTUR and VIOAR. It is left to cMSs to consider acceptance of limited number of trials for these species or use where possible combined efficacy data from other EPP0 zones, according to the national requirements. The classification of weed susceptibility for each weed species, which have been located in the Maritime zone is presented below. The recommended dose rate of GF-3969 for the Maritime zone is 135 g fp/ha and split dose of 67,5g + 67,5g fp/ha or 85g + 50g fp/ha. Additionally, in Belgium, Netherlands and Luxemburg a range of single dose rates 67,5-135 g fp/ha is proposed.

#### a) single application:

Weed species	GF-3969	
	67,5 g fp/ha	135 g fp/ha
monocotyledonous weeds		
AGRRE (8 trials)	MS	S
DIGSA (5 trials)	MT	MS
ECHCG (11 trials)	S	HS
POAAN (3 trials)	S	HS
PANVI (1 trial)	MS	HS
SETPU (1 trial)	HS	HS
SETVI (1 trial)	T	MT
dicotyledonous weeds		
AMARE (3 trials)	HS	HS
CHEAL (14 trials)	S	HS
CHEPO (4 trials)	MS	S
DATST (2 trials)	MT	MT
GASPA (3 trials)	S	HS
GERPU (2 trials)	S	S
LAMPU (2 trials)	HS	HS
MATCH (2 trials)	HS	HS
MATIN (2 trials)	S	HS
POLCO (5 trials)	MS	S
POLLA (3 trials)	HS	HS
POLPE (5 trials)	MS	S
SOLNI (3 trials)	T	T
STEME (2 trials)	HS	HS

THLAR (2 trials)	HS	HS
VERPE (2 trials)	HS	HS
ABUTH (1 trial)	MS	S
AMALI (1 trial)	HS	HS
ATXHO (1 trial)	MS	HS
BRSNW (1 trial)	HS	HS
CIRAR (1 trial)	S	S
EROCI (1 trial)	MS	MS
FUMOF (1 trial)	S	S
GAETE (1 trial)	HS	HS
GASCI (1 trial)	HS	HS
HELAN (1 trial)	MS	S
POLAV (1 trial)	HS	HS
RAPRA (1 trial)	HS	HS
SONAR (1 trial)	MS	S
SPRAR (1 trial)	HS	HS
STAPA (1 trial)	S	MS
URTUR (1 trial)	S	HS
VIOAR (1 trial)	HS	HS

b) split application

Weed species	GF-3969	
	85g + 50g fp/ha	67,5g + 67,5g fp/ha
monocotyledonous weeds		
AGRRE (8 trials)	S	S
DIGSA (5 trials)	MS	S
ECHCG (11 trials)	HS	HS
POAAN (2 trials)	S	HS
PANVI (1 trial)	HS	HS
SETPU (1 trial)	HS	HS
SETVI (1 trial)	S	HS
dicotyledonous weeds		
AMARE (3 trials)	HS	HS
CHEAL (14 trials)	HS	HS
CHEPO (4 trials)	HS	S
DATST (2 trials)	MS	MS
GASPA (3 trials)	HS	HS
GERPU (2 trials)	HS	HS
LAMPU (2 trials)	HS	HS
MATCH (2 trials)	HS	HS
MATIN (2 trials)	HS	HS
POLCO (5 trials)	S	S
POLLA (3 trials)	HS	HS
POLPE (5 trials)	S	S
SOLNI (3 trials)	MT	MT
STEME (2 trials)	HS	HS
THLAR (2 trials)	HS	HS
VERPE (2 trials)	HS	HS
ABUTH (1 trial)	S	HS
AMALI (1 trial)	HS	HS
ATXHO (1 trial)	S	HS
BRSNW (1 trial)	HS	HS
CIRAR (1 trial)	S	MS
EROCI (1 trial)	HS	HS
FUMOF (1 trial)	S	HS
GAETE (1 trial)	HS	HS
GASCI (1 trial)	HS	HS
HELAN (1 trial)	S	S
POLAV (1 trial)	HS	HS
RAPRA (1 trial)	HS	HS
SONAR (1 trial)	S	S
SPRAR (1 trial)	HS	HS
STAPA (1 trial)	HS	S

URTUR (1 trial)	HS	HS
VIOAR (1 trial)	HS	HS

A total of 8 trials were carried out in **the North-East EPPO climatic zone**, all in Poland. Very limited number of valid trials was estimated for the following weeds (only 1 trial): SETPF, BRSNN, CIRAR, HELAN, MATIN, POLPE, SOLNI and VIOAR. The classification of weed susceptibility for each weed species, which have been located in the North-East zone is presented below. The recommended dose rate of GF-3969 for North-East zone is 135 g fp/ha and split dose of 67,5g + 67,5g fp/ha.

a) single application:

Weed species	GF-3969	
	135 g fp/ha	
monocotyledonous weeds		
ECHCG (6 trials)	S	
SETPF (1 trial)	HS	
dicotyledonous weeds		
AMARE (6 trials)	HS	
CHEAL (8 trials)	S	
GALAP (2 trials)	MS	
POLCO (4 trials)	MS	
STEME (2 trials)	HS	
VERPE (3 trials)	MT	
BRSNN (1 trial)	HS	
CIRAR (1 trial)	MS	
HELAN (1 trial)	T	
MATIN (1 trial)	HS	
POLPE (1 trial)	HS	
SOLNI (1 trial)	MT	
VIOAR (1 trial)	MS	

b) split application

Weed species	GF-3969	
	67,5g + 67,5g fp/ha	
monocotyledonous weeds		
ECHCG (6 trials)	HS	
SETPF (1 trial)	HS	
dicotyledonous weeds		
AMARE (6 trials)	HS	
CHEAL (8 trials)	S	
GALAP (2 trials)	S	
POLCO (4 trials)	MS	
STEME (2 trials)	HS	
VERPE (3 trials)	MT	
BRSNN (1 trial)	HS	
CIRAR (1 trial)	MT	
HELAN (1 trial)	T	
MATIN (1 trial)	HS	
POLPE (1 trial)	S	
SOLNI (1 trial)	T	
VIOAR (1 trial)	S	

A total of 10 efficacy trials were carried out in **the South-East EPPO climatic zone** in the following countries: Hungary (4 trials), Romania (4 trials), Slovakia (2 trials). Very limited number of valid trials was estimated for the following weeds (only 1 trial): DIGSA, PANDI, AMARE, CHEHG, POLAV and POLCO. It is left to cMSs to consider acceptance of limited number of trials for these species or use where possible combined efficacy data from other EPPO zones, according to the national requirements. The classification of weed susceptibility for each weed species which have been located in the South-East zone is presented below. The recommended range of dose rates of GF-3969 for the Maritime zone is 67,5-135 g fp/ha and split dose of 67,5g + 67,5g fp/ha.

a) single application:		
Weed species	GF-3969	
	67,5 g fp/ha	135 g fp/ha
monocotyledonous weeds		
ECHCG (9 trials)	S	HS
SETVI (3 trials)	S	HS
SORHA (3 trials)	MT	S
DIGSA (1 trial)	S	HS
PANDI (1 trial)	T	S
dicotyledonous weeds		
ABUTH (2 trials)	T	MT
AMBEL (6 trials)	MS	S
CHEAL (5 trials)	S	HS
DATST (4 trials)	MT	MT
HELAN (3 trials)	MS	S
HIBTR (3 trials)	MS	HS
MERAN (2 trials)	MT	MT
XANST (2 trials)	S	HS
AMARE (1 trial)	HS	HS
CHEHG (1 trial)	HS	HS
POLAV (1 trial)	S	HS
POLCO (1 trial)	MS	S
b) split application		
Weed species	GF-3969	
	67,5g + 67,5g fp/ha	
monocotyledonous weeds		
ECHCG (9 trials)	HS	
SETVI (3 trials)	HS	
SORHA (3 trials)	S	
DIGSA (1 trial)	HS	
PANDI (1 trial)	HS	
dicotyledonous weeds		
ABUTH (2 trials)	HS	
AMBEL (6 trials)	S	
CHEAL (5 trials)	HS	
DATST (4 trials)	S	
HELAN (3 trials)	HS	
HIBTR (3 trials)	S	
MERAN (2 trials)	HS	
XANST (2 trials)	S	
AMARE (1 trial)	HS	
CHEHG (1 trial)	HS	
POLAV (1 trial)	S	
POLCO (1 trial)	S	

GF-3969 was tested also with different non-ionic surfactants: KG691, ACTIROB, ATPOLANBIO and CODACI (vegetable oil). In **the Maritime EPPO climatic zone**, GF-3969 + KG691 achieved the effectiveness compared to other surfactants in case of POAAN, SETPU, ABUTH, AMALI, AMARE, BRSNW, CHEAL, CHEPO, GAETE, GASCI, GASP, GERPU, LAMPU, MATCH, MATIN, POLAV, POLLA, RAPRA, SPRAR, STAPA, STEME, THLAR, URTUR, VERPE and VIOAR. The mix of GF-3969 + KG691 achieved higher effectiveness than CODACI or ACTIROB in case of: AGRRE (89% vs 63%), DIGSA (78% vs 64%), ECHCG (97% vs 72%), PANVI (95% vs 80%), SETVI (58% vs 45%), ATXHO (98% vs 40%), CIRAR (90% vs 80%), EROCI (80% vs 70%), FUMOF (93% vs 78%), HELAN (90% vs 80%), POLCO (92% vs 79%), POLPE (83% vs 43%), SONAR (88% vs 75%). In **the North-East EPPO climatic zone**, GF-3969 + KG691 achieved the effectiveness compared to other surfactants in case of AMARE, BRSNW, CHEAL, HELAN, MATIN, POLCO, POLPE, STEME, VERPE and VIOAR. The mix of GF-3969 + KG691 achieved higher effectiveness than CODACI or ATPOLANBIO in case of: ECHCG, SETPF, CIRAR (81% vs 60%), GALAP (71% vs 41%), SOLNI (58% vs 38% or 45%). In **the South-East EPPO climatic zone**, GF-3969 + KG691 achieved the effectiveness compared to other surfactants in case of DIGSA, PANDI, SORHA, ABUTH, AMARE, AMBEL, CHEAL, CHEHG, HELAN, HIBTR, MERAN, POLAV, POLCO and XANST. The mix of

GF-3969 + KG691 achieved higher effectiveness than CODACI or ACTIROB in case of: ECHCG (99% vs 86%), SETVI (99,7% vs 89%) and DATST (68% vs 54%).  
Based on the above results, it can be concluded that the test product GF-3969 can be recommended with non-ionic surfactants or vegetable oil.

### 3.3 Information on the occurrence or possible occurrence of the development of resistance (KCP 6.3)

Proposed zonal label text:

GF-3969, is a product containing rimsulfuron and thifensulfuron methyl active substances. Both active substance are members of the sulfonylureas chemical family. (Group ~~"B"~~ 2 (legacy B) according to HRAC classification).

The commercial use of GF-3969 has the risk to develop resistance and this risk is considered unacceptable, therefore a management strategy to prevent the resistance development and to manage those individual already resistance is provided:

1. Use rate which will effective good control of all target weed species;
2. Follow label statements concerning rates and application timing;
3. Consider the use of cultural practices and crop rotation to prevent development of resistance biotypes;
4. Do not over rely on a single herbicide mode of action.

EPPO guideline: Resistance risk analysis PP1/213(4)

In this section, the resistance management of the product GF-3969 will be discussed and a strategy proposed. EPPO guideline PP 1/213 will be used for guidance in this chapter.

GF-3969 is a water dispersible granule formulation containing 148.15 g/kg of rimsulfuron, 92.6 g/kg of thifensulfuron methyl and 111.1 g/kg of safener - isoxadifen ethyl. GF-3969 is a post-emergence herbicide for the control of grass (annual and perennial) and broadleaf weed in maize

#### 3.3.1 Mode of action

GF-3969 contains rimsulfuron and thifensulfuron methyl, both active substances are members of the sulfonylurea herbicides family, and controls weeds through both root and foliar activity. It controls weeds by blocking biosynthesis of the plant enzyme acetolactate synthase (ALS), which is needed to make the branched-chain amino acids: leucine, isoleucine and valine, essential building blocks of proteins and other plant components.

GF-3969 is a systemic herbicide, entering the plant through the roots and the leaves and being quickly distributed in the plant. Weed growth ceases within as little as six hours after application. Activity begins in the young growing points, which turn yellow or chlorotic within a few days. Weed death normally occurs within one to three weeks after application, depending on the species and environmental conditions. GF-3969 performs best when applied to actively growing weeds.

#### 3.3.2 Mechanism of resistance

- Target site resistance: This is the basis for most of the weed biotypes with resistance to ALS inhibitor herbicides. A mutation in the gene encoding the ALS enzyme renders the weed less

sensitive to sulfonylurea. The ability for other ALS inhibitor herbicides to bind at this site and hence their activity could also be affected, and it depend directly of the mutated gene position on the ALS genome. The single site of action means that sulfonylureas pose a relatively high resistance risk.

- No-target site resistance: This type of resistance includes several mechanisms like overexpression of the enzymes, transportation and accumulation of the chemical in vacuole, etc., but the most commonly found is the enhance of metabolism, which is based on the plant's ability to metabolize the herbicide to non-phytotoxic compounds rapidly enough to prevent the build-up of lethal herbicide levels. This mechanism is present in grass resistant populations. Resistant biotypes can metabolize sulfonylurea herbicides into non-toxic metabolites.

### 3.3.3 Evidence of resistance to ALS inhibitors herbicides in EU

The resistance to weeds arising from treatment with sulfonylurea herbicides was first detected in *Alopecurus myosuroides* in 1984 in the United Kingdom, several years after the first widespread commercial use of chlorsulfuron.

Since that discovery, resistance to ALS inhibitors (sulfonylureas, triazolopyrimidine, imidazolinone, pyrimidinylthiobenzoates and sulfonyl-amino-carbonyl-triazolinones) has been documented in ~~165~~ 168 weeds species (~~101~~ 102 broadleaves weeds and ~~64~~ 66 grass weeds) in a total of 40 countries world-wide. ALS inhibitors-resistant weeds have appeared in cereals, maize/soybeans rotation, rice, highway right-of-way, and forestry. In these situations, the use of long residual ALS inhibitors and/or frequent application (more than one per season) and extensive use of one mode of action herbicide has contributed to the development of resistance.

In ~~2020~~ 2021, there were ~~are~~ 44 56 confirmed and published cases of weeds resistant to ALS inhibitors in Europe, Middle East and Africa (Table 3.3-1).

**Table 3.3-1: Confirmed cases of Sulfonylurea resistance weeds in Europe.**

Weed species	Year - Country
<i>Alisma plantago-aquatica</i>	Italy (1994), Portugal (1995), Spain (2000), Turkey (2009)
<i>Alopecurus myosuroides</i>	UK (1984), Belgium (1996), Netherlands (1999, 2010), Denmark (2001), Germany (2001, 2007, 2009), France (2003, 2006), Czech Republic (2008), Turkey (2008), Poland (2010, 2012), Sweden (2011, 2014), Spain (2015), Switzerland (2019), Ireland (2021)
<i>Amaranthus blitoides</i>	Israël (1991)
<i>Amaranthus palmeri</i>	Israël (2008), Spain (2016)
<i>Amaranthus retroflexus</i>	Israël (1991), Serbia (2002), Italy (2003), Germany (2012), Ukraine (2020)
<i>Amaranthus tuberculatus</i> (=A.rudis)	Israel (2019)
<i>Ambrosia artemisiifolia</i>	France (2013), Serbia (2019)
<i>Apera spica-venti</i>	Czech Republic (2005), Germany (2005, 2009), Poland (2005, 2011), France (2006), Austria (2009), Sweden (2010), Denmark (2011, 2016), Lithuania (2013), Latvia (2015), Belgium (2019)
<i>Avena fatua</i>	UK (1994), France (2006), Germany (2009), Poland (2011)
<i>Avena sterilis</i>	UK (1993), Italy (2004, 2007), France (2006), Italy (2007), Turkey (2008), Iran (2009)
<i>Avena sterilis ssp. ludoviciana</i>	Iran (2009, 2010)
<i>Bifora radians</i>	Turkey (2008)
<i>Bromus sterilis</i>	France (2009), Germany (2017), Czech Republic (2017)

Weed species	Year - Country
<i>Capsella bursa-pastoris</i>	Israël (2000), Denmark (2012), Norway (2019)
<i>Centaurea cyanus</i>	Poland (2010)
<i>Chenopodium album</i>	Finland (2015)
<i>Chrysanthemum coronarium</i>	Israël (2000)
<i>Conyza bonariensis</i>	Israël (1993)
<i>Conyza canadensis</i>	Israël (1993), Poland (2000)
<i>Conyza sumatrensis</i>	France (2016)
<i>Cuscuta pentagona</i> (= <i>C. campestris</i> )	Israël (1994)
<i>Cyperus difformis</i>	Italy (1999), Spain (2000), Greece (2009), Turkey (2010)
<i>Digitaria sanguinalis</i>	France (2015)
<i>Diplotaxis eruroides</i>	Israël (2012)
<i>Echinochloa crus-galli</i> var. <i>crus-galli</i>	Italy (2005, 2009), Turkey (2009), Austria (2011), Germany (2012), France (2013), Spain (2015), Ukraine (2017)
<i>Echinochloa oryzoides</i>	Turkey ( <del>2008</del> 2009)
<i>Echinochloa phyllopogon</i> (= <i>E. oryzicola</i> )	Greece (2009), France (2013)
<i>Erucaria hispanica</i>	Israël (2012)
<i>Galinsoga parviflora</i>	France (2018)
<i>Galium aparine</i>	Turkey (2008), Iran (2017)
<i>Helianthus annuus</i>	France (2009)
<i>Kochia scoparia</i>	Czech Republic (1996)
<i>Lolium perenne</i>	Germany (2008), Denmark (2016)
<i>Lolium perenne</i> ssp. <i>multiflorum</i>	Italy (2002, 2005, 2012), France (2003), Denmark (2010), UK (2012), Switzerland (2018), Ireland (2021)
<i>Lolium rigidum</i>	France (2006), Israël (2007, 2013), Greece (2009)
<i>Matricaria recutita</i> (= <i>M. chamomilla</i> )	Germany (2008), Belgium (2012), Norway (2012), Poland (2014), Sweden (2014)
<i>Oryza sativa</i> var. <i>sylvatica</i>	Italy (2010), Greece (2013), Turkey (2020)
<i>Papaver rhoeas</i>	Spain (1993), Greece (1998, 2002), Italy (1998), UK (2001), Denmark (2003), France (2007, 2016), Sweden (2011), Germany (2012), Belgium (2014), Poland (2014)
<i>Phalaris brachystachys</i>	Turkey (2008)
<i>Poa annua</i>	France (2015)
<i>Poa trivialis</i>	France (2012)
<i>Polygonum persicaria</i>	Norway (2009)
<i>Rapistrum rugosum</i>	Iran (2010), Spain (2018)
<i>Rumex obtusifolius</i>	France (2017)
<i>Schoenoplectus mucronatus</i> (= <i>Scirpus mucronatus</i> )	Italy (1995)
<i>Senecio vernalis</i>	Israël (2014)
<i>Senecio vulgaris</i>	France (2009)
<i>Setaria viridis</i>	France (2011)
<i>Sinapis alba</i>	Spain (2007), Cyprus (2012)
<i>Sinapis arvensis</i>	Turkey (2001, 2008), Italy (2006), Spain (2011), Iran (2009)
<i>Sonchus asper</i>	Norway (2006), France (2015), UK (2016)
<i>Sorghum halepense</i>	Italy (2007), Serbia (2014, 2018), Hungary (2015), Spain (2015), Israël (2017)

Weed species	Year - Country
<i>Spergula arvensis</i>	Norway (2006)
<i>Stellaria media</i>	Denmark (1991), Sweden (1995), Ireland (1996), UK (2000), Norway (2002), Germany (2011), France (2012), Belgium (2013), Finland (2013), Latvia (2016)
<i>Tripleurospermum perforatum</i> (= <i>T. inodorum</i> )	UK (2002), Norway (2006), Germany (2009), Denmark (2010), France (2010), Poland (2014), Sweden (2015), <b>Czech Republic (2021)</b>
<i>Xanthium strumarium</i>	Kazakhstan (2015)

Source: Heap I., The International Survey of Herbicide Resistant Weeds Online. Available on internet [www.weedscience.com](http://www.weedscience.com)

Resistance has almost exclusively arisen in situations where ALS inhibitor herbicides have been used repeatedly to control specific weeds in non-crop areas (e.g. roadsides, railways) and monoculture (cereals, maize, rice, highway right-of-way, and forestry). In these situations, the use of ALS inhibitors and/or frequent application (more than one per season) has contributed to the development of resistance. Both long-term residuality and multiple applications of the same mode of action exert a strong selection pressure on target weeds.

### 3.3.4 Cross-resistance

Cross-resistance occurs in biotypes that are resistant to one or more herbicides due to either one of the mechanisms outlined in section 3.3.2. The modification of the target site or the enhanced metabolism renders the plant less susceptible/resistant to chemicals that have the same mode or site of action or in the case of enhanced metabolism a similar molecular structure or part of the molecular structure. For example, a modification of the target site, as is the case in certain sulfonylurea resistant biotypes, will result in cross-resistance to other sulfonylureas and other groups of ALS inhibitors, e.g. Imidazolinones. The presence of cross-resistance between sulfonylurea's and other ALS inhibitors means that sulfonylurea's pose a relatively high resistance risk. Please note that, ALS resistant biotypes are easily controlled by products based on an alternative mode of action. The implications of cross resistance between groups of herbicides with the same mode of action and the susceptibility of resistant biotypes to products with alternative modes of action are important factors in the management of resistant biotypes. This includes the prevention/delay of the appearance of resistant biotypes.

### 3.3.5 Sensitivity data

Baseline sensitivity data is not presented in this dossier due the large number of years that the active substances, rimsulfuron and thifensulfuron methyl, present in GF-3969, were present on the maize market, and because already resistant biotypes to sulfonylurea have been reported on *Echinochloa crus-galli*, *Setaria viridis*, *Digitaria sanguinalis*, *Sorghum halepense*, *Chenopodium album* and *Amarantus retroflexus* (see Table 3.3-2 & Table 3.3-3).

### 3.3.6 Resistance risk assessment of unrestricted use pattern

The following resistance risk assessment is based on the unmodified use pattern and results from the inherent risk when the product is applied under the unrestricted use conditions. It is a combination of the risk posed by the target, the active substance/product and agronomic conditions.

### 3.3.6.1 The pests

The weeds usually only produce one generation per year and development of resistance is usually a relatively slow process. It can therefore be difficult to class the weed species as inherently more or less likely to develop resistance to an herbicide. Table 3.3-2 & Table 3.3-3 describe the key characteristics of the key target species for which ALS resistance have been already recorded in several countries in Europe. The overall inherent risk is evaluated as high, and in the normal field situation the presence of these weed species in the maize field is high.

**Table 3.3-2: Characteristics of key target grass weeds describing inherent resistance.**

	<i>Echinochloa crus-galli</i>	<i>Sorghum halepense</i>	<i>Setaria species</i>	<i>Digitaria sanguinalis</i>
Life cycle	Annual	Perennial	Annual	Annual
Existing resistance (by HRAC Group)	Rice: A 1, K+ 3, B 2, C+ 5 Maize: B 2, C+ 5	Cotton, Tomatoes: A 1, Maize: B 2	Maize: B 2	Maize: B 2, C+ 5 Soybean: A 1
Existence of cross-resistance to another MoA	Yes	Unknown by crop	Unknown by crop	Unknown by crop
High fitness of resistant strains	unknown	unknown	unknown	unknown
Fecundity (average number seeds/plant)	3000 to 15000	Main reproduction by rhizomes	500 to 5000	>10000
Dispersal mechanism of populations	Cross pollination	Cross pollination by wind	Self-pollination by wind	Self-pollination by wind
Overall Inherent Risk	High	High	High	High

**Table 3.3-3: Characteristics of key target broadleaf weeds describing inherent resistance**

	<i>Amaranthus retroflexus</i>
Life cycle	Annual
Existing resistance (by HRAC Group)	Maize: B 2, C+ 5 Soybean: B 2 Potatoes: C+ 5
Existence of cross-resistance to another MoA	Unknown by crop
High fitness of resistant strains	unknown
Fecundity (average number seeds/plant)	>10000
Dispersal mechanism of populations	Cross pollination by wind
Overall Inherent Risk	High

There are several grasses and broadleaf weed species which reported resistant to sulfonylureas across Europe (see Table 3.3-1). And in maize fields, we can highlight and confirm those presented in Table 3.3-2 & Table 3.3-3. The recommendations and rules described below apply to GF-3969, as well as to the all others Applicant's herbicides, to:

- Prevent the apparition of weed resistant populations to ALS inhibitors herbicides
- Collect and test seed and leaves samples after an herbicide failure to check the presence of resistance individuals.
- Give sound advices to farmers to control resistant weed populations in the field where they are established, as well as preventive recommendation to delay the occurrence of herbicide resistant weeds.

### 3.3.6.2 The active substances

The active substances, rimsulfuron and thifensulfuron methyl are based on a single site of action, the ALS enzyme.

Target site and enhanced metabolism resistance to sulfonylurea and other ALS inhibiting herbicides have already developed over a wide range of weed species, across different crop agronomy systems.

Sulfonylurea and other ALS inhibiting herbicides are available for use on most crops within a rotation, like maize, winter cereals, which can include the mono-cropping and a minimum tillage (both of which increase the risk of resistance development).

### **3.3.6.3 Agronomic practices**

The risk of resistance inherent a plant protection product as is to GF-3969 can be increased by certain conditions of use. Resistance has almost exclusively arisen in situations where ALS inhibitor herbicides have been used repeatedly to control specific weeds in non-crop areas (e.g. roadsides, railways), and crops grown in monoculture (cereals, maize/soybeans rotation, rice, highway right-of-way, and forestry), and on crop rotation where the herbicide with the same mode of action are use on each crop.

In these situations, the use of long residual ALS inhibitors and/or frequent application has contributed to the development of resistance. Both long-term residual and multiple applications of the same mode of action exert a strong selection pressure on target weeds.

In addition, the use of sulfonylurea and other ALS inhibiting herbicides available for use on most crops within the rotation also exert a strong selection pressure on certain target weeds.

### **3.3.7 Management strategy**

Based on the information presented the commercial use of GF-3969 has the risk to develop resistance on the weeds which have been identified, and this risk is considered unacceptable, therefore a management strategy to prevent the resistance development and to manage those individual already resistance is provided.

To protect the value of the sulfonylurea herbicides, and the inhibitors of the ALS herbicides in general, Applicant will recommend the use of GF-3969 in tank mix or in sequential applications with a suitable product with an alternative mode of action for the control of weeds with high risk.

Herbicides with a different mode of action to the ALS inhibitors have been evaluated in in-vivo tests to propose chemical alternatives for the control in post emergence of *Echinochloa crus-galli*, *Setaria viridis*, *Digitaria sanguinalis*, *Sorghum halepense*, *Chenopodium album* and *Amarantus ssp.* resistant populations and give practical recommendations/advices to farmers and distributors. Results from the monitoring tests are presented in the chapters below.

#### **3.3.7.1 Test methods**

In order to determine the resistant profiles of the different populations of *Echinochloa crus-galli*, *Setaria viridis*, *Digitaria sanguinalis*, *Sorghum halepense* and *Amarantus ssp.* populations sampled in EU Central zone between 2004 and 2018, two types of resistance tests have been carried out from seeds and leaves samples.

The objectives were to confirm if these populations where resistant or not to maize ALS-inhibitors herbicides rimsulfuron and nicosulfuron.

In-vivo tests were carried out with the seeds under controlled conditions, comparing the efficacy of different ALS-inhibitors (rimsulfuron, nicosulfuron, foramsulfuron, thiencarbazone), together with

products with different modes of action (mesotrione, tembotrione, isoxaflutole). Efficacies were compared with a susceptible reference population.

DNA analysis were carried out from field samplings and on the collected leaves in the pots of the in-vivo studies with the objective to detect a potential mutation on the ALS gene-enzyme. Two positions, Proline-197 and Tryptophane-574, form the ALS enzyme were target through PCR and pyrosequencing methodology.

#### In-vivo tests in growth chamber

Seeds of the targeted populations were collected from the field across EU Central zone, and were sent to different laboratories (BIOtransfer, IdentXX – University of Hohenheim) to be analyzed in comparison to a susceptible reference population from Herbiseed or Arbiotech.

Seeds of each population were sown in Petri dishes on vermiculite moistened with KNO<sub>3</sub> 0.2%. All the seeds were then placed under the following conditions: 18 °C/28 °C night/day with a 16 h photoperiod and a relative humidity of 60%-80%.

When the coleoptiles emerged from the seeds, they were transplanted in 8x8x8 cm pots filled with a mixture of sandy-clay-loam soil and vermiculite (1/2: 1/2; v: v). In a standard case, 5 plants were transplanted per pot and 4 pots were used for each condition of treatment. Depending on the amount of seeds and the germination rate of the sample, the number of plants or pots was adjusted by agreement with DuPont. After transplantation, all the plants were replaced in the same growing conditions than previously up to they reach the stage of treatment BBCH 12-13 for grasses and BBCH 14 for broadleaves.

Plants of the different populations were sprayed using a Track Sprayer equipped with flat fan nozzles Teejet XR110015 and calibrated to deliver 200 L/ha at 400 kPa and 4 km/h. After treatment, pots with treated plants were replaced under the same growing conditions than previously.

The herbicide products used in the following studies are made up of ALS inhibiting herbicides (HRAC group B) and/or 4-hydroxyphenylpyruvate dioxygenase (4-HPPD) inhibiting herbicides (HRAC group F2).

**Table 3.3-4: Herbicide products used in the presented studies**

Product	Form.	Active substance(s) (a.s.)	HRAC Classification	Concentration (g a.s./L or *g a.s./kg)
DPX-E9636 / TITUS	WG	Rimsulfuron	B 2	250*
DPX-V9360 / VICTUS	OD	Nicosulfuron	B 2	40
PRINCIPAL	WG	Nicosulfuron + Rimsulfuron	B 2	535*
MILAGRO	SC	Nicosulfuron	B 2	40
DPX-M6316 / HARMONY	WG	Thifensulfuron methyl	B 2	500*
PULSAR 40	SL	Imazamox	B 2	40
BASAGRAN	WG	Bentazone	C 6	870*
CADELI	EC	Bromoxynil	C 6	225
CALLISTO	SC	Mesotrione	F 27	100
ELUMIS	OD	Nicosulfuron + Mesotrione	B 2 + F 27	105 (30+75)
LAUDIS	OD	Tembotrione + Isoxaflutole	F 27	66 (44+22)
MONSOON ACTIVE	OD	Foramsulfuron + Thiencarbazone-methyl + Cyprosulfamide	B 2	55 (30+10+15)
ADENGO	SC	Isoxaflutole + Thiencarbazone-methyl + Cyprosulfamide	F 27 + B 2	103 (50+20+33)
STRATOS ULTRA	EC	Cycloxydim	A 1	100
FUSILADE MAX	EC	Fluazifop	A 1	125
CAMIX	EC	Mesotrione + S-metolachlore + Benoxacor	F 27 + K 3 15	460

ISARD	EC	Dimethenamid	<del>K3</del> 15	720
-------	----	--------------	------------------	-----

The surfactant DPX-KG691 (Ethoxylated aliphatic alcohol) was added to sulfonylureas products at the rate of 0.1%.

#### DNA analysis in ALS-gene

The PCR and pyrosequencing methodology applied on the sampled leaves include the following steps:

- a. Sample preparation: A small portion (around 0.5 cm<sup>2</sup>) of plant fresh material were dried and placed in a 96 well plate (Qiagen, Collection microtubes).
- b. DNA extraction: Samples are crushed using Qiagen TissueLyser II, and the DNA extraction was conducted according to an in-house protocol by using a customized kit (Perkin Elmer; Chemagic Plant400 Kit) with King Fisher. Then, the product of extraction is amplified through a PCR reaction using specific primers for Matricaria, targeting the two main positions of ALS-gene (Proline-197 & Tryptophane-574).
- c. PCR: The program of the PCR was: 94°C (5 min); 35 cycles: 94°C (40 sec), 62°C (35 sec), 72°C (30 sec); 72°C (5 min); 10°C (30 sec).
- d. Pyrosequencing: After the PCR, samples are prepared for single nucleotide polymorphism (SNP) via Pyrosequencing, following in-house protocols (chemistry: Qiagen; PyroMark Q24 gold reagents; equipment: Qiagen; PyroMark Q24).

Then, results coming from the Pyrosequencing allow to determine any substitution of amino acids on the targeted positions, and if the mutation is heterozygous (only 1 allele mutated) or homozygous (2 alleles mutated). TSR (Target Site Resistance) detected means that at least one of the analyzed plants showed a mutation. Otherwise the whole stock of samples is wild type. Base pair changes within a codon may lead to changes in the amino acid sequence. In case of Pro-197 and Trp-574 of ALS gene complex, changes of amino acids lead to changes in the active site of acetolactate synthase, which reduce the effect of ALS-inhibitors.

Wild type means that at position Pro-197 both alleles have CCT (Proline); TGG (Tryptophane) at position Trp-574.

Heterozygous means, that one allele has CCT at position 197 (TGG at position 574) and the other allele is mutated, e.g. CTT (Leucine).

Homozygous means that both alleles are mutated, e.g. CTT at position 197 or TTG at position 574. At position Pro-197 at both alleles two bases might be mutated. Therefore, samples were counted as homozygous if one of the two positions were mutated at both alleles, irrespective of the second base.

TSR detected means that at least one of the analyzed plants showed a mutation. Otherwise the whole stock of samples is wild type. Base pair changes within a codon may lead to changes in the amino acid sequence. In case of Pro-197 and Trp-574 of ALS gene complex, changes of amino acids lead to changes in the active site of acetolactate synthase, which reduce the effect of ALS-inhibitors.

Wild type means that at position Pro-197 both alleles have CCT (Proline); TGG (Tryptophane) at position Trp-574. Heterozygous means, that one allele has CCT at position 197 (TGG at position 574) and the other allele is mutated, e.g. CTT (Leucine). Homozygous means that both alleles are mutated, e.g. CTT at position 197 or TTG at position 574. At position Pro-197 at both alleles two bases might be mutated. Therefore, samples were counted as homozygous if one of the two positions were mutated at both alleles, irrespective of the second base.

### 3.3.7.2 Resistance management strategy to control *Sorghum halepense* (SORHA)

To determine the activity of GF-3969, and the active substance of rimsulfuron in particular, which is the active substance effective against this weed, seeds samples of *Sorghum halepense* (SORHA) were collected in the maize fields following weed control failure.

In order to determine the resistant profiles of 33 seeds and 35 leaves populations of *Sorghum halepense* populations sampled in EU Central zone between 2013 and 2018, two types of resistance tests have been carried out from seeds and leaves samples.

**Table 3.3-5: List of all SORHA seeds samples analyzed from 2013 to 2018 in EPPO central zone**

Species	Country	Year	Location	Seeds Code	Leaves Code
SORHA	Hungary	2013	Kocs (sensitive seeds)	S-ERDC-SORHA-13-03	L-ERDC-SORHA-13-03
SORHA	Hungary	2013	Meggyespuszta	S-ERDC-SORHA-13-06	L-ERDC-SORHA-13-06
SORHA	Hungary	2013	Tolna	S-ERDC-SORHA-13-04	L-ERDC-SORHA-13-05
SORHA	Hungary	2013	Tolna	S-ERDC-SORHA-13-05	-
SORHA	Hungary	2014	Monson	S-HUN-SORHA-14-04	L-HUN-SORHA-14-04
SORHA	Hungary	2014	Regöly	S-HUN-SORHA-14-05	-
SORHA	Hungary	2014	Bonyhad-Tabod	S-HUN-SORHA-14-08	L-HUN-SORHA-14-08
SORHA	Hungary	2014	Szekszard	S-HUN-SORHA-14-01	L-HUN-SORHA-14-01
SORHA	Hungary	2014	Szekszard	S-HUN-SORHA-14-03	L-HUN-SORHA-14-03
SORHA	Hungary	2014	Szekszard	S-HUN-SORHA-14-06	L-HUN-SORHA-14-06
SORHA	Hungary	2014	Szekszard, Szalkai	S-HUN-SORHA-14-07	L-HUN-SORHA-14-07
SORHA	Hungary	2014	Phonic	S-HUN-SORHA-14-02	L-HUN-SORHA-14-02
SORHA	Hungary	2015	Kéty)	S-HUN-SORHA-15-02	L-HUN-SORHA-15-02
SORHA	Hungary	2015	Felsónána	S-HUN-SORHA-15-03	L-HUN-SORHA-15-03
SORHA	Hungary	2015	Szakály	S-HUN-SORHA-15-05	L-HUN-SORHA-15-05
SORHA	Hungary	2015	Tamási	S-HUN-SORHA-15-06	L-HUN-SORHA-15-06
SORHA	Hungary	2015	Iregszemcse	S-HUN-SORHA-15-07	L-HUN-SORHA-15-07
SORHA	Hungary	2015	Tolna-mözs Soja	S-HUN-SORHA-15-11	L-HUN-SORHA-15-11
SORHA	Hungary	2015	Tolna-mözs Maize	S-HUN-SORHA-15-12	L-HUN-SORHA-15-12
SORHA	Hungary	2017	n.a	S-HUN-SORHA-17-011	L-HUN-SORHA-17-011
SORHA	Hungary	2017	Baranya, Szentdenes	S-HUN-SORHA-17-11	L-HUN-SORHA-17-01
SORHA	Hungary	2017	Pecs, Szederkeny	S-HUN-SORHA-17-21	L-HUN-SORHA-17-20
SORHA	Hungary	2018	Derecske	S-HUN-SORHA-18-01	L-HUN-SORHA-18-01
SORHA	Hungary	2018	Hodmezovasarhely	S-HUN-SORHA-18-04	L-HUN-SORHA-18-04
SORHA	Romania	2017	n.a	S-ROM-SORHA-17-01	L-ERDC-SORHA-18-10
SORHA	Romania	2017	n.a	S-ROM-SORHA-17-02	L-ERDC-SORHA-18-11
SORHA	Romania	2017	n.a	S-ROM-SORHA-17-03	L-ERDC-SORHA-18-12
SORHA	Romania	2017	n.a	S-ROM-SORHA-17-04	L-ERDC-SORHA-18-13
SORHA	Romania	2018	Braila	S-ROM-SORHA-18-01	-
SORHA	Romania	2018	Draganesti-Vlasca	S-ROM-SORHA-18-02	-
SORHA	Romania	2018	Stefanesti de jos	S-ROM-SORHA-18-03	-
SORHA	Romania	2018	Oltenita	S-ROM-SORHA-18-04	-
SORHA	Serbia	2015	n.a	S-SER-SORHA-15-01	-

n.a = not available

**Table 3.3-6: List of all SORHA leaves samples analyzed from 2012 to 2018 in EPPO central zone.**

Species	Country	Year	Location	Seeds Code	Leaves Code
SORHA	Hungary	2013	Kocs	S-ERDC-SORHA-13-03	L-ERDC-SORHA-13-03
SORHA	Hungary	2013	Meggyespuszta	S-ERDC-SORHA-13-06	L-ERDC-SORHA-13-06
SORHA	Hungary	2013	Bacs Kiskun I	-	L-ERDC-SORHA-13-04
SORHA	Hungary	2013	Tolna	S-ERDC-SORHA-13-04	L-ERDC-SORHA-13-05
SORHA	Hungary	2014	Monson	S-HUN-SORHA-14-04	L-HUN-SORHA-14-04
SORHA	Hungary	2014	Bonyhad-Tabod	S-HUN-SORHA-14-08	L-HUN-SORHA-14-08
SORHA	Hungary	2014	Szekszard	S-HUN-SORHA-14-01	L-HUN-SORHA-14-01
SORHA	Hungary	2014	Szekszard	S-HUN-SORHA-14-03	L-HUN-SORHA-14-03
SORHA	Hungary	2014	Szekszard	S-HUN-SORHA-14-06	L-HUN-SORHA-14-06
SORHA	Hungary	2014	Szekszard, Szalkai	S-HUN-SORHA-14-07	L-HUN-SORHA-14-07
SORHA	Hungary	2014	Sarpilis	-	L-HUN-SORHA-14-05
SORHA	Hungary	2014	Phonic	S-HUN-SORHA-14-02	L-HUN-SORHA-14-02
SORHA	Hungary	2015	n.a	-	L-HUN-SORHA-15-01

SORHA	Hungary	2015	Kéty	S-HUN-SORHA-15-02	L-HUN-SORHA-15-02
SORHA	Hungary	2015	Felsónána	S-HUN-SORHA-15-03	L-HUN-SORHA-15-03
SORHA	Hungary	2015	n.a	-	L-HUN-SORHA-15-04
SORHA	Hungary	2015	Szakály	S-HUN-SORHA-15-05	L-HUN-SORHA-15-05
SORHA	Hungary	2015	Tamási	S-HUN-SORHA-15-06	L-HUN-SORHA-15-06
SORHA	Hungary	2015	Iregszemcse	S-HUN-SORHA-15-07	L-HUN-SORHA-15-07
SORHA	Hungary	2015	Tamási-Adorján	-	L-HUN-SORHA-15-08
SORHA	Hungary	2015	Tamási-Csapófield	-	L-HUN-SORHA-15-09
SORHA	Hungary	2015	Tamási-Farnadi	-	L-HUN-SORHA-15-10
SORHA	Hungary	2015	Tolna-mözs	S-HUN-SORHA-15-11	L-HUN-SORHA-15-11
SORHA	Hungary	2015	Tolna-mözs	S-HUN-SORHA-15-12	L-HUN-SORHA-15-12
SORHA	Hungary	2017	n.a	S-HUN-SORHA-17-011	L-HUN-SORHA-17-011
SORHA	Hungary	2017	Baranya, Szentdenes	S-HUN-SORHA-17-11	L-HUN-SORHA-17-01
SORHA	Hungary	2017	Baranya, Szentdenes	-	L-HUN-SORHA-17-02
SORHA	Hungary	2017	Pecs, Szederkeny	S-HUN-SORHA-17-21	L-HUN-SORHA-17-20
SORHA	Hungary	2018	Derecske	S-HUN-SORHA-18-01	L-HUN-SORHA-18-01
SORHA	Hungary	2018	Hodmezovasarhely	S-HUN-SORHA-18-04	L-HUN-SORHA-18-04
SORHA	Romania	2017	n.a	S-ROM-SORHA-17-01	L-ERDC-SORHA-18-10
SORHA	Romania	2017	n.a	S-ROM-SORHA-17-02	L-ERDC-SORHA-18-11
SORHA	Romania	2017	n.a	S-ROM-SORHA-17-03	L-ERDC-SORHA-18-12
SORHA	Romania	2017	n.a	S-ROM-SORHA-17-04	L-ERDC-SORHA-18-13
SORHA	Romania	2018	Braila	-	L-ROM-SORHA-18-07

*n.a = not available*

The objectives were to confirm if these Sorghum populations were resistant or not to maize herbicides ALS-inhibitors as rimsulfuron and nicosulfuron.

In-vivo tests were carried out with the seeds under controlled conditions, comparing the efficacy of different ALS-inhibitors (rimsulfuron, nicosulfuron, foramsulfuron, thiencarbazone), together with products with different modes of action (mesotrione, tembotrione, isoxaflutole). Efficacies were compared with a susceptible reference population.

A DNA analysis was carried out on the collected leaves in the untreated pots and some survival plants of the in-vivo tests with the objective to detect a potential mutation on the ALS gene-enzyme. Two positions, Proline-197 and Tryptophane-574, from the ALS enzyme were targeted through PCR and pyrosequencing methodology.

Results showed that resistance to ALS-inhibitors, as Nicosulfuron and Rimsulfuron has been confirmed on several SORHA populations in Hungary and Serbia between 2013 and 2017. Most of them showed target-site resistance mechanisms (through in-vivo study and DNA analysis), through ALS-gene mutation mainly on position Trp-574. However, some other cases confirmed resistance through in-vivo studies despite any detection of mutated plants in DNA analysis. This also confirms that non-target-site resistance mechanisms are also still existing in the fields.

In Romania, two first cases of resistant SORHA have been confirmed. A small proportion of the sampled population showed target-site mutation on ALS-gene position Trp-574.

To control these resistant populations to ALS-inhibitors, excellent efficacy has been obtained with ACCase inhibitors (as Cycloxydim or Fluazifop) and 4-hydroxyphenylpyruvate dioxygenase (4-HPPD) inhibiting herbicides (HRAC group F2), showing that these alternative modes of action could be adapted solutions in the field.

IN-VIVO Data from samples from Hungary, Romania and Serbia between 2013 and 2018

Between 2013 and 2015, all samples analysed from Hungarian fields have been confirmed resistant to ALS-inhibitors, except one (see Table 3.3-7-Table 3.3-9).

Significant loss of control has been observed with Rimsulfuron and Nicosulfuron at N and 4N rates. Good alternative solutions to control these resistant populations were ACCase inhibitors as Cycloxydim or Fluazifop. In Serbia, one sample in 2015 has also been confirmed resistant to Nicosulfuron.

**Table 3.3-7: % Visual efficacy (average of 4 rep) at 28 days after application on SORHA populations from Hungary in 2013**

Products Name	Active substance	Rate (g a.s./ha)	Ref. S	Hungary			
				S-ERDC-SORHA-13-03 (*)	S-ERDC-SORHA-13-06 (*)	S-ERDC-SORHA-13-04 (*)	S-ERDC-SORHA-13-05
DPX-E9636 25WG + T90	Rimsulfuron	15 + 0.1%	100	81	-	24	0
DPX-E9636 25WG + T90	Rimsulfuron	60 + 0.1%	100	100	-	74	40
DPX-V9360 40OD	Nicosulfuron	60	100	83	0	0	0
DPX-V9360 40OD	Nicosulfuron	240	100	93	0	0	0
STRATOS ULTRA	Cycloxydim	300	100	100	100	100	100
FUSILADE MAX	Fluazifop	375	100	100	-	100	100

(\*) additional DNA analysis on ALS-gene from leaves samples (see next section)

**Table 3.3-8: % Visual efficacy (average of 4 rep) at 28 days after application on SORHA populations from Hungary in 2014**

Products Name	Active substance	Rate (g a.s./ha)	Ref. S	Hungary							
				S-HUN-SORHA-14-04 (*)	S-HUN-SORHA-14-05	S-HUN-SORHA-14-08 (*)	S-HUN-SORHA-14-01 (*)	S-HUN-SORHA-14-03 (*)	S-HUN-SORHA-14-06 (*)	S-HUN-SORHA-14-07 (*)	S-HUN-SORHA-14-02 (*)
DPX-E9636 25WG + T90	Rimsulfuron	15 + 0.1%	100	0	36	50	28	57	66	45	20
DPX-E9636 25WG + T90	Rimsulfuron	60 + 0.1%	100	28	58	61	43	85	86	59	20
DPX-V9360 40OD	Nicosulfuron	60	100	10	15	20	33	13	28	20	8
DPX-V9360 40OD	Nicosulfuron	240	100	18	25	20	34	23	30	20	23
STRATOS ULTRA	Cycloxydim	300	100	100	100	100	100	100	100	100	100
FUSILADE MAX	Fluazifop	375	100	100	100	100	100	100	100	100	100

(\*) additional DNA analysis on ALS-gene from leaves samples (see next section)

**Table 3.3-9: % Visual efficacy (average of 4 rep) at 28 days after application on SORHA populations from Hungary and Serbia in 2015**

Products Name	Active substance	Rate (g a.s./ha)	Ref. S	Hungary							Serbia
				S-HUN-SORHA-15-02 (*)	S-HUN-SORHA-15-03 (*)	S-HUN-SORHA-15-05 (*)	S-HUN-SORHA-15-06 (*)	S-HUN-SORHA-15-07 (*)	S-HUN-SORHA-15-11 (*)	S-HUN-SORHA-15-12 (*)	S-SER-SORHA-15-01

DPX-E9636 25WG + T90	Rimsulfuron	15 + 0.1%	100	80	33	73	66	58	94	98	-
DPX-E9636 25WG + T90	Rimsulfuron	60 + 0.1%	100	69	68	92	97	90	97	99	-
DPX-V9360 40OD	Nicosulfuron	60	100	40	36	25	28	18	50	-	13
DPX-V9360 40OD	Nicosulfuron	240	100	43	33	33	46	55	68	-	49
STRATOS ULTRA	Cycloxydim	300	100	99	100	100	100	100	100	100	100
FUSILADE MAX	Fluazifop	375	100	100	100	100	100	100	100	-	100

(\*) additional DNA analysis on ALS-gene from leaves samples (see next section)

In 2018, the 2 population from Hungary and the 4 populations from Romania, did not show any resistance to ALS-inhibitors, being equivalent controlled as the susceptible reference with Rimsulfuron and Nicosulfuron.

DNA ANALYSIS Data from samples from Hungary and Romania between 2012 and 2018

All the results coming from the DNA analyzes through the Pyrosequencing are presented in the tables below:

**Table 3.3-10: ALS-gene profiles of SORHA leaves populations on two positions Pro-197 and Trp-574**

Country	Year	Leaves Code	Seeds Code	ALS-gene Pro-197 position				ALS-gene Trp-574 position			
				% Wild type	% Heterozygous	% Homozygous	Amino Acid Subst. Pro/Pro-197	% Wild type	% Heterozygous	% Homozygous	Amino Acid Subst. Trp/Trp-574
Hungary	2013	L-ERDC-SORHA-13-03	S-ERDC-SORHA-13-03	100%	0%	0%	-	100%	0%	0%	-
Hungary	2013	L-ERDC-SORHA-13-06	S-ERDC-SORHA-13-06	0%	100%	0%	Pro/Ser	100%	0%	0%	-
Hungary	2013	L-ERDC-SORHA-13-04	-	100%	0%	0%	-	0%	100%	0%	Trp/Leu
Hungary	2013	L-ERDC-SORHA-13-05	S-ERDC-SORHA-13-04	100%	0%	0%	-	100%	0%	0%	-
Hungary	2014	L-HUN-SORHA-14-04	S-HUN-SORHA-14-04	100%	0%	0%	-	0%	40%	60%	Trp/Leu/Leu/Leu
Hungary	2014	L-HUN-SORHA-14-08	S-HUN-SORHA-14-08	100%	0%	0%	-	100%	0%	0%	-
Hungary	2014	L-HUN-SORHA-14-01	S-HUN-SORHA-14-01	100%	0%	0%	-	40%	20%	40%	Trp/Leu/Leu/Leu
Hungary	2014	L-HUN-SORHA-14-03	S-HUN-SORHA-14-03	100%	0%	0%	-	100%	0%	0%	-

Country	Year	Leaves Code	Seeds Code	ALS-gene Pro-197 position				ALS-gene Trp-574 position			
				% Wild type	% Heterozygous	% Homozygous	Amino Acid Subst. Pro/Pro-197	% Wild type	% Heterozygous	% Homozygous	Amino Acid Subst. Trp/Trp-574
Hungary	2014	L-HUN-SORHA-14-06	S-HUN-SORHA-14-06	100%	0%	0%	-	100%	0%	0%	-
Hungary	2014	L-HUN-SORHA-14-07	S-HUN-SORHA-14-07	100%	0%	0%	-	100%	0%	0%	-
Hungary	2014	L-HUN-SORHA-14-05	-	100%	0%	0%	-	100%	0%	0%	-
Hungary	2014	L-HUN-SORHA-14-02	S-HUN-SORHA-14-02	100%	0%	0%	-	0%	75%	25%	Trp/Leu/Leu
Hungary	2015	L-HUN-SORHA-15-01	-	100%	0%	0%	-	0%	100%	0%	Trp/Leu
Hungary	2015	L-HUN-SORHA-15-02	S-HUN-SORHA-15-02	100%	0%	0%	-	0%	100%	0%	Trp/Leu
Hungary	2015	L-HUN-SORHA-15-03	S-HUN-SORHA-15-03	100%	0%	0%	-	0%	87%	13%	Trp/Leu/Leu/Leu
Hungary	2015	L-HUN-SORHA-15-04	-	100%	0%	0%	-	0%	100%	0%	Trp/Leu
Hungary	2015	L-HUN-SORHA-15-05	S-HUN-SORHA-15-05	100%	0%	0%	-	100%	0%	0%	-
Hungary	2015	L-HUN-SORHA-15-06	S-HUN-SORHA-15-06	100%	0%	0%	-	100%	0%	0%	-
Hungary	2015	L-HUN-SORHA-15-07	S-HUN-SORHA-15-07	100%	0%	0%	-	88%	12%	0%	Trp/Leu
Hungary	2015	L-HUN-SORHA-15-08	-	100%	0%	0%	-	100%	0%	0%	-
Hungary	2015	L-HUN-SORHA-15-09	-	100%	0%	0%	-	100%	0%	0%	-
Hungary	2015	L-HUN-SORHA-15-10	-	100%	0%	0%	-	100%	0%	0%	-

Country	Year	Leaves Code	Seeds Code	ALS-gene Pro-197 position				ALS-gene Trp-574 position			
				% Wild type	% Heterozygous	% Homozygous	Amino Acid Subst. Pro/Pro-197	% Wild type	% Heterozygous	% Homozygous	Amino Acid Subst. Trp/Trp-574
Hungary	2015	L-HUN-SORHA-15-11	S-HUN-SORHA-15-11	100%	0%	0%	-	64%	36%	0%	Trp/Leu
Hungary	2015	L-HUN-SORHA-15-12	S-HUN-SORHA-15-12	100%	0%	0%	-	100%	0%	0%	-
Hungary	2017	L-HUN-SORHA-17-011	S-HUN-SORHA-17-011	100%	0%	0%	-	24%	76%	0%	Trp/Leu
Hungary	2017	L-HUN-SORHA-17-03	S-HUN-SORHA-17-04	100%	0%	0%	-	8%	92%	0%	Trp/Leu
Hungary	2017	L-HUN-SORHA-17-05	S-HUN-SORHA-17-06	100%	0%	0%	-	0%	100%	0%	Trp/Leu
Hungary	2017	L-HUN-SORHA-17-07	S-HUN-SORHA-17-08	100%	0%	0%	-	16%	80%	4%	Trp/Leu/Leu/Leu
Hungary	2017	L-HUN-SORHA-17-09	S-HUN-SORHA-17-10	100%	0%	0%	-	0%	96%	4%	Trp/Leu - Leu/Leu
Hungary	2017	L-HUN-SORHA-17-01	S-HUN-SORHA-17-11	100%	0%	0%	-	0%	88%	12%	Trp/Leu/Leu/Leu
Hungary	2017	L-HUN-SORHA-17-12	S-HUN-SORHA-17-13	100%	0%	0%	-	44%	56%	0%	Trp/Leu
Hungary	2017	L-HUN-SORHA-17-15	S-HUN-SORHA-17-14	100%	0%	0%	-	64%	32%	4%	Trp/Leu/Leu/Leu
Hungary	2017	L-HUN-SORHA-17-02	-	100%	0%	0%	-	56%	44%	0%	Trp/Leu
Hungary	2017	L-HUN-SORHA-17-20	S-HUN-SORHA-17-21	100%	0%	0%	-	0%	56%	44%	Trp/Leu - Leu/Leu
Hungary	2018	L-HUN-SORHA-18-01	S-HUN-SORHA-18-01	100%	0%	0%	-	100%	0%	0%	-
Hungary	2018	L-HUN-SORHA-18-04	S-HUN-SORHA-18-04	100%	0%	0%	-	100%	0%	0%	-

Country	Year	Leaves Code	Seeds Code	ALS-gene Pro-197 position				ALS-gene Trp-574 position			
				% Wild type	% Heterozygous	% Homozygous	Amino Acid Subst. Pro/Pro-197	% Wild type	% Heterozygous	% Homozygous	Amino Acid Subst. Trp/Trp-574
Romani a	2017	L-ERDC-SORHA-18-10	S-ROM-SORHA-17-01	100%	0%	0%	-	100%	0%	0%	-
Romani a	2017	L-ERDC-SORHA-18-11	S-ROM-SORHA-17-02	100%	0%	0%	-	100%	0%	0%	-
Romani a	2017	L-ERDC-SORHA-18-12	S-ROM-SORHA-17-03	100%	0%	0%	-	70%	30%	0%	Trp/Leu
Romani a	2017	L-ERDC-SORHA-18-13	S-ROM-SORHA-17-04	100%	0%	0%	-	90%	10%	0%	Trp/Leu
Romani a	2018	L-ROM-SORHA-18-07	-	100%	0%	0%	-	100%	0%	0%	-

Regarding all the DNA analysis carried out on leaves samples from Hungarian and Romanian populations, most of the confirmed resistant cases showed heterozygous or homozygous substitutions of alleles mainly on ALS-gene position Trp-574 (one Leucine replacing Tryptophan). Only one population on 2013 was mutated on Pro-197.

For the populations where in-vivo tests and DNA analysis have been run in parallel, resistant mechanisms have been able to be confirmed, showing that TSR and nTSR resistance was both confirmed in Hungary. It allows also to confirm that two Romanian populations start to have small proportion of resistant plant through ALS-gene mutation.

**Table 3.3-11: Correlation between in-vivo and DNA analysis on Hungarian and Romanian SORHA populations**

Seeds code	Leaves code	Location	In-vivo Studies				DNA Analysis		Resistance profile
			%EFFICACY				%MUTANTS		
			DPX-E9636 25WG Rimsulfuron 15-1-T00 0.10%	DPX-E9636 25WG Rimsulfuron 60-1-T00 0.10%	VICTUS OD40 Nicosulfuron 60	VICTUS OD40 Nicosulfuron 240	%mutated plants on ALS-197	%mutated plants on ALS-574	
S-ERDC-SORHA-13-03	L-ERDC-SORHA-13-03	Kocs	81	100	83	93	0	0	Susceptible
S-ERDC-SORHA-13-06	L-ERDC-SORHA-13-06	Meggyespuszta	-	-	0	0	100	0	TSR

<i>S-ERDC-SORHA-13-04</i>	<i>L-ERDC-SORHA-13-05</i>	<i>Tolna</i>	24	74	0	0	0	0	<i>nTSR</i>
<b>S-HUN-SORHA-14-04</b>	<b>L-HUN-SORHA-14-04</b>	<b>Monson</b>	<b>0</b>	<b>28</b>	<b>10</b>	<b>18</b>	<b>0</b>	<b>100</b>	<b>TSR</b>
<i>S-HUN-SORHA-14-08</i>	<i>L-HUN-SORHA-14-08</i>	<i>Bonyhad-Tabod</i>	50	61	20	20	0	0	<i>nTSR</i>
<b>S-HUN-SORHA-14-01</b>	<b>L-HUN-SORHA-14-01</b>	<b>Szekszard</b>	<b>28</b>	<b>43</b>	<b>33</b>	<b>34</b>	<b>0</b>	<b>60</b>	<b>TSR</b>
<i>S-HUN-SORHA-14-03</i>	<i>L-HUN-SORHA-14-03</i>	<i>Szekszard</i>	57	85	13	23	0	0	<i>nTSR</i>
<i>S-HUN-SORHA-14-06</i>	<i>L-HUN-SORHA-14-06</i>	<i>Szekszard</i>	66	86	28	30	0	0	<i>nTSR</i>
<i>S-HUN-SORHA-14-07</i>	<i>L-HUN-SORHA-14-07</i>	<i>Szekszard, Szalkai</i>	45	59	20	20	0	0	<i>nTSR</i>
<b>S-HUN-SORHA-14-02</b>	<b>L-HUN-SORHA-14-02</b>	<b>Phonic</b>	<b>20</b>	<b>20</b>	<b>8</b>	<b>23</b>	<b>0</b>	<b>100</b>	<b>TSR</b>
<b>S-HUN-SORHA-15-02</b>	<b>L-HUN-SORHA-15-02</b>	<b>Kéty</b>	<b>80</b>	<b>69</b>	<b>40</b>	<b>43</b>	<b>0</b>	<b>100</b>	<b>TSR</b>
<b>S-HUN-SORHA-15-03</b>	<b>L-HUN-SORHA-15-03</b>	<b>Felsőnána</b>	<b>33</b>	<b>68</b>	<b>36</b>	<b>33</b>	<b>0</b>	<b>100</b>	<b>TSR</b>
<i>S-HUN-SORHA-15-05</i>	<i>L-HUN-SORHA-15-05</i>	<i>Szakály</i>	73	92	25	33	0	0	<i>nTSR</i>
<i>S-HUN-SORHA-15-06</i>	<i>L-HUN-SORHA-15-06</i>	<i>Tamási</i>	66	97	28	46	0	0	<i>nTSR</i>
<b>S-HUN-SORHA-15-07</b>	<b>L-HUN-SORHA-15-07</b>	<b>Iregszemcse</b>	<b>58</b>	<b>90</b>	<b>18</b>	<b>55</b>	<b>0</b>	<b>12</b>	<b>TSR</b>
<b>S-HUN-SORHA-15-11</b>	<b>L-HUN-SORHA-15-11</b>	<b>Tolna-möz</b>	<b>94</b>	<b>97</b>	<b>50</b>	<b>68</b>	<b>0</b>	<b>36</b>	<b>TSR</b>
<i>S-HUN-SORHA-15-12</i>	<i>L-HUN-SORHA-15-12</i>	<i>Tolna-möz</i>	98	99	-	-	0	0	<i>Susceptible</i>
<b>S-HUN-SORHA-17-011</b>	<b>L-HUN-SORHA-17-011</b>	<b>n.a.</b>	<b>44</b>	<b>70</b>	<b>57</b>	<b>100</b>	<b>0</b>	<b>76</b>	<b>TSR</b>
<b>S-HUN-SORHA-17-11</b>	<b>L-HUN-SORHA-17-01</b>	<b>Baranya, Szentdenes</b>	<b>64</b>	<b>88</b>	<b>79</b>	<b>100</b>	<b>0</b>	<b>36</b>	<b>TSR</b>
<b>S-HUN-SORHA-17-21</b>	<b>L-HUN-SORHA-17-20</b>	<b>Pecs, Szederkeny</b>	<b>52</b>	<b>86</b>	<b>69</b>	<b>100</b>	<b>0</b>	<b>100</b>	<b>TSR</b>
<i>S-ROM-SORHA-17-01</i>	<i>L-ERDC-SORHA-18-10</i>	<i>Derecske</i>	100	99	98	100	0	0	<i>Susceptible</i>
<i>S-ROM-SORHA-17-02</i>	<i>L-ERDC-SORHA-18-11</i>	<i>Hodmezovasarhely</i>	99	99	99	98	0	0	<i>Susceptible</i>
<b>S-ROM-SORHA-17-03</b>	<b>L-ERDC-SORHA-18-12</b>	<b>n.a.</b>	<b>98</b>	<b>96</b>	<b>91</b>	<b>99</b>	<b>0</b>	<b>30</b>	<b>TSR</b>
<b>S-ROM-SORHA-17-04</b>	<b>L-ERDC-SORHA-18-13</b>	<b>n.a.</b>	<b>95</b>	<b>98</b>	<b>92</b>	<b>98</b>	<b>0</b>	<b>10</b>	<b>TSR</b>

Providing DNA analyses in addition to the in-vivo data generated from seeds samples allowed to identify different mechanisms of resistance, confirmed in Hungary. In fact, when loss of efficacy was observed in the in-vivo tests, it was not always necessary correlated with proportion of plants showing mutations on ALS-gene. In some cases, as no mutation was observed on the sampled leaves, the efficacy reduction observed with ALS-inhibitors could be explained by non-target-site resistance mechanisms. Another option could be another position in the gene that has been mutated, but this is should be observed through a complete sequencing of the gene.

In the Table 3.3-12, all the populations in bold showed correlation between loss of efficacy with ALS inhibitors treatments and a certain proportion of plants with mutation on ALS-gene. In italic, despite no mutation detected, a significant loss of control was still observed with the ALS-inhibitors. These cases could be suspected to provide non-target-site resistance. For all the other cases, the good efficacies observed in the pots was confirmed by 100% of wild type biotypes in the DNA analysis.

In conclusions, resistance to ALS-inhibitors, such as nicosulfuron and rimsulfuron has been confirmed on several SORHA populations in Hungary between 2013 and 2017. Most of them showed target-site resistance mechanisms (through in-vivo study and DNA analysis), through ALS-gene mutation mainly

on position Trp-574. However, some other cases confirmed resistance through in-vivo studies despite any detection of mutated plants in DNA analysis. This also confirms that non-target-site resistance mechanisms are also still existing in the fields. In Romania, two first cases of resistant SORHA have been confirmed. A small proportion of the sampled population showed target-site mutation on ALS-gene position Trp-574.

To control these resistant populations to ALS-inhibitors, excellent efficacy has been obtained with ACCase inhibitors (as Cycloxydim or Fluazifop) and 4-hydroxyphenylpyruvate dioxygenase (4-HPPD) inhibiting herbicides (HRAC group P2 27), showing that these alternative modes of action could be adapted solutions in the field.

### 3.3.7.3 Resistance management strategy to control *Echinochloa crus-galli* (ECHCG)

To determine the activity of GF-3969, and the active substance of rimsulfuron in particular, which is the active substance effective against this weed, seeds samples of *Echinochloa crus-galli* (ECHCG) were collected in the maize fields following weed control failure.

In order to determine the resistant profiles of 32 seeds and 28 leaves populations of *Echinochloa crus-galli* populations sampled in EU Central zone between 2017 and 2018, two types of resistance tests have been carried out from seeds and leaves samples.

**Table 3.3-12: List of all ECHCG seeds samples analyzed in 2017 and 2018 in EPPO central zone**

Species	Country	Year	Location	Seeds Code	Leaves Code
ECHCG	Austria	2017	Burgenland, Gerhaus	S-AUS-ECHCG-17-01	L-ERDC-ECHCG-18-06
ECHCG	Czech	2017	Trutnov	S-CZE-ECHCG-17-02	L-ERDC-ECHCG-18-14
ECHCG	Czech	2017	Touzim	S-CZE-ECHCG-17-03	L-ERDC-ECHCG-18-07
ECHCG	Czech	2017	Kujavy	S-CZE-ECHCG-17-04	L-ERDC-ECHCG-18-01
ECHCG	Germany	2017	n.a.	S-DEU-ECHCG-17-01	L-ERDC-ECHCG-18-02
ECHCG	Germany	2017	n.a.	S-DEU-ECHCG-17-02	L-ERDC-ECHCG-18-03
ECHCG	Germany	2017	n.a.	S-DEU-ECHCG-17-03	L-ERDC-ECHCG-18-04
ECHCG	Germany	2017	Sommerstorf	S-DEU-ECHCG-17-05	L-DEU-ECHCG-17-01
ECHCG	Germany	2018	Lentzke	S-DEU-ECHCG-18-01	
ECHCG	Germany	2018	Schwarzach	S-DEU-ECHCG-18-02	
ECHCG	Germany	2018	Freising	S-DEU-ECHCG-18-04	
ECHCG	Germany	2018	Liepen	S-DEU-ECHCG-18-06	
ECHCG	Hungary	2017	Debrecen Jozsa	S-HUN-ECHCG-17-002	L-ERDC-ECHCG-18-23
ECHCG	Hungary	2017	Debrecen Latokep	S-HUN-ECHCG-17-01	L-ERDC-ECHCG-18-24
ECHCG	Hungary	2017	Mosonmagyaróvár	S-HUN-ECHCG-17-021	L-ERDC-ECHCG-18-25
ECHCG	Hungary	2017	Abasar, Heves	S-HUN-ECHCG-17-031	L-ERDC-ECHCG-18-26
ECHCG	Hungary	2017	Pest gödöllő	S-HUN-ECHCG-17-11	L-ERDC-ECHCG-18-27
ECHCG	Hungary	2018	Hodmezovasarhely	S-HUN-ECHCG-18-04	L-HUN-ECHCG-18-04
ECHCG	Hungary	2018	n.a.	S-HUN-ECHCG-18-05	L-HUN-ECHCG-18-05
ECHCG	Poland	2017	Okrzeszyce	S-POL-ECHCG-17-01	L-ERDC-ECHCG-18-09
ECHCG	Poland	2017	Godzikowice	S-POL-ECHCG-17-02	L-ERDC-ECHCG-18-10
ECHCG	Poland	2017	Kurowo	S-POL-ECHCG-17-03	L-ERDC-ECHCG-18-11
ECHCG	Poland	2017	Naclaw	S-POL-ECHCG-17-04	L-ERDC-ECHCG-18-28
ECHCG	Poland	2017	Piechanin	S-POL-ECHCG-17-05	L-ERDC-ECHCG-18-12
ECHCG	Poland	2018	Wojokowice	S-POL-ECHCG-18-02	L-POL-ECHCG-18-02
ECHCG	Poland	2018	Gaj, 63-100 Srem	S-POL-ECHCG-18-04	L-POL-ECHCG-18-04
ECHCG	Romania	2017	n.a.	S-ROM-ECHCG-17-01	L-ERDC-ECHCG-18-29
ECHCG	Romania	2017	n.a.	S-ROM-ECHCG-17-02	L-ERDC-ECHCG-18-30
ECHCG	Romania	2017	n.a.	S-ROM-ECHCG-17-03	L-ERDC-ECHCG-18-31
ECHCG	Romania	2017	n.a.	S-ROM-ECHCG-17-04	L-ERDC-ECHCG-18-32
ECHCG	Romania	2017	n.a.	S-ROM-ECHCG-17-05	L-ERDC-ECHCG-18-33
ECHCG	Slovakia	2017	n.a.	S-SVK-ECHCG-17-01	L-ERDC-ECHCG-18-08

n.a. = not available

**Table 3.3-13: List of all ECHCG leaves samples analyzed from 2012 to 2018 in EPPO central zone**

Species	Country	Year	Location	Seeds Code	Leaves Code
ECHCG	Austria	2017	Burgenland, Gerhaus	S-AUS-ECHCG-17-01	L-ERDC-ECHCG-18-06
ECHCG	Czech	2017	Trutnov	S-CZE-ECHCG-17-02	L-ERDC-ECHCG-18-14
ECHCG	Czech	2017	Touzim	S-CZE-ECHCG-17-03	L-ERDC-ECHCG-18-07
ECHCG	Czech	2017	Kujavy	S-CZE-ECHCG-17-04	L-ERDC-ECHCG-18-01
ECHCG	Germany	2017	n.a	S-DEU-ECHCG-17-01	L-ERDC-ECHCG-18-02
ECHCG	Germany	2017	n.a	S-DEU-ECHCG-17-02	L-ERDC-ECHCG-18-03
ECHCG	Germany	2017	n.a	S-DEU-ECHCG-17-03	L-ERDC-ECHCG-18-04
ECHCG	Germany	2017	Sommerstorf	S-DEU-ECHCG-17-05	L-DEU-ECHCG-17-01
ECHCG	Hungary	2017	Debrecen Jozsa	S-HUN-ECHCG-17-002	L-ERDC-ECHCG-18-23
ECHCG	Hungary	2017	Debrecen Latokep	S-HUN-ECHCG-17-01	L-ERDC-ECHCG-18-24
ECHCG	Hungary	2017	Mosonmagyaróvár	S-HUN-ECHCG-17-021	L-ERDC-ECHCG-18-25
ECHCG	Hungary	2017	Abasar, Heves	S-HUN-ECHCG-17-031	L-ERDC-ECHCG-18-26
ECHCG	Hungary	2017	Pest gödöllő	S-HUN-ECHCG-17-11	L-ERDC-ECHCG-18-27
ECHCG	Hungary	2018	Hodmezovasarhely	S-HUN-ECHCG-18-04	L-HUN-ECHCG-18-04
ECHCG	Hungary	2018	n.a	S-HUN-ECHCG-18-05	L-HUN-ECHCG-18-05
ECHCG	Poland	2017	Okrzeszyce	S-POL-ECHCG-17-01	L-ERDC-ECHCG-18-09
ECHCG	Poland	2017	Godzikowice	S-POL-ECHCG-17-02	L-ERDC-ECHCG-18-10
ECHCG	Poland	2017	Kurowo	S-POL-ECHCG-17-03	L-ERDC-ECHCG-18-11
ECHCG	Poland	2017	Naclaw	S-POL-ECHCG-17-04	L-ERDC-ECHCG-18-28
ECHCG	Poland	2017	Piechanin	S-POL-ECHCG-17-05	L-ERDC-ECHCG-18-12
ECHCG	Poland	2018	Wojkowice	S-POL-ECHCG-18-02	L-POL-ECHCG-18-02
ECHCG	Poland	2018	Gaj, 63-100 Srem	S-POL-ECHCG-18-04	L-POL-ECHCG-18-04
ECHCG	Romania	2017	n.a	S-ROM-ECHCG-17-01	L-ERDC-ECHCG-18-29
ECHCG	Romania	2017	n.a	S-ROM-ECHCG-17-02	L-ERDC-ECHCG-18-30
ECHCG	Romania	2017	n.a	S-ROM-ECHCG-17-03	L-ERDC-ECHCG-18-31
ECHCG	Romania	2017	n.a	S-ROM-ECHCG-17-04	L-ERDC-ECHCG-18-32
ECHCG	Romania	2017	n.a.	S-ROM-ECHCG-17-05	L-ERDC-ECHCG-18-33
ECHCG	Slovakia	2017	n.a.	S-SVK-ECHCG-17-01	L-ERDC-ECHCG-18-08

n.a. = not available

The objectives were to confirm if these *Echinochloa* populations were resistant or not to maize herbicides ALS-inhibitors such as Rimsulfuron and Nicosulfuron.

In-vivo tests were carried out with the seeds under controlled conditions, comparing the efficacy of different ALS-inhibitors (rimsulfuron, nicosulfuron, foramsulfuron, thien carbazone), together with products with different modes of action (mesotrione, tembotrione, isoxaflutole). Efficacies were compared with a susceptible reference population.

A DNA analysis was carried out on the collected leaves in the untreated pots and some survival plants of the in-vivo tests with the objective to detect a potential mutation on the ALS gene-enzyme. Two positions, Proline-197 and Tryptophane-574, from the ALS enzyme were target through PCR and pyrosequencing methodology.

Results showed that resistance to ALS-inhibitors, such as Nicosulfuron and Rimsulfuron but also Foramsulfuron and Thien carbazone, has been confirmed on one population in Czech Republic and one in Poland in 2017, through in-vivo study and DNA analysis confirming target-site mutations on ALS-gene at position Trp-574 in important part of the populations.

To control these resistant populations to ALS-inhibitors, excellent efficacies has been obtained with 4-hydroxyphenylpyruvate dioxygenase (4-HPPD) inhibiting herbicides (HRAC group F2), showing that these alternative modes of action could be adapted solutions in the field.

**IN-VIVO Data from samples from Austria, Czech Republic, Germany Hungary, Poland, Romania and Slovakia in 2017 and 2018**

**Table 3.3-14: % Visual efficacy (average of 4 rep) at 28 days after application on ECHCG populations from Austria, Czech Republic and Germany in 2017**

Products Name	Active substance	Rate (g a.s./ha)	Ref. S	Austria	Czech Rep				Germany			
				S-AUS-ECHCG-17-01	S-CZE-ECHCG-17-02	S-CZE-ECHCG-17-03	S-CZE-ECHCG-17-04	S-DEU-ECHCG-17-01	S-DEU-ECHCG-17-02	S-DEU-ECHCG-17-03	S-DEU-ECHCG-17-05	
DPX-E9636 25WG + T90	Rimsulfuron	15 + 0.1%	100	100	100	7	10	10	10	10	10	10
DPX-E9636 25WG + T90	Rimsulfuron	60 + 0.1%	100	100	10	8	10	10	10	10	10	10
DPX-V9360 40OD	Nicosulfuron	60	100	100	10	9	10	99	10	10	10	10
DPX-V9360 40OD	Nicosulfuron	240	100	100	10	9	10	10	10	10	10	10
OUST 75WG + T90	Sulfometuron	75 + 0.1%	100	100	10	6	10	10	10	10	10	10
ELUMIS OD105	Nicosulfuron + Mesotrione	45 + 112.5	100	100	10	9	10	10	10	10	10	99
LAUDIS 66OD	Tembotrione	150	99	100	10	9	99	99	99	99	10	0
MONSOON ACTIVE 40OD	Foramsulfuron + Thiencarbazone	45 + 15	100	100	10	7	10	10	10	10	10	10
ADENGO 70SC	Thiencarbazone + Isoxaflutole	40 + 100	100	99	99	5	10	10	10	10	10	10

Only one case of resistant ECHCG has been confirmed in Czech Republic. Showing a lack of control with Rimsulfuron at N and 4N rate, and some surviving plants with Nicosulfuron at N rate. With other ALS-inhibitors as Sulfometuron or Foramsulfuron and Thiencarbazone, a similar loss of efficacy was observed. To control this populations, HPPD inhibitors seemed to provide satisfying results. In Austria and Germany, none of the test populations was confirmed resistant.

**Table 3.3-15: % Visual efficacy (average of 4 rep) at 28 days after application on ECHCG populations from Hungary and Poland in 2017**

Products Name	Active substance	Rate (g a.s./ha)	Ref. S	Hungary					Poland					
				S-HUN-ECHCG-17-01	S-HUN-ECHCG-17-02	S-HUN-ECHCG-17-03	S-HUN-ECHCG-17-04	S-HUN-ECHCG-17-05	S-POL-ECHCG-17-01	S-POL-ECHCG-17-02	S-POL-ECHCG-17-03	S-POL-ECHCG-17-04	S-POL-ECHCG-17-05	
DPX-E9636 25WG + T90	Rimsulfuron	15 + 0.1%	100	10	10	10	10	10	10	10	10	10	10	78
DPX-E9636 25WG + T90	Rimsulfuron	60 + 0.1%	100	10	10	10	10	10	10	10	10	10	10	97
DPX-V9360 40OD	Nicosulfuron	60	100	10	10	10	10	10	10	10	10	10	10	77
DPX-V9360 40OD	Nicosulfuron	240	100	10	10	10	10	10	10	10	10	10	10	98
OUST 75WG + T90	Sulfometuron	75 + 0.1%	100	10	10	10	10	10	10	10	10	10	10	69
ELUMIS OD105	Nicosulfuron + Mesotrione	45 + 112.5	100	10	99	99	10	10	98	99	10	99	96	

LAUDIS 66OD	Tembotrione	150	99	10 0									
MONSOON ACTIVE 4OOD	Foramsulfuron + Thiencarbazone	45 + 15	100	10 0	64								
ADENGO 70SC	Thiencarbazone + Isoxaflutole	40 + 100	100	91	98	94	94	98	98	95	10 0	99	91

**Table 3.3-16: % Visual efficacy (average of 4 rep) at 28 days after application on ECHCG populations from Hungary and Poland in 2017**

Products Name	Active substance	Rate (g a.s./ha)	Ref. S	Romania					Slovakia
				S-ROM-ECHCG-17.01	S-ROM-ECHCG-17.02	S-ROM-ECHCG-17.03	S-ROM-ECHCG-17.04	S-ROM-ECHCG-17.05	S-SVK-ECHCG-17.01
DPX-E9636 25WG + T90	Rimsulfuron	15 + 0.1%	100	10 0	10 0	10 0	10 0	10 0	100
DPX-E9636 25WG + T90	Rimsulfuron	60 + 0.1%	100	10 0	10 0	10 0	10 0	10 0	100
DPX-V9360 4OOD	Nicosulfuron	60	100	10 0	10 0	10 0	10 0	10 0	100
DPX-V9360 4OOD	Nicosulfuron	240	100	10 0	10 0	10 0	10 0	10 0	100
OUST 75WG + T90	Sulfometuron	75 + 0.1%	100	10 0	10 0	10 0	10 0	10 0	100
ELUMIS OD105	Nicosulfuron + Mesotrione	45 + 112.5	100	10 0	10 0	10 0	99	10 0	97
LAUDIS 66OD	Tembotrione	150	99	10 0	10 0	10 0	10 0	10 0	100
MONSOON ACTIVE 4OOD	Foramsulfuron + Thiencarbazone	45 + 15	100	10 0	10 0	10 0	10 0	10 0	100
ADENGO 70SC	Thiencarbazone + Isoxaflutole	40 + 100	100	98	99	99	98	99	98

In Hungary, Romania and Slovakia, no resistant case has been confirmed on the tested populations. With similar profile as observed in the case from Czech Republic one population from Poland showed a significant level of resistance, being not well controlled by Rimsulfuron and Nicosulfuron at N rate, but also by Sulfometuron, and Foramsulfuron and Thiencarbazone. Again, Mesotrione or Tembotrione as HPPD inhibitors could be good alternative to be able to control this population.

DNA ANALYSIS Data from samples from Austria, Czech Republic, Germany, Hungary, Poland, Romania and Slovakia between 2017 and 2018

**Table 3.3-17: ALS-gene profiles of ECHCG leaves populations on two positions Pro-197 and Trp-574**

Country	Year	Leaves Code	Seeds Code	ALS-gene Pro-197 position				ALS-gene Trp-574 position			
				% Wild type	% Heterozygous	% Homozygous	Amino Acid Subst. Pro/Pro-197	% Wild type	% Heterozygous	% Homozygous	Amino Acid Subst. Trp/Trp-574
Austria	2017	L-ERDC-ECHCG-18-06	S-AUS-ECHCG-17-01	100%	0%	0%	-	100%	0%	0%	-
Czech	2017	L-ERDC-ECHCG-18-14	S-CZE-ECHCG-17-02	100%	0%	0%	-	100%	0%	0%	-
Czech	2017	L-ERDC-ECHCG-18-07	S-CZE-ECHCG-17-03	100%	0%	0%	-	0%	100%	0%	Trp/Leu
Czech	2017	L-ERDC-ECHCG-18-01	S-CZE-ECHCG-17-04	100%	0%	0%	-	100%	0%	0%	-
Germany	2017	L-ERDC-ECHCG-18-02	S-DEU-ECHCG-17-01	100%	0%	0%	-	100%	0%	0%	-

Germany	2017	L-ERDC-ECHCG-18-03	S-DEU-ECHCG-17-02	100%	0%	0%	-	100%	0%	0%	-
Germany	2017	L-ERDC-ECHCG-18-04	S-DEU-ECHCG-17-03	100%	0%	0%	-	100%	0%	0%	-
Germany	2017	L-DEU-ECHCG-17-01	S-DEU-ECHCG-17-05	100%	0%	0%	-	100%	0%	0%	-
Hungary	2017	L-ERDC-ECHCG-18-23	S-HUN-ECHCG-17-002	100%	0%	0%	-	100%	0%	0%	-
Hungary	2017	L-ERDC-ECHCG-18-24	S-HUN-ECHCG-17-01	100%	0%	0%	-	100%	0%	0%	-
Hungary	2017	L-ERDC-ECHCG-18-25	S-HUN-ECHCG-17-021	100%	0%	0%	-	100%	0%	0%	-
Hungary	2017	L-ERDC-ECHCG-18-26	S-HUN-ECHCG-17-031	100%	0%	0%	-	100%	0%	0%	-
Hungary	2017	L-ERDC-ECHCG-18-27	S-HUN-ECHCG-17-11	100%	0%	0%	-	100%	0%	0%	-
Hungary	2018	L-HUN-ECHCG-18-01	S-HUN-ECHCG-18-01	100%	0%	0%	-	100%	0%	0%	-
Hungary	2018	L-HUN-ECHCG-18-04	S-HUN-ECHCG-18-04	100%	0%	0%	-	100%	0%	0%	-
Hungary	2018	L-HUN-ECHCG-18-05	S-HUN-ECHCG-18-05	100%	0%	0%	-	100%	0%	0%	-
Hungary	2018	L-HUN-ECHCG-18-06	S-HUN-ECHCG-18-06	100%	0%	0%	-	100%	0%	0%	-
Hungary	2018	L-HUN-ECHCG-18-07	S-HUN-ECHCG-18-07	100%	0%	0%	-	100%	0%	0%	-
Poland	2017	L-ERDC-ECHCG-18-09	S-POL-ECHCG-17-01	100%	0%	0%	-	100%	0%	0%	-
Poland	2017	L-ERDC-ECHCG-18-10	S-POL-ECHCG-17-02	100%	0%	0%	-	100%	0%	0%	-
Poland	2017	L-ERDC-ECHCG-18-11	S-POL-ECHCG-17-03	100%	0%	0%	-	100%	0%	0%	-
Poland	2017	L-ERDC-ECHCG-18-28	S-POL-ECHCG-17-04	100%	0%	0%	-	100%	0%	0%	-
Poland	2017	L-ERDC-ECHCG-18-12	S-POL-ECHCG-17-05	100%	0%	0%	-	6%	94%	0%	Trp/Leu
Poland	2018	L-POL-ECHCG-18-01	S-POL-ECHCG-18-01	60%	40%	0%	Pro/Thr	100%	0%	0%	-
Poland	2018	L-POL-ECHCG-18-02	S-POL-ECHCG-18-02	100%	0%	0%	-	100%	0%	0%	-
Poland	2018	L-POL-ECHCG-18-03	S-POL-ECHCG-18-03	100%	0%	0%	-	95%	5%	0%	Trp/Leu
Poland	2018	L-POL-ECHCG-18-04	S-POL-ECHCG-18-04	100%	0%	0%	-	100%	0%	0%	-
Poland	2018	L-POL-ECHCG-18-05	S-POL-ECHCG-18-05	100%	0%	0%	-	100%	0%	0%	-
Romania	2017	L-ERDC-ECHCG-18-29	S-ROM-ECHCG-17-01	100%	0%	0%	-	100%	0%	0%	-
Romania	2017	L-ERDC-ECHCG-18-30	S-ROM-ECHCG-17-02	100%	0%	0%	-	100%	0%	0%	-
Romania	2017	L-ERDC-ECHCG-18-31	S-ROM-ECHCG-17-03	100%	0%	0%	-	100%	0%	0%	-
Romania	2017	L-ERDC-ECHCG-18-32	S-ROM-ECHCG-17-04	100%	0%	0%	-	100%	0%	0%	-
Romania	2017	L-ERDC-ECHCG-18-33	S-ROM-ECHCG-17-05	100%	0%	0%	-	100%	0%	0%	-
Slovakia	2017	L-ERDC-ECHCG-18-08	S-SVK-ECHCG-17-01	100%	0%	0%	-	100%	0%	0%	-

In addition of the in-vivo studies, these DNA analyses confirmed well again that the two populations from Czech Republic and Poland confirmed resistant to ALS-inhibitors through target-site mechanisms. In fact, 100% and 94% of the analyzed plants respectively from Czech Republic and Poland showed ALS-gene heterozygous mutation on position Trp-574 (substitution of one allele Trp to Leu).

In conclusions, resistance to ALS-inhibitors, as Nicosulfuron and Rimsulfuron but also Foramsulfuron and Thiencarbazone, has been confirmed on one ECHCG population in Czech Republic and Poland in 2017, through in-vivo study and DNA analysis confirming target-site mutations on ALS-gene at position Trp-574 in important part of the populations.

To control these resistant populations to ALS-inhibitors, excellent efficacies has been obtained with 4-hydroxyphenylpyruvate dioxygenase (4-HPPD) inhibiting herbicides (HRAC group ~~P2~~ 27), showing that these alternative modes of action could be adapted solutions in the field.

### 3.3.7.4 Resistance management strategy to control *Setaria* species (SETss)

To determine the activity of GF-3969, and the active substance of rimsulfuron in particular, which is the active substance effective against this weed, seeds samples of *Setaria* species (SETss) were collected in the maize fields following weed control failure.

In order to determine the resistant profiles of 16 seeds and 14 leaves populations of *Setaria* species populations sampled in EU Central zone in 2017 and 2018, two types of resistance tests have been carried out from seeds and leaves samples.

**Table 3.3-18: List of all SETss seeds samples analyzed in 2017 and 2018 in EPPO central zone**

Species	Country	Year	Location	Seeds Code	Leaves Code
SETPU	Czech	2017	Troubsko	S-CZE-SETPU-17-01	L-ERDC-SETLU-18-01
SETPU	Poland	2017	Zakrzow	S-POL-SETLU-17-01	L-ERDC-SETLU-18-02

SETPU	Poland	2017	Brylowek	S-POL-SETLU-17-02	L-ERDC-SETLU-18-03
SETPU	Poland	2017	Strzelin	S-POL-SETLU-17-03	L-ERDC-SETLU-18-04
SETVI	Austria	2017	Burgenland, Gerhaus	S-AUS-SETVI-17-01	-
SETVI	Poland	2017	lubelskie Puchaczów	S-POL-SETVI-17-01	L-ERDC-SETVI-18-02
SETVI	Poland	2017	Lipno - Witkowo	S-POL-SETVI-17-02	L-ERDC-SETVI-18-09
SETVI	Poland	2018	n.a	S-POL-SETVI-18-01	-
SETVI	Poland	2018	n.a	S-POL-SETVI-18-02	-
SETVI	Poland	2018	n.a	S-POL-SETVI-18-03	-
SETVI	Romania	2017	n.a	S-ROM-SETVI-17-01	L-ERDC-SETVI-18-04
SETVI	Romania	2017	n.a	S-ROM-SETVI-17-02	L-ERDC-SETVI-18-05
SETVI	Romania	2017	n.a	S-ROM-SETVI-17-03	L-ERDC-SETVI-18-06
SETVI	Romania	2017	n.a	S-ROM-SETVI-17-04	L-ERDC-SETVI-18-07
SETVI	Slovakia	2017	Cicov	S-SVK-SETVI-17-01	L-ERDC-SETVI-18-08
SETVI	Germany	2018	Lentzke	S-DEU-SETVI-18-01	-

n.a = not available

**Table 3.3-19: List of all SETss leaves samples analyzed in 2017 and 2018 in EPPO central zone**

Species	Country	Year	Location	Seeds Code	Leaves Code
SETPU	Czech	2017	Troubsko	S-CZE-SETPU-17-01	L-ERDC-SETLU-18-01
SETPU	Poland	2017	Zakrzow	S-POL-SETLU-17-01	L-ERDC-SETLU-18-02
SETPU	Poland	2017	Brylowek	S-POL-SETLU-17-02	L-ERDC-SETLU-18-03
SETPU	Poland	2017	Strzelin	S-POL-SETLU-17-03	L-ERDC-SETLU-18-04
SETPU	Poland	2018	Wojokowice		L-POL-SETPU-18-01
SETPU	Poland	2018	Wojokowice		L-POL-SETPU-18-02
SETPU	Poland	2018	Piastowice		L-POL-SETPU-18-03
SETVI	Poland	2017	lubelskie Puchaczów	S-POL-SETVI-17-01	L-ERDC-SETVI-18-02
SETVI	Poland	2017	Lipno - Witkowo	S-POL-SETVI-17-02	L-ERDC-SETVI-18-09
SETVI	Romania	2017	n.a	S-ROM-SETVI-17-01	L-ERDC-SETVI-18-04
SETVI	Romania	2017	n.a	S-ROM-SETVI-17-02	L-ERDC-SETVI-18-05
SETVI	Romania	2017	n.a	S-ROM-SETVI-17-03	L-ERDC-SETVI-18-06
SETVI	Romania	2017	n.a	S-ROM-SETVI-17-04	L-ERDC-SETVI-18-07
SETVI	Slovakia	2017	Cicov	S-SVK-SETVI-17-01	L-ERDC-SETVI-18-08

n.a = not available

The objectives were to confirm if these *Setaria* populations were resistant or not to ALS-inhibitors as TITUS® 25WG (rimsulfuron), and/or ACCENT® 75WG (nicosulfuron).

In-vivo tests were carried out with seeds under controlled conditions in growth chamber, comparing the efficacy of different ALS-inhibitors (rimsulfuron, nicosulfuron), together with products with different modes of action (fop, dims, inhibition of HPPD, chloroacetamids). Efficacies were always compared to a susceptible reference population. DNA analysis was carried out on the collected leaves in the fields with the objective to detect a potential mutation on the ALS gene-enzyme. Two positions, Proline-197 and Tryptophane-574, from the ALS enzyme were target through PCR and pyrosequencing methodology.

At the end, all the tested populations of *Setaria* in 2017 and 2018, did not show any resistance neither through the in-vivo studies nor through the DNA analysis done on the leaves.

### 3.3.7.5 Resistance management strategy to control *Digitaria sanguinalis* (DIGSA)

To determine the activity of GF-3969, and the active substance of rimsulfuron in particular, which is the active substance effective against this weed, seeds samples of *Digitaria sanguinalis* (DIGSA) were collected in the maize fields.

In order to determine the resistant profiles of 2 populations of *Digitaria sanguinalis* populations sampled in EU Central zone in 2015, DNA analysis have been carried out from leaves samples.

**Table 3.3-20: List of all DIGSA samples analyzed in 2015 in EPPO central zone**

Species	Country	Year	Location	Leaves Code
DIGSA	Romania	2015	Curcani	L-ROM-DIGSA-15-01
DIGSA	Romania	2015	Chirnogi	L-ROM-DIGSA-15-03

The objectives were to confirm if these *Digitaria* populations were resistant or not to ALS-inhibitors.

DNA analysis was carried out on the collected leaves in the fields with the objective to detect a potential mutation on the ALS gene-enzyme. Two positions, Proline-197 and Tryptophane-574, from the ALS enzyme were target through PCR and pyrosequencing methodology.

**Table 3.3-21: ALS-gene profiles of DIGSA leaves populations on two positions Pro-197 and Trp-574**

Country	Year	Leaves Code	ALS-gene Pro-197 position				ALS-gene Trp-574 position			
			% Wild type	% Heterozygous	% Homozygous	Amino Acid Subst. Pro/Pro-197	% Wild type	% Heterozygous	% Homozygous	Amino Acid Subst. Trp/Trp-574
Romania	2015	L-ROM-DIGSA-15-01	100%	0%	0%	0%	88%	12%	0%	12%
Romania	2015	L-ROM-DIGSA-15-03	100%	0%	0%	0%	84%	16%	0%	16%

Results showed that both populations from Romania presented a small proportion of plants where the ALS-gene was mutated on in the position Trp-574. The amino-acid Tryptophane was substituted with a Leucine as heterozygous mutation.

Based on the products that can provide good control of *Digitaria sanguinalis*, alternative modes of action to ALS-inhibitors could be HPPD inhibitors (P2 27) as tembotrione or chloroacetamids such as Dmta, s-metolachlore (K3 15). In the objective of resistance management, these active ingredients could be included on the application strategy.

### 3.3.7.6 Resistance management strategy to control *Amaranthus retroflexus* (AMARE)

To determine the activity of GF-3969, and thifensulfuron methyl in particular, which is the active substance effective against this weed, seeds samples of *Amaranthus retroflexus* (AMARE) were collected in the maize fields.

To determine the resistant profiles of 11 seeds and 9 leaves populations sampled in EU Central zone between 2013 and 2018, two types of resistance tests have been carried out from seeds and leaves samples.

**Table 3.3-22: List of all AMARE seeds samples analyzed between 2013 and 2018 in EPPO central zone**

Species	Country	Year	Location	Seeds Code	Leaves Code
AMARE	Hungary	2017	Gödöllő	S-HUN-AMARE-17-006	L-ERDC-AMARE-18-07
AMARE	Hungary	2017	Debrecen	S-HUN-AMARE-17-001	L-ERDC-AMARE-18-06
AMARE	Hungary	2017	Loventi Zsolt	S-HUN-AMARE-17-022	L-ERDC-AMARE-18-01
AMARE	Hungary	2018	Püzki	S-HUN-AMARE-18-08	-
AMARE	Austria	2013	Spitzziken Burgenland	S-AMARE-13-16	-
AMARE	Austria	2013	Spitzziken Burgenland	S-AMARE-13-17	-
AMARE	Germany	2018	Schwarzach	S-DEU-AMARE-18-01	-
AMARE	Germany	2018	Liepen	S-DEU-AMARE-18-03	-
AMARE	Romania	2015	Breila	S-ROM-AMARE-15-01	L-ROM-AMARE-15-01
AMARE	Romania	2018	Braila	S-ROM-AMARE-18-02	-

AMARE	Romania	2018	Tunari	S-ROM-AMARE-18-03	-
-------	---------	------	--------	-------------------	---

**Table 3.3-23: List of all AMARE leaves samples analyzed in 2015 and 2018 in EPPO central zone**

Species	Country	Year	Location	Seeds Code	Leaves Code
AMARE	Hungary	2017	Gödöllő	S-HUN-AMARE-17-006	L-ERDC-AMARE-18-07
AMARE	Hungary	2017	Debrecen	S-HUN-AMARE-17-001	L-ERDC-AMARE-18-06
AMARE	Hungary	2017	Loventi Zsolt	S-HUN-AMARE-17-022	L-ERDC-AMARE-18-01
AMARE	Hungary	2018	Solnok	-	L-HUN-AMARE-18-01
AMARE	Hungary	2018	Szegvar	-	L-HUN-AMARE-18-04
AMARE	Hungary	2018	n.a	-	L-HUN-AMARE-18-05
AMARE	Hungary	2018	Tarhos	-	L-HUN-AMARE-18-06
AMARE	Hungary	2018	n.a	-	L-HUN-AMARE-18-07
AMARE	Romania	2015	Breila	S-ROM-AMARE-15-01	L-ROM-AMARE-15-01

n.a = not available

The objectives were to confirm if these *Amaranthus* populations were resistant or not to maize herbicides ALS-inhibitors such as rimsulfuron and nicosulfuron.

In-vivo tests were carried out with the seeds under controlled conditions, comparing the efficacy of different ALS-inhibitors (rimsulfuron, nicosulfuron, foramsulfuron, thien carbazon), together with products with different modes of action (mesotrione, tembotrione, isoxaflutole). Efficacies were compared with a susceptible reference population.

A DNA analysis was carried out on the collected leaves in the untreated pots and some survival plants of the in-vivo tests with the objective to detect a potential mutation on the ALS gene-enzyme. Two positions, Proline-197 and Tryptophane-574, from the ALS enzyme were target through PCR and pyrosequencing methodology.

Results showed that resistance to ALS-inhibitors was confirmed in Austria in 2013, Romania in 2015 and Hungary in 2017, mainly through target-site mutations on ALS-gene position Trp-574.

To control these resistant populations to ALS-inhibitors, good efficacies has been obtained with 4-hydroxyphenylpyruvate dioxygenase (4-HPPD) inhibiting herbicides as Tembotrione or Isoxaflutole (HRAC group [P2 27](#)), showing that these alternative modes of action could be adapted solutions in the field. PSII inhibitors ([E3 6](#)) such as Bentazone or Bromoxynil could provide control also but with more variable results.

### **IN-VIVO Data from AMARE samples from Austria, Romania, Hungary and Germany between 2013 and 2018**

**Table 3.3-24: % Visual efficacy (average of 4 rep) at 28 days after application on AMARE populations from Austria and Romania between 2013 and 2015**

Products Name	Active substance	Rate (g a.s./ha)	Ref. S	Austria		Romania
				S-AMARE-13-16	S-AMARE-13-17	S-ROM-AMARE-15-01 (*)
DPX-M6316 50WG + T90	Thifensulfuron methyl	30 + 0.1%	99	40	34	45
PULSAR 40	Imazamox	50	100	44	31	25
BASAGRAN SG87	Bentazone	1479	93	76	63	94
DPX-M6316 50WG + BASAGRAN SG87	Thifensulfuron + Bentazone	3.75 + 1479	100	10 0	92	-
CADELI	Bromoxynil	300	92	-	-	100

(\*) complementary DNA analysis – data in Table 3.3-26

Both populations sampled in Austria in 2013 showed resistance profiles to ALS inhibitors, not being controlled by Thifensulfuron ethyl or Imazamox. Similarly, the population from Romania in 2015 has been also confirmed resistant to ALS-inhibitors.

**Table 3.3-25: % Visual efficacy (average of 4 rep) at 28 days after application on AMARE populations from Hungary in 2017**

Products Name	Active substance	Rate (g a.s./ha)	Ref. S	S-HUN-AMARE-17-006 (*)	S-HUN-AMARE-17-001 (*)	S-HUN-AMARE-17-022 (*)
DPX-E9636 25WG + T90	Rimsulfuron	15 + 0.1%	100	100	100	41
DPX-E9636 25WG + T90	Rimsulfuron	60 + 0.1%	100	100	100	74
DPX-V9360 40SC	Nicosulfuron	60	100	100	100	56
DPX-V9360 40SC	Nicosulfuron	240	100	100	100	100
OUST WG75	Sulfometuron	150	100	100	100	29
ELUMIS OD105	Nicosulfuron + Mesotrione	45 + 112.5	100	100	100	100
LAUDIS 66OD	Tembotrione + isoxadifen	99 + 49.5	100	100	100	100
MONSOON ACTIVE 55OD	Foramsulfuron + Thiencazone	200	100	100	100	47
ADENGO 70SC	Thiencazone + Isoxaflutole	150	100	100	100	100

(\*) complementary DNA analysis – data in Table 3.3-26

In Hungary, in 2017, only one of the three AMARE samples were confirmed resistant to ALS-inhibitors. Good control was obtained with alternative modes of action as HPPD inhibitor (Mesotrione, Tembotrione, and Isoxaflutole).

**Table 3.3-26: % Visual efficacy (average of 4 rep) at 28 days after application on AMARE populations from Hungary, Germany and Romania in 2018**

Products Name	Active substance	Rate (g a.s./ha)	Ref. S	Hungary		German		Romani
				S-HUN-AMARE-18-00	S-DEU-AMARE-18-01	S-DEU-AMARE-18-03	S-ROM-AMARE-18-07	S-ROM-AMARE-18-03
GF-3969 35.18WG + T90	Rimsulfuron + Thifensulfuron + Isoxadifen	20+12.5+15+0.2 %	100	100	100	100	100	100
GF-3969 35.18WG + T90	Rimsulfuron + Thifensulfuron + Isoxadifen	40+25+30+0.4%	100	100	100	100	100	100
LAUDIS 66OD 150 g ai	Tembotrione + isoxadifen	99 + 49.5	100	100	100	-	-	-
ADENGO 70SC	Thiencazone + Isoxaflutole	150	76.4	100	96.26	82	90.95	57.95

In 2018, none of the tested populations in Hungary, Germany and Romania were confirmed resistant to ALS inhibitors.

DNA ANALYSIS Data from AMARE samples from between 2013 and 2018

**Table 3.3-27: ALS-gene profiles of AMARE leaves populations on two positions Pro-197 and Trp-574**

Country	Year	Leaves Code	Seeds Code	ALS-gene Pro-197 position				ALS-gene Trp-574 position			
				% Wild type	% Heterozygous	% Homozygous	Amino Acid Subst. Pro/Pro-197	% Wild type	% Heterozygous	% Homozygous	Amino Acid Subst. Trp/Trp-574
Hungary	2017	L-ERDC-AMARE-18-07	S-HUN-AMARE-17-006	-	-	-	-	100%	0%	0%	-
Hungary	2017	L-ERDC-AMARE-18-06	S-HUN-AMARE-17-001	-	-	-	-	100%	0%	0%	-
Hungary	2017	L-ERDC-AMARE-18-01	S-HUN-AMARE-17-022	-	-	-	-	0%	3%	97%	Trp/Leu Leu/Leu
Hungary	2018	L-HUN-AMARE-18-01	-	100%	0%	0%	-	100%	0%	0%	-
Hungary	2018	L-HUN-AMARE-18-04	-	100%	0%	0%	-	100%	0%	0%	-
Hungary	2018	L-HUN-AMARE-18-05	-	100%	0%	0%	-	100%	0%	0%	-
Hungary	2018	L-HUN-AMARE-18-06	-	100%	0%	0%	-	100%	0%	0%	-
Hungary	2018	L-HUN-AMARE-18-07	-	100%	0%	0%	-	100%	0%	0%	-
Romania	2015	L-ROM-AMARE-15-01	S-ROM-AMARE-15-01	100%	0%	0%	-	4%	0%	96%	Leu/Leu

All DNA analysis carried out in 2015 and 2017 confirmed the resistance profile obtained from the in-vivo studies. The population from Romania showed a high proportion of mutated plants on ALS-gene position Trp-574 (homozygous substitution to Leucine). The populations from Hungary showed a similar profile with heterozygous and homozygous mutations on 100% of analyzed plants.

All the other populations sampled in the field in 2018, did not show any target-site resistance profile.

In conclusion, resistance to ALS-inhibitors was confirmed in Austria in 2013, Romania in 2015 and Hungary in 2017, mainly through target-site mutations on ALS-gene position Trp-574.

To control these resistant populations to ALS-inhibitors, good efficacies has been obtained with 4-hydroxyphenylpyruvate dioxygenase (4-HPPD) inhibiting herbicides as Tembotrione or Isoxaflutole (HRAC group F2), showing that these alternative modes of action could be adapted solutions in the field.

### 3.3.8 Implementation of the management strategy

As a result, the following resistant management strategy will be communicated for the use of GF-3969, and the follow guidelines will be recommended:

- The principles of good plant protection practices will be promoted. These include the use cultural and mechanical practices to ensure that herbicide application is made under favorable environmental conditions, facilitating good even coverage, to prevent resistance appearance by avoiding monocultures situations, ploughing before crop drill, etc...
- Use of GF-3969 in tank mix or sequential applications with effective products on the target weeds with a different mode of action. As examples, and if the weed pressure is high and

resistance is suspected, GF-3969 may be tank mix in post emergence or apply in sequences with herbicides based on the following active substances:

- In the case of *Echinochloa crus-galli* it is recommended to tank mix or alternate with herbicide belonging to the HPPD mode of action (27 (legacy F2) group according to the HRAC classification) like mesotrione, sulcotrione, tembotrione.
  - In the case of *Sorghum halepense* it is recommended to tank mix or alternate with herbicide belonging to the ACCase mode of action (1 (legacy A) group according to the HRAC classification) like cycloxydim, fluzafop
  - In case of *Setaria viridis* is recommended to tank mix or alternate with herbicide belonging to the ACCase mode of action (1 (legacy A) group according to the HRAC classification) like cycloxydim and also with herbicide belonging to the Chloroacetamid mode of action (15 (legacy K3) group according to HRAC classification) like dimethenamid.
  - In case of *Digitaria sanguinalis* is recommended to tank mix or alternate with herbicide belonging to the HPPD mode of action (27 (legacy F2) group according to the HRAC classification) like mesotrione, sulcotrione, tembotrione and also with herbicide belonging to the Chloroacetamid mode of action (15 (legacy K3) group according to HRAC classification) like dimethenamid
  - In case of *Amaranthus retroflexus* is recommended to tank mix or alternate with herbicide belonging to the HPPD mode of action (27 (legacy F2) group according to the HRAC classification) like mesotrione, sulcotrione, tembotrione.
- Destroy all the seeds produce by no-controlled weeds using mechanical control or effective herbicides with a different mode of action.

The use of GF-3969 in tank mix with herbicides with a different mode of action for the control of grass weeds (see above) is recommended to prevent and manage the presence of weed resistant biotypes to sulfonyleureas.

The resistance management strategy is implemented / communicated via:

- label statements
- leaflets
- training courses
- CORTEVA customer meetings

Part of the management strategy is to monitor the product performance to determine any shifts in sensitivity towards the product. This will help determine the success of the management strategies implemented.

The monitoring strategies employed will be based on the investigation of complaints from growers of apparent loss of field performance. Providing that all other aspects negatively impacting field performance can be ruled out samples will be taken and tested for resistance according to an “in vivo” resistant method develop by Applicant or by the conventional whole-plant soil bio-assay.

### **3.3.9 Monitoring, reporting and reaction to changes in performance**

Monitoring studies have been and will be conducted on GF-3969 from the moment that the product will be re-authorized. Monitoring studies will continue for this high resistant risk species like *Echinochloa crus-galli*, *Sorghum halepense*, *Digitaria sanguinalis* and *Amaranthus retroflexus* to sulfonyleureas herbicides.

Seed samples will be collected in the fields following weed control failure. Resistant “in vivo” test under growth chamber conditions and is appropriated PCR analysis will be performed to confirm if the population is resistant or not.

**Comments of zRMS:**

GF-3969 contains two active substances: rimsulfuron and thifensulfuron methyl. Both actives belong to the sulfonyleureas chemical group and they are classified by HRAC in Group 2 (legacy B). There is known about six cases of rimsulfuron resistant weeds in maize: *Solanum ptycanthum* (Canada, 2000), *Amaranthus palmeri* (Israel, 2008), *Sorghum halepense* (Mexico, 2009 and Serbia, 2014), *Setaria faberi* (United States, 2004) and *Conyza canadensis* (United States, 2011). Also sixteen cases of thifensulfuron methyl resistant weeds have been detected in maize: *Kochia scoparia* (Canada, 2014 and 2017), *Amaranthus powellii* (Canada, 1998), *Amaranthus retroflexus* (Canada, 1998, United States, 1998 and Ukraine, 2020), *Amaranthus tuberculatus* (United States, 1993, 1994, 1995, 1996, 2002 and 2011), *Amaranthus palmeri* (United States, 2009, 2010 and 2014) and *Conyza canadensis* (United States, 2011). Moreover, 56 cases of sulfonyleureas resistance weeds in Europe have been noted. The in-vivo test results show that resistance to ALS-inhibitors, such as nicosulfuron and rimsulfuron has been confirmed on several SORHA populations (Hungary in 2013-2017), one ECHCG population (Czech Republic and Poland in 2017), two DIGSA populations (Romania in 2015) and three AMARE populations (Austria in 2013, Romania in 2015 and Hungary in 2017). **The overall resistance risk for GF-3969 is high.** Based on the information submitted in the dRR, the recommendations of Good Experimental Practice and anti-resistance strategy, it can be proposed following directions in the label of product:

*GF-3969 contains rimsulfuron and thifensulfuron methyl, the actives belonging to the chemical group of sulfonyleureas (HRAC Group 2). To prevent possible resistance developing to this class of herbicides, the following rules should be applied:*

- use the herbicide according to the label directions, including time and number of applications and the recommended dose rate, on the intensively growing weeds,
- use the herbicide alternately with other herbicides belonging to different chemical groups, showing different mode of action,
- use the product in tank mix or sequential applications with other products on the target weeds with different mode of action,
- follow the principles of good agricultural and plant protection practices,
- destroy all the seeds produce by no-controlled weeds using mechanical control or effective herbicides with a different mode of action.

### 3.4 Adverse effects on treated crops (KCP 6.4)

#### 3.4.1 Phytotoxicity to host crop (KCP 6.4.1)

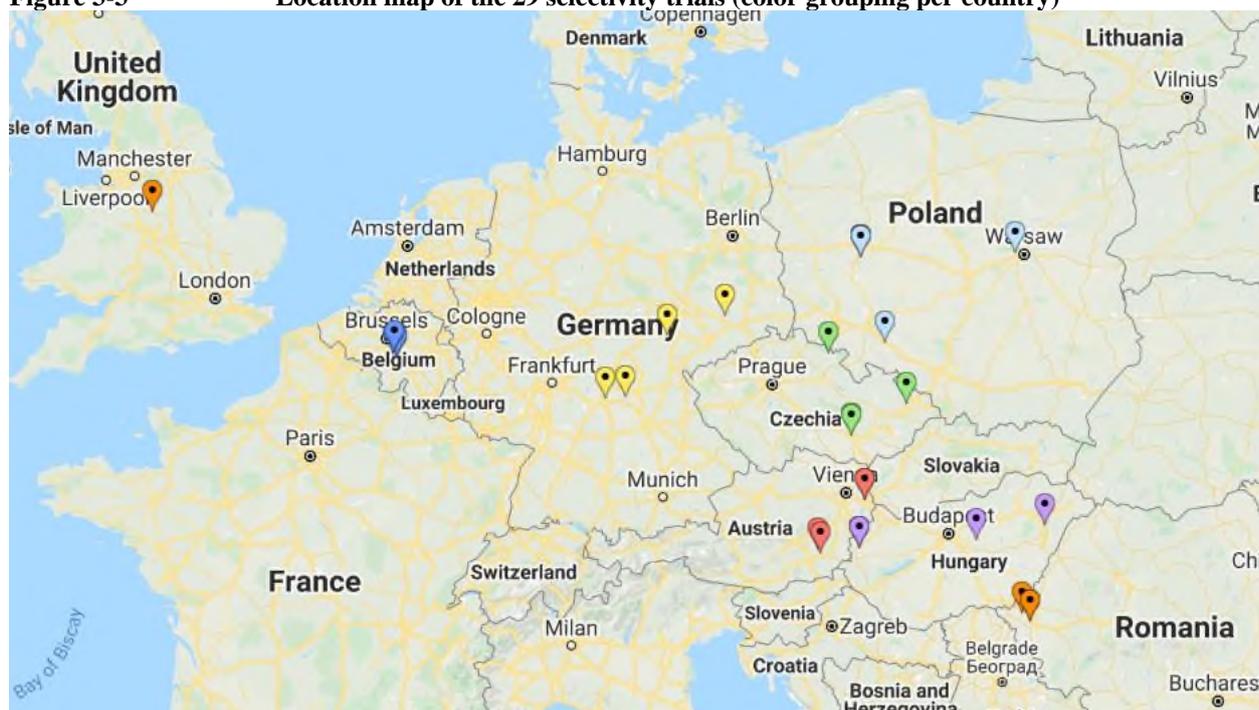
Crop phytotoxicity after application of GF-3969 to maize was assessed in 29 selectivity trials across multiple climatic conditions and farming systems across the central registration zone. Trials were carried out by contractor companies, all of which follow the EPPO standards (PP 1/135 and 1/226) and are officially recognized by the competent authorities to carry out field registration trials in accordance with the principles of Good Experimental Practice (GEP).

**Table 3.4-1: Phytotoxicity to maize: Trial distribution of selectivity trials throughout EPPO zones and across central registration zone**

EPPO zone	Country	Year		Total	TOTAL EPPO ZONE
		2017	2018		
North-East	Poland	1	4	5	5
Maritime	Germany	2	2	4	17
	Belgium	2	2	4	
	Austria	2	2	4	
	Czech Republic	2	2	4	
	United Kingdom	-	1*	1	
South-East	Hungary	2	2	4	7
	Romania	1	2	3	
	<b>Total</b>	<del>11</del> <b>12</b>	<del>15</del> <b>17</b>	<del>26</del> <b>29</b>	<b>29</b>
	Total Central Zone	<del>11</del> <b>12</b>	<del>15</del> <b>17</b>	<del>26</del> <b>29</b>	<b>29</b>

\* Not taken to yield

**Figure 3-3 Location map of the 29 selectivity trials (color grouping per country)**



This the map was created using trial location details, <https://de.batchgeo.com/> and google maps.

**Table 3.4-2: Presentation of reference standards used in trials (selectivity trials, transformation trials)**

Reference (trademark)	Form. Type	Form. concentration	Active substance	Application timing	Rate used in reported trials (g a.s./ha)	Rate used in reported trials (L or Kg f.p./ha)
Equip ultra™	SC	22.5 g/L 22.5 g/L	Foramsulfuron Isoxadifen-ethyl	Post-emergence	120(N)* and 240(2N)*	2.67 - 5.33 L/ha
Laudis®	OD	44 g/L 22 g/L	Tembotrione Isoxadifen-ethyl	Post-emergence	148.5(N) and 297(2N)	2.25 -4.5 L/ha

\*90 g (N) and 180 g (2N) as/ha in CZL-18-143 & CZM-18-143

The following selectivity assessments are presented in the following section based on % area of the plot: PHYALL (overall phytotoxicity), chlorosis (PHYCHL), deformation (PHYDEF), necrosis (PHYNEC), and stunting (PHYSTU).

### **Crop safety after applying GF-3969 + surfactant at single (135 g fp/ha) and double rate (270 g fp/ha) compared to a reference and the untreated**

The data presented in Table 3.4-3 clearly demonstrated that the application of GF-3969 + surfactant at 135 g fp/ha is safe to maize if applied according to label recommendations.

### **Crop safety after applying GF-3969 with different surfactants**

Table 3.4-3 demonstrated that crop safety of GF-3969 plus non-ionic surfactant (such as KG691) is equal to or similar to any of the other included surfactants tested alongside GF-3969. Thus, different surfactants may be applied together with GF-3969.

### **The benefit of adding a safener (isoxadifen ethyl) to GF-3969**

Data presented hereafter demonstrated phytotoxicity for all treatments including the reference products. In detail, however, isoxadifen ethyl increased crop selectivity of GF-3969 in maize compared to the tank

mix without isoxadifen at target and double rate. It is therefore concluded that the benefit of isoxadifen as contained within GF-3969 was clearly justified.

### **Crop safety after split application of GF-3969 in maize**

The clear majority of trials confirmed crop safety of GF-3969 as split application even if applied at 2N. It is therefore concluded that the dataset presented hereafter clearly demonstrated that the splitting application of GF-3969 + surfactant at N and 2N rate is crop safe across various climatic conditions if applied to label recommendations.

### **Crop safety of GF-3969 with and without surfactant (efficacy trials)**

Thirty-seven efficacy trials were conducted to evaluate the effect of GF-3969 with and without non-ionic surfactant on phytotoxicity to maize. All trial details were already described in the efficacy section of the corresponding BAD and are therefore not repeated here. Those trials demonstrated that the addition of a non-ionic surfactant such as DPX-KG691 did not cause significant phytotoxicity symptoms in terms of overall phytotoxicity (PHYALL), chlorosis (PHYCHL), necrosis (PHYNEC), stunting (PHYSTU), or deformation (PHYDEF). If symptoms were observed, they vanished over time and / or were comparable to either of the included reference products. Thus, GF-3969 plus a non-ionic surfactant (such as KG691) is crop safe.

#### **Comments of zRMS:**

The phytotoxicity was assessed both in the efficacy and selectivity trials. Selectivity trials were carried out in three Eppo climatic zone: Maritime (4 trials in Austria, 4 trials in Belgium, 4 trials in Czech Republic, 4 trials in Germany and 1 trial in UK), the North-East zone (5 trials in Poland) and the South-East zone (4 trials in Hungary and 3 trials in Romania). General phytotoxicity, discoloration/chlorosis, malformation, necrosis and stunting were detected during selectivity trials. The significant general phytotoxicity (>10%) were noted in 6 trials after applied at dose rate 1N and in 10 trials at dose rate 2N in the case of plots treated of GF-3969 with safener and surfactant. The significant level (>15%) of PHYALL was detected at the last assessment but only in 1 trial in case of dose 1N and in 2 trials in case of dose 2N. The similar effects were observed on the plots treated of standards (GF-3969 with surfactants (Atpolan, Codacide) or Equip Ultra) and GF-3969 in split application. The addition of safener to GF-3969 caused better effects. The number of trials with significant symptoms was lower, both during the trials and at the last assessments. The significant discoloration/chlorosis (>10%) were noted in 1 trial after applied at dose rate 1N and in 6 trials at dose rate 2N of GF-3969 with surfactant and safener. The all symptoms were transient and no discoloration has been noted in the trials at the last assessments. The similar effects were observed on the plots treated of standards. The symptoms on the level >15% were detected in 1 selectivity trial after applied of GF-3969 in split doses at the last assessment. The significant malformation (>10% to 15%) were noted in only 1 trial after applied at dose rate 2N of GF-3969 with safener and surfactant. These symptoms were remained until the last assessment. No trials with significant necrosis (>10%) were noted after applied of GF-3969 with safener and surfactant at 1N and 2N, both during trials and at the last assessments. The significant stunting (>10%) were observed in 5 trials after applied at dose rate 1N and in 7 trials at dose rate 2N of GF-3969 with surfactant and safener. These symptoms were transient and stunting on the level >15% was noted in only 1 trial on the plots treated double dose. Summarizing, the most of negative impacts observed in the submitted trials were transient. Furthermore, the addition of a non-ionic surfactant such as DPX-KG691 did not cause significant phytotoxicity symptoms or they were comparable to the results achieved by the reference products.

Based on the above selectivity trial results, it can be concluded that GF-3969 with surfactant is safe for maize if it is used in accordance to the label recommendations. However, in the opinion of zRMS special warning should be included to the label: “GF-3969 can cause transient phytotoxicity symptoms (e.g. discoloration, malformation, necrosis or stunting)”.

**Table 3.4-3: Maximum phytotoxicity after applying GF-3969 at N (135 g fp/ha) and 2N (270 g fp/ha) compared to references and the untreated check**

Number of trials with	Symptom / %class	GF-3969 + surf. <u>without</u> safener		GF-3969 + surf. <u>with</u> safener		GF-3969 + Atpolan (surf.)		GF-3969 + Codacide (surf.)		GF-3969 (split appl)		Equip Ultra		[LAUDIS]		Untreated Check
		N rate	2N rate	N rate	2N rate	N rate	2N rate	N rate	2N rate	N rate	2N rate	N rate	2N rate	N rate	2N rate	
Maximum of phytotoxicity (PHYALL %AREA/PL OT) recorded during the trials	0% to 5%	13	12	17	15	4	4	17	14	17	6	14	12	23	22	26
	>5% to 10%	7	3	5	3	2	2	5	3	2	9	4	2	2	3	0
	>10% to 15%	1	2	1	2	1	0	2	6	2	0	3	3	1	1	0
	>15%	7	11	5	8	3	4	4	5	5	5	5	9	2	2	0
Level of symptoms (PHYALL %AREA/PL OT) at the last assessments	0% to 5%	25	20	27	26	9	9	28	27	25	18	25	25	27	27	26
	>5% to 10%	1	4	0	0	0	0	0	0	0	1	0	0	0	0	0
	>10% to 15%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	>15%	2	4	1	2	1	1	0	1	1	1	1	1	1	1	0
Maximum of phytotoxicity (PHYCHL %AREA/PL OT) recorded during the trials	0% to 5%	15	13	18	15	4	4	15	12	18	8	14	12	23	23	23
	>5% to 10%	6	1	6	4	3	1	7	6	2	8	5	3	2	2	0
	>10% to 15%	2	8	0	4	0	1	2	5	1	1	2	6	0	0	0

Number of trials with	GF-3969 + surf. <u>without</u> safener		GF-3969 + surf. <u>with</u> safener		GF-3969 + Atpolan (surf.)		GF-3969 + Codacide (surf.)		GF-3969 (split appl)		Equip Ultra		[LAUDIS]		Untreated Check
	N rate	2N rate	N rate	2N rate	N rate	2N rate	N rate	2N rate	N rate	2N rate	N rate	2N rate	N rate	2N rate	
>15 %	2	3	1	2	1	2	1	2	3	2	2	2	0	0	0



Number of trials with	GF-3969 + surf. <u>without</u> safener		GF-3969 + surf. <u>with</u> safener		GF-3969 + Atpolan (surf.)		GF-3969 + Codacide (surf.)		GF-3969 (split appl)		Equip Ultra		[LAUDIS]		Untreated Check	
	Symptom / %class	N rate	2N rate	N rate	2N rate	N rate	2N rate	N rate	2N rate	N rate	2N rate	N rate	2N rate	N rate		2N rate
Maximum of phytotoxicity (PHYNEC %AREA/PL OT) recorded during the trials	0% to 5%	12	9	13	12	4	4	13	13	11	9	12	13	13	13	13
	>5% to 10%	0	2	0	1	0	0	0	0	1	0	1	0	0	0	0
	>10% to 15%	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	>15%	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Level of symptoms (PHYNEC %AREA/PL OT) at the last assessments	0% to 5%	12	11	13	12	4	4	13	13	12	9	13	13	13	13	13
	>5% to 10%	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0
	>10% to 15%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	>15%	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Maximum of phytotoxicity (PHYSTU %AREA/PL OT) recorded during the trials	0% to 5%	13	9	14	12	5	3	17	15	15	9	15	10	20	20	21
	>5% to 10%	2	1	3	3	1	4	3	3	3	3	2	4	1	1	0
	>10% to 15%	2	2	1	2	1	0	0	2	0	0	3	3	1	0	0
	>15%	5	10	4	5	1	1	2	2	4	4	2	5	0	1	0

Number of trials with		GF-3969 + surf. without safener		GF-3969 + surf. with safener		GF-3969 + Atpolan (surf.)		GF-3969 + Codacide (surf.)		GF-3969 (split appl)		Equip Ultra		[LAUDIS]		Untreated Check
		N rate	2N rate	N rate	2N rate	N rate	2N rate	N rate	2N rate	N rate	2N rate	N rate	2N rate	N rate	2N rate	
Level of symptoms (PHYSTU %AREA/PL OT) at the last assessments	0% to 5%	19	13	22	20	8	7	22	22	20	14	22	20	22	22	21
	>5% to 10%	1	6	0	1	0	0	0	0	1	1	0	2	0	0	0
	>10% to 15%	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	>15%	2	3	0	1	0	0	0	0	1	1	0	0	0	0	0

### 3.4.2 Effect on the yield of treated plants or plant product (KCP 6.4.2)

28 weed-free selectivity trials across Central Europe have been evaluated between 2017 (12 trials), and 2018 (16 trials) to assess the potential yield impact of GF-3969 in maize (Table 3.4-4). Thereby, crop safety of GF-3969 + surfactant compared to the untreated and included reference products, the value of adding isoxadifen as safener in GF-3969, crop safety of GF-3969 using different surfactants, and crop safety of GF-3969 after split application was determined.

Plots were harvested using the middle rows and specific equipment. Moisture content was determined. Final yield is expressed as tons/ha corrected to standard moisture content in the trials. Statistical analysis was performed on each trial using Tukey's HSD (P=0.05) mean test to determine if the means are the same or different from each other.

**Table 3.4-4: Effect on the yield of treated maize after application of GF-3969 + surfactant: Trial distribution throughout EPPO zone**

EPPO zone	Year	2017		2018		Total
	Country	Seed	Silage	Seed	Silage	EPPO zone
Maritime	Austria	2		2		16
	Belgium	1	1	2		
	Czech Republic	1	1	1	1	
	Germany	1	1		2	
North East	Poland		1	2	2	5
South East	Hungary	1	1	1	1	7
	Romania		1	1	1	
	<b>Total</b>	<b>6</b>	<b>6</b>	<b>9</b>	<b>7</b>	<b>28</b>
	<b>Total Central Zone</b>	<b>6</b>	<b>6</b>	<b>9</b>	<b>7</b>	

**Table 3.4-5: Reference products used**

Reference (trademark)	Form. Type	Form. concentration	Active substance	Application timing	Rate used in reported trials (g a.s./ha)	Rate used in reported trials (L or Kg f.p./ha)
Equip Ultra™*	SC	22.5 g/L 22.5 g/L	Foramsulfuron Isoxadifen-ethyl	Post-emergence	120(N) and 240(2N)	2.67 - 5.33 L/ha
Laudis®	OD	44 g/L 22 g/L	Tembotrione Isoxadifen-ethyl	Post-emergence	148.5(N) and 297(2N)	2.25 & 4.5 L/ha

\*CZL-18-143 was applied at 90(N) and 180 g (2N) rate.

#### Crop safety of GF-3969 in maize compared to different reference products and the untreated

The majority of 14 out of 15 trials conducted on seed maize varieties demonstrated equivalent yield compared to the untreated or the included reference products (Table 3.4-7). Moreover, all silage maize trials (n=13) demonstrated no significant negative effect of GF-3969 compared to the untreated or the included reference products. It is therefore concluded that the data presented herein fully demonstrated crop safety of GF-3969 if application was done in accordance to label recommendations.

#### Crop safety of GF-3969 in maize using different surfactants

There was no difference on yield quantity if GF-3969 was applied using DPX-KG691 or Codacide as surfactant (Table 3.4-8). If GF-3969 was applied at twice the recommended dose rate, DPX-KG691 and Atpolan provided equivalent yield in an orthogonal comparison (n=5). These findings were fully supported by the trials conducted on silage corn. It is therefore concluded that GF-3969 may safely be applied using different surfactants. No negative yield impact is expected if label recommendations were obeyed.

### Crop safety of GF-3969 after split application in maize

Even if GF-3969 was applied at split application at twice the recommended dose rate, yield was comparable (94%) to the included reference Equip (94%, Table 3.4-9). It is therefore concluded that split application of GF-3969 is crop safe if label recommendations were followed.

### The value of isoxadifen ethyl as contained in GF-3969

If isoxadifen was missing, the application of GF-3969 rate resulted in 6% (N rate) or even 12% (2N) yield decrease for seed corn varieties and 5% (N rate) or even 10% (2N) tested across silage corn varieties. It is therefore concluded that isoxadifen is clearly justified to avoid any negative yield impact after the application of GF-3969 in maize.

**Table 3.4-6: Yield comparison after applying GF-3969 with and without isoxadifen ethyl (safener)**

EPPO	Trial number	Variety	BBCH at appl	Yield in the untreated (t/ha)	Yield at 1N as % of untreated		Yield at 2N rate as % of untreated	
					GF-3969 N rate	GF-3969 N rate no safener	GF-3969 2N rate	GF-3969 2N rate no safener
AVG 15 trials (seed corn varieties) – BBCH13-18				10.47	97%	91%	96%	84%
AVG 13 trials (silage corn varieties) BBCH13-19				34.47	100%	95%	96%	86%

### Conclusion

There were 28 selectivity trials conducted to assess the potential yield effect after applying GF-3969 to maize. Trials were scattered across different countries, climatic regions and years. Thereby, 15 seed corn varieties as well as 13 silage corn varieties were tested to confirm crop safety of GF-3969. Overall, the data package presented in this dossier clearly demonstrated that the application of GF-3969 in maize is crop safe compared to the untreated or the included reference products in the clear majority of trials. Even though multiple phytotoxicity symptoms were observed, only a single trial expressed significant yield reduction if GF-3969 was applied at target rate. This, however, should not be overestimated since the application of twice (!) the recommended dose rate within this trial was comparable to the included reference product, thus is crop safe. The value of adding isoxadifen as safener to GF-3969 was clearly demonstrated across all trials, varieties and years. Additionally, different surfactants were tested to assess yield effects if GF-3969 was applied alongside with different surfactants. Overall it was demonstrated that GF-3969 may be applied using different surfactants. Moreover, the comparison of single and split application of GF-3969 at target and twice the recommended dose rate revealed equivalent yield quantities. Hence GF-3969 may safely be applied as split application if label recommendations were followed.

Overall it is concluded that GF-3969 is crop safe if applied in accordance to label recommendations.

#### Comments of zRMS:

Effect on the yield was assessed in 28 selectivity trials, on both grain maize (10 trials from Maritime EPPO climatic zone (2 trials in Czech Republic, 4 trials in Austria, 3 trials in Belgium, 1 trial in Germany), 2 trials from North-East zone (all in Poland), 3 trials from South-East zone (2 trials in Hungary and 1 trial in Romania)) and forage/silage maize (6 trials from Maritime EPPO climatic zone (2 trials in Czech Republic, 1 trial in Belgium, 3 trials in Germany), 3 trials from North-East zone (all in Poland), 4 trials from South-East zone (2 trials in Hungary and 2 trials in Romania)). Based on the above selectivity trial results, it can be concluded that GF-3969 with surfactant is safe for maize if it is used in accordance to the label recommendations. Furthermore, the test product can safely be applied as split application. Both the addition of surfactant and the method of application (single application or split dose) have no negative impact on the yield.

**Table 3.4-7: Relationship between phytotoxicity and yield after applying GF-3969 in maize**

EPPO	Trial number	Variety	Crop Stage at application (BBCH)	Maximum phyto. at 1N rate (%)			Maximum phyto. at 2N rate (%) (DAA)			Yield in the untreated (t/ha)	Yield at 1N as % of untreated			Yield at 2N rate as % of untreated		
				GF-3969 N rate	EQUIP N rate	LAUDIS N rate	GF-3969 2N rate	EQUIP 2N rate	LAUDIS 2N rate		GF-3969 N rate	EQUIP N rate	LAUDIS N rate	GF-3969 2N rate	EQUIP 2N rate	LAUDIS 2N rate
	AVG 15 seed corn trials (BBCH13-18)			7.5	6.3	2.6	9.8	10.1	3.2	10.5	98%	100%	100%	96%	96%	100%
	AVG 13 silage trials (BBCH13-19)			7.7	7.7	1.9	8.3	10.6	2.3	34.5	100%	99%	102%	100%	99%	98%

**Table 3.4-8: Yield comparison after applying GF-3969 with different surfactants (seed & silage maize)**

EPPO	Trial number	Variety	BBCH At appl	Yield in UTC (t/ha)	Yield at 1N as % of the untreated			Yield at 2N rate as % of the untreated		
					GF-3969 N rate+ KG691	GF-3969 N rate +CODACIDE	GF-3969 N rate +ATPOLAN	GF-3969 2N rate +KG691	GF-3969 2N rate + CODACIDE	GF-3969 2N rate +ATPOLAN
	AVG 10 trials (seed corn varieties) – BBCH13-18			11.03	99%	99%	-	99%	99%	-
	AVG 5 trials (seed corn varieties) – BBCH14-18			9.36	93%	99%	97%	88%	94%	88%
	AVG 9 trials (silage corn varieties) – BBCH13-18			38.97	99%	96%	-	95%	98%	-
	AVG 4 trials (silage corn varieties) – BBCH15-19			24.36	100%	102%	101%	100%	101%	100%

**Table 3.4-9: Yield comparison after split application of GF-3969 in seed and silage maize varieties (2017-2018 data package)**

EPPO	Trial number	Variety	BBCH At appl	Yield in UTC (t/ha)	Yield at 1N as				Yield at 2N rate as			
					GF-3969 N rate	GF-3969 Split N rate	EQUIP N rate	LAUDIS N rate	GF-3969 2N rate	GF-3969 Split 2N rate	EQUIP 2N rate	LAUDIS 2N rate
	AVG 13 trials (seed corn varieties) – BBCH13-18			10.08	96%	94%	97%	99%	95%	94%	94%	99%
	AVG 2 trials (seed corn varieties) – BBCH13-18			13.03	102%	-	103%	98%	101%	101%	99%	103%
	AVG 13 trials (silage corn varieties) – BBCh13-19			34.47	100%	96%	97%	99%	96%	96%	95%	97%

### 3.4.3 Effects on the quality of plants or plant products (KCP 6.4.3)

Twenty-two selectivity trials analysed to test different quality parameters (Table 3.4-10). Studies were conducted in seven different countries between 2017 and 2018 on maize and revealed no negative impact compared to the untreated or compared to the included reference products.

**Table 3.4-10: Effects on the quality of plants or plant products: Trial distribution throughout EPPO zone**

EPPO	Country	Trial ID	variety	Parameters analyzed			
				CONSTA	CONPRO	CONFAT	DIGEST
Maritime	Austria	AST-18-100	seed corn	CONSTA	'---	'---	'---
Maritime	Belgium	BNB-17-656	silage corn	CONSTA	CONPRO	'---	DIGEST
Maritime	Belgium	BNB-18-656	seed corn	CONSTA	CONPRO	'---	'---
Maritime	Belgium	BNB-18-657	silage corn	CONSTA	CONPRO	'---	'---
Maritime	Czech Republic	CZF-17-123	silage corn	'---	CONPRO	'---	DIGEST
Maritime	Czech Republic	CZL-17-123	seed corn	CONSTA	CONPRO	CONFAT	'---
Maritime	Czech Republic	CZL-18-143	silage corn	CONSTA	CONPRO	CONFAT	DIGEST
Maritime	Czech Republic	CZM-18-143	seed corn	CONSTA	CONPRO	CONFAT	'---
Maritime	Austria	DUC-17-019	seed corn	CONSTA	CONPRO	CONFAT	'---
Maritime	Austria	DUC-18-143	seed corn	CONSTA	'---	'---	'---
Maritime	Germany	DUI-18-722	seed corn	CONSTA	CONPRO	CONFAT	DIGEST
Maritime	Germany	DUT-17-041	seed corn	CONSTA	CONPRO	CONFAT	'---
Maritime	Germany	DUT-18-015	seed corn	CONSTA	CONPRO	CONFAT	DIGEST
Maritime	Germany	DUU-17-123	silage corn	CONSTA	CONPRO	CONFAT	DIGEST
SouthEast	Hungary	HUM-17-123	seed corn	CONSTA	CONPRO	'---	'---
SouthEast	Hungary	HUS-17-123	silage corn	CONSTA	'---	CONFAT	'---
SouthEast	Hungary	HUS-18-104	seed corn	CONSTA	CONPRO	CONFAT	'---
SouthEast	Hungary	HUS-18-105	silage corn	CONSTA	CONPRO	CONFAT	'---
NorthEast	Poland	PLA-18-143	seed corn	CONSTA	'---	'---	'---
SouthEast	Romania	ROE-17-123	silage corn	CONSTA	CONPRO	CONFAT	'---
SouthEast	Romania	ROE-18-143	seed corn	CONSTA	CONPRO	CONFAT	'---
SouthEast	Romania	ROE-18-243	silage corn	CONSTA	CONPRO	CONFAT	'---

CONSTA: starch content (in %), CONPRO: protein content (in %), CONFAT: fat content (in %), DIGEST: digestibility

Protein, starch and fat content as well as digestibility were analyzed analysed after harvest in appropriate laboratories. Different scales were used for quality parameters of trial DUU-17-123. However, since the outcome is comparable to the other units and to not change the final report, values are presented as in the original report, but presented in a separate row to facilitate the reading.

**Table 3.4-11: Treatments to compare**

Reference (trademark)	Form. Type	Form. concentration	Active substance	Application timing	Rate used in reported trials (g a.s./ha)	Rate used in reported trials (L or Kg f.p./ha)
Equip Ultra™*	SC	22.5 g/L 22.5 g/L	Foramsulfuron Isoxadifen-ethyl	Post-emergence	120(N) and 240(2N)	2.67 - 5.33 L/ha
Laudis®	OD	44 g/L 22 g/L	Tembotrione Isoxadifen-ethyl	Post-emergence	148.5(N) and 297(2N)	2.25 - 4.5 L/ha

\*CZL-18-143 was applied at 90(N) and 180 g (2N) rate.

### Conclusion

The effect of GF-3969 application in maize on yield quality was evaluated in multiple trials across countries and time. Thereby, the analyses of starch content (n=21, Table 3.4-12), protein content (n=17, Table 3.4-13), fat content (n=15, Table 3.4-14) and digestibility (n=5, Table 3.4-15) demonstrated that GF-3969 may safely be applied in maize since no negative effects on yield quality were observed, neither

are they expected if application was done in accordance to label recommendations. Overall it is therefore concluded that crop safety of GF-3969 can be claimed.

**Comments of zRMS:**

The quality of plants or plant products (starch, protein and fat content, digestibility) was assessed in 22 selectivity trials (grain and forage/silage). No negative impacts were seen from application of GF-3969 with surfactant (1N and 2N), either as a split dose or a single dose. No significant differences between results from objects treated of test product and reference products. Based on this submitted data it can be concluded to accept the data provided by the applicant. GF-3969 with surfactant was safe for grain and forage/silage maize.

**Table 3.4-12: Summary of starch content (%) after GF-3969 application in maize across different EPPO zones**

EPPO	Trial number	Variety	BBCH at appl	Starch content (in %) Untreated	STARCH% at 1N				STARCH% at 2N			
					GF-3969 N rate	GF-3969 Split N rate	LAUDIS N rate	EQUIP N rate	GF-3969 2N rate	GF-3969 Split 2N rate	LAUDIS 2N rate	EQUIP 2N rate
	AVG 8 trials (seed corn variety)		BBCH13-18	59.69	59.29	59.50	59.55	59.74	59.86	58.79	59.43	59.44
	AVG 13 trials (seed corn variety)		BBCH13-18	62.05	61.63	-	61.46	62.02	61.94	-	61.50	61.81
	*AVG 2 trials (silage corn variety)		BBCH18	10.15	10.39	-	9.30	9.83	9.07	-	10.50	9.37
	<sup>π</sup> AVG 5 trials (silage corn variety)		BBCH15-18	30.91	28.58	29.85	29.94	29.77	28.71	29.50	30.34	29.29
	* + <sup>π</sup> AVG 7 trials (silage corn variety)		BBCH15-18	24.98	23.38	-	24.05	24.07	23.10	-	24.67	23.60

**Table 3.4-13: Summary of protein content (%) after GF-3969 application in maize across different EPPO zones**

EPPO	Trial number	Variety	Crop Stage at application (BBCH)	PROTEIN CONTENT UNTREATED	PROTEIN% at 1N				PROTEIN% at 2N			
					GF-3969 N rate	GF-3967 Split N rate	LAUDIS N rate	EQUIP N rate	GF-3969 2N rate	GF-3969 Split 2N rate	LAUDIS 2N rate	EQUIP 2N rate
	AVG 5 trials (seed corn varieties)		BBCH14-18	7.34	7.19	7.46	7.37	7.30	7.52	7.50	7.28	7.40
	AVG 9 trials (seed corn varieties)		BBCH13-18	7.56	7.72	-	7.74	7.54	7.66	-	7.47	7.67
	AVG 5 trials (silage corn varieties)		BBCH15-18	10.37	9.78	9.92	10.18	10.21	10.02	9.81	10.23	9.94
	AVG 8 trials (silage corn varieties)		BBCH13-18	7.27	6.86	-	7.08	7.17	6.99	-	7.16	6.96

**Table 3.4-14: Summary of fat content (%) after GF-3969 application in maize across different EPPO zones**

EPPO	Trial number	Variety	Crop Stage at application (BBCH)	FAT CONTENT UNTREATED	FAT% at 1N				FAT% at 2N			
					GF-3969 N rate	GF-3969 Split N rate	LAUDIS N rate	EQUIP N rate	GF-3969 2N rate	GF-3969 Split 2N rate	LAUDIS 2N rate	EQUIP 2N rate
	AVG 4 trials (seed corn varieties)		BBCH14-18	2.91	2.79	2.84	2.87	2.89	2.97	2.85	2.88	2.84
	AVG 5 trials (seed corn varieties)		BBCH13-18	3.53	3.63	-	3.52	3.52	3.50	-	3.61	3.52
	AVG 3 trials (silage corn varieties)		BBCH18	2.63	2.50	2.54	2.74	2.53	2.30	2.36	2.81	2.57
	AVG 4 trials (silage corn varieties)		BBCH18	2.09	1.98	-	2.17	2.01	1.84	-	2.22	2.03

**Table 3.4-15: Summary of digestibility after GF-3969 application in maize**

EPPO	Trial number	Variety	Crop Stage at application (BBCH)	DIGEST UNTREATED	DIGEST% at 1N				DIGEST% at 2N			
					GF-3969 N rate	GF-3967 Split N rate	LAUDIS N rate	EQUIP N rate	GF-3969 2N rate	GF-3969 Split 2N rate	LAUDIS 2N rate	EQUIP 2N rate
	AVG 4 trials (silage corn varieties)		BBCH14-18	71.53	70.51	71.27	71.19	71.16	71.29	71.30	71.21	71.35
	AVG 5 trials (silage corn varieties)		BBCH13-18	63.80	63.44	-	63.45	63.54	63.22	-	63.93	63.86

### **3.4.4 Effects on transformation processes (KCP 6.4.4)**

According to EPPO PP 143 (2) it is not necessary to provide information on the transformation process if no residues are present at harvest. This is the case for GF-3969 in maize, as no residues neither from rimsulfuron nor thifensulfuron methyl were present at harvest there is no likelihood that GF-3969 could have any effect on the transformation process. In addition, any parts of maize crops are not commercially used for processing or transformation processes (brewing, fermentation, baking).

**Comments of zRMS:**

Accepted.

### **3.4.5 Impact on treated plants or plant products to be used for propagation (KCP 6.4.5)**

The registration of GF-3969 in maize is intended to be used only on maize hybrids, which mean a very low risk for propagation, as hybrids seed from maize are not usually replanted due to the lower germinability of the hybrids seeds, for this reason no particular information on the impact of propagation is provided on this dossier.

#### **Summary and conclusion**

Overall it is concluded that GF-3969 is crop safe if application was done in accordance to label recommendations.

**Comments of zRMS:**

In line with EPPO standard PP 1/135(4) 'Phytotoxicity assessment', data from germination tests are needed when application is made at or after inflorescence initiation e.g. for cereals when the first node is detectable (BBCH 30) or where detectable residues occur in harvested seed.  
Because GF-3969 is intended to use in the growth stage of BBCH 11-18, in the opinion of zRMS the further trials are not required.

### **3.5 Observations on other undesirable or unintended side-effects (KCP 6.5)**

#### **3.5.1 Impact on succeeding crops (KCP 6.5.1)**

The impact of GF-3969 on succeeding crops is presented following the EPPO Guidance PP1/207 (2) which describe the methods used to examine whether an herbicide cause negative effect on crops grown as rotational or replacement crops after a crop treated with that product. A greenhouse study was conducted in 2017 by the laboratory "Rheinland-Pfalz (RLP) AgroScience GmbH" in order to determine the EC<sub>10</sub> values of GF-3969, also coded as DPX-V4B07 containing rimsulfuron and thifensulfuron methyl. Doses of GF-3969 also coded as DPX-V4B07 from 0 to 135 g fp/ha including thifensulfuron methyl at the highest dose of 12.5 g a.s./ha and rimsulfuron at the high dose of 20 g a.s./ha were used as the doses to calculate the TER

value as well as the maximum dose of the final product GF-3969 to determine the EC<sub>10</sub> values of each selected crops.

Crops EC<sub>10</sub> values are presented in Table 3.5-1. Results show that alfalfa and sugar beet are the most sensitive species tested for GF-3969 followed by potatoes. Cereals shown in general high EC<sub>10</sub> values. And from the most tolerant crops to GF-3969 peas, soybean and tomatoes were identified. None of the tested plant species was affected in seedling emergence.

**Table 3.5-1: EC<sub>10</sub>-values of GF-3969 /DPX-V4B07 (µg a.s./kg dry soil)**

Test plant		EC <sub>10</sub> (µg a.s./kg dry soil)	[% of max. field application rate]	EC <sub>50</sub> (µg a.s./kg dry soil)	[% of max. Field application rate]	[%] seedling emergence in the control on day 21
Alfalfa	<i>Medicago sativa</i>	0.43	1	1.40	3	94
Spring oil seed rape	<i>Brassica napus</i>	0.61	1	2.23	5	100
Sunflower	<i>Helianthus annuus</i>	0.60	1	1.69	4	100
Sugar beet	<i>Beta vulgaris var. altissima</i>	0.45	1	2.18	5	100
Potatoes	<i>Solanum tuberosum</i>	0.52	1	3.78	8	100
Soybean	<i>Glycine max</i>	3.50	7	26.93	57	100
Tomatoes	<i>Solanum lycopersicum</i>	2.67	6	18.11	38	100
Peas	<i>Pisum sativum</i>	6.58	14	14.53	<33	100
Cotton	<i>Gossypium</i>	1.09	2	10.45	22	100
Winter Barley	<i>Hordeum vulgare</i>	1.42	3	5.46	11	100
Winter Rye	<i>Secale cereale</i>	4.62	10	9.39	20	92
Winter Wheat	<i>Triticum aestivum</i>	8	17	13.28	28	100
Winter Triticale	<i>Triticum aestivum</i> × <i>Triticosecale</i>	1.45	3	6.07	13	88
Spring Barley	<i>Hordeum vulgare</i>	0.58	1	3.53	7	88

Following the recommendation from the EPPO PP 1/207 to calculate the PEC<sub>actual</sub> values the worst case DT<sub>50</sub> of each active substance was selected. Looking on the DT<sub>50</sub> of rimsulfuron and thifensulfuron methyl, the value of 9.8 days of DT<sub>50</sub> for rimsulfuron it could consider as the worst scenario. This value was taken to calculate the PEC<sub>actual</sub>. TER values for the final product GF-3969 are presented in Table 3.5-2.

**Table 3.5-2: PEC-values and TER-calculation of GF-3969 based on EC<sub>10</sub>-values.**

Succeeding crop <sup>(1)</sup>	Days after application <sup>(2)</sup>	EC <sub>10</sub> mg/kg soil <sup>(3)</sup>	PEC <sup>(4)</sup>		TER <sup>(5)</sup>	
			mg/kg soil e.g. 5 cm	mg/kg soil e.g. 20 cm	EC <sub>10</sub> /PEC e.g. 5 cm	EC <sub>10</sub> /PEC e.g. 20 cm
Alfalfa	153	0.43	0.001	0.000	453.45	1813.80
Spring oil seed rape	323	0.61	0.000	0.000	>10000	>10000
Sunflower	335	0.6	0.000	0.000	>10000	>10000
Sugar beet	318	0.45	0.000	0.000	>10000	>10000
Potatoes	335	0.52	0.000	0.000	>10000	>10000
Soybean	335	0.5	0.000	0.000	>10000	>10000
Tomatoes	304	2.67	0.000	0.000	>10000	>10000
Peas	335	6.58	0.000	0.000	>10000	>10000
Cotton	304	1.09	0.000	0.000	>10000	>10000

Succeeding crop <sup>(1)</sup>	Days after application <sup>(2)</sup>	EC <sub>10</sub> mg/kg soil <sup>(3)</sup>	PEC <sup>(4)</sup>		TER <sup>(5)</sup>	
			mg/kg soil e.g. 5 cm	mg/kg soil e.g. 20 cm	EC <sub>10</sub> /PEC e.g. 5 cm	EC <sub>10</sub> /PEC e.g. 20 cm
Winter Barley	153	1.42	0.001	0.000	1497.44	>10000
Winter Rye	153	4.62	0.001	0.000	4871.95	>10000
Winter Wheat	153	8.0	0.001	0.000	8436.27	>10000
Winter Triticale	153	1.45	0.000	0.000	1529.07	6116.29.
Spring Barley	304	0.58	0.000	0.000	>10000	>10000

- (1) possible following crops in a regular crop rotation
- (2) adequate value for following crop in a regular crop rotation
- (3) EC<sub>10</sub>-values of succeeding crops
- (4) PEC (soil depth e.g. 5/20 cm)
- (5) TER (soil depth e.g. 5/20 cm)

According to these calculations there is no risk for succeeding crops concerning GF-3969, which degrade very fast in soil as showing for all TER values above 1. Based on these results and following the recommendation from the EPPO guidance 207: *If the TER values are >1 (or the specific national level, if higher), then no further testing is necessary.* No further field studies were conducted.

~~Currently the label of GF 3969 on maize include the following re-crop statement:~~

~~In case of crop failure for any reason, sown corn, soybean, peas and tomatoes within 3 months after application of GF 3969. In the winter of the same calendar year can be planted all winter cereal crops and winter oilseed rape.~~

In the case of a normal crop rotation the following crops can be planted after application of GF-3969: all winter cereals (barley, rye, wheat and triticale) in the same calendar year and spring cereals barley, spring oil seed rape, potatoes, sugar beet, sunflower, spring peas, potatoes, soybean, peas, cotton, alfalfa and tomatoes on the following springs.

#### Comments of zRMS:

Based on the submitted trial results, no special further field studies are necessary. The TER values were >1 for the all tested crops. The proposed warning which should be placed on the label of GF-3969 concerning normal crop rotation is justified.

No trial results in case of crop failure have been submitted.

### 3.5.2 Impact on other plants including adjacent crops (KCP 6.5.2)

Studies on the toxicity to non-target terrestrial plants have been carried out with GF-3969. The results are summarised in the following table.

**Table 3.5-3: ER<sub>50</sub>-values (g product/ha) of different test plants**

Species	Test item	Exposure System	Results	Reference
<i>Brassica napus</i> (Oilseed Rape) <sub>d</sub>	GF-3969	21 d Seedling emergence	ER <sub>50</sub> = 9.74 g product/ha shoot fresh weight	Spatz, B., 2018 (DuPont-49939)
<i>Glycine max</i> (Soybean) <sub>d</sub>			ER <sub>50</sub> > 135 g product/ha shoot fresh weight	

Species	Test item	Exposure System	Results	Reference
<i>Pisum sativum</i> (Pea) <sub>d</sub>			ER <sub>50</sub> = 129 g product/ha shoot fresh weight	
<i>Cucumis sativus</i> (Cucumber) <sub>d</sub>			ER <sub>50</sub> = 48.1 g product/ha shoot fresh weight	
<i>Beta vulgaris</i> (Sugarbeet) <sub>d</sub>			ER <sub>50</sub> = 9.26 g product/ha shoot dry weight	
<i>Solanum lycopersicum</i> (Tomato) <sub>d</sub>			ER <sub>50</sub> >45 g product/ha shoot dry weight	
<i>Sorghum bicolor</i> (Sorghum) <sub>m</sub>			ER <sub>50</sub> >135 g product/ha shoot dry weight	
<i>Allium cepa</i> (Onion) <sub>m</sub>			ER <sub>50</sub> = 5.07 g product/ha shoot dry weight	
<i>Avena sativa</i> (Oat) <sub>m</sub>			ER <sub>50</sub> >135 g product/ha shoot dry weight	
<i>Lolium perenne</i> (Ryegrass) <sub>m</sub>			ER <sub>50</sub> = 22.1 g product/ha shoot dry weight	
<i>Allium cepa</i> (Onion) <sub>m</sub>	GF-3969	21 d Vegetative vigour	ER <sub>50</sub> = 5.80 g product/ha shoot dry weight	Arnie, J.R., McKelvey, R.A., Aufderheide, J.A., Lockard, L.A., Zhang, L., 2020 (49942)
<i>Avena sativa</i> (Oat) <sub>m</sub>			ER <sub>50</sub> = 15.9 g product/ha shoot dry weight	
<i>Sorghum bicolor</i> (Sorghum) <sub>m</sub>			ER <sub>50</sub> = 3.00 g product/ha shoot dry weight	
<i>Zea mays</i> (Corn) <sub>m</sub>			ER <sub>50</sub> > 136 g product/ha visual injury/shoot dry weight	
<i>Beta vulgaris</i> (Sugarbeet) <sub>d</sub>			ER <sub>50</sub> = 1.61 g product/ha shoot dry weight	
<i>Brassica napus</i> (Oilseed Rape) <sub>d</sub>			ER <sub>50</sub> = 3.99 g product/ha shoot dry weight	
<i>Cucumis sativus</i> (Cucumber) <sub>d</sub>			ER <sub>50</sub> = 31.4 g product/ha shoot height	
<i>Glycine max</i> (Soybean) <sub>d</sub>			ER <sub>50</sub> = 11.1 g product/ha shoot dry weight	
<i>Solanum lycopersicum</i> (Tomato) <sub>d</sub>			ER <sub>50</sub> = >136 g product/ha shoot dry weight, visual injury, shoot height	
<i>Pisum sativum</i> (Pea) <sub>d</sub>			ER <sub>50</sub> = 10.6 g product/ha shoot dry weight	

m: monocotyledonous; d: dicotyledonous

Based on the ER<sub>50</sub> values the most sensitive crops are onion (ER<sub>50</sub> = 5.07 g product/ha) for seedling emergence test and sugarbeet (ER<sub>50</sub> = 1.61 g product/ha) for vegetative vigour test.

### Risk assessment for non-target terrestrial plants from use of GF-3969 formulation in maize

The risk assessment for plants potentially grown nearby to fields treated with GF-3969 can be considered with potential risk mitigation measures that can be implemented to reduce off-field exposure of nearby sensitive crops. These mitigation measures correspond to use of unsprayed in-field buffer strips of a given

width; and/or the usage of drift reducing nozzles. The results of the risk assessment (based on the most sensitive endpoint from each plant species) using typical mitigation measures (varying no-spray buffer zone distances in addition to use of drift-reducing nozzles with reduction by 50 or 75%) are summarized in the following tables. The risk assessment is based on the maximum single application rate of 135 g product/ha.

**Table 3.5-4: Calculated TER for GF-3969 on adjacent crops and corresponding buffer zone - Assessment using AF = 1**

Test species	Most Sensitive Study endpoint	ER <sub>50</sub> (g f.p./ha)	Theoretical drift dose (g f.p./ha, according Ganzelmeier table) reaching the adjacent crops located at				Buffer (m)
			1 m	3 m	5 m	10 m	
			3.74	1.29	0.77	0.39	
			Calculated TER on adjacent crops				
<i>Allium cepa</i> (Onion) <sub>m</sub>	Seedling emergence	5.07	1.4	3.9	6.6	13	-
<i>Avena sativa</i> (Oat) <sub>m</sub>	Vegetative vigour	15.9	4.3	12	21	41	-
<i>Sorghum bicolor</i> (Sorghum) <sub>m</sub>	Vegetative vigour	3.00	<b>0.80</b>	2.3	3.9	7.7	3
<i>Zea mays</i> (Corn) <sub>m</sub>	Vegetative vigour	>136	36	105	177	349	-
<i>Beta vulgaris</i> (Sugarbeet) <sub>d</sub>	Vegetative vigour	1.61	<b>0.43</b>	1.2	2.1	4.1	3
<i>Brassica napus</i> (Oilseed Rape) <sub>d</sub>	Vegetative vigour	3.99	1.1	3.1	5.2	10	-
<i>Cucumis sativus</i> (Cucumber) <sub>d</sub>	Vegetative vigour	31.4	8.3	24	41	81	-
<i>Glycine max</i> (Soybean) <sub>d</sub>	Vegetative vigour	11.1	2.9	8.6	14	28	-
<i>Lycopersicon esculentum</i> (Tomato) <sub>d</sub>	Vegetative vigour	>136	36	105	177	349	-
<i>Pisum sativum</i> (Pea) <sub>d</sub>	Vegetative vigour	10.6	2.8	8.2	14	27	-

TER: toxicity to exposure ratio. TER values shown in **bold** fall below the relevant trigger of 1

**Table 3.5-5: Calculated TER for GF-3969 on adjacent crops and corresponding buffer zone - Assessment using AF = 1 and 50 % drift reduction technology**

Test species	Most Sensitive Study endpoint	ER <sub>50</sub> (g f.p./ha)	Theoretical drift dose (g f.p./ha, according Ganzelmeier table) reaching the adjacent crops located at				Buffer (m)
			1 m	3 m	5 m	10 m	
			1.87	0.65	0.39	0.20	
			Calculated TER on adjacent crops				
<i>Allium cepa</i> (Onion) <sub>m</sub>	Seedling emergence	5.07	2.7	7.8	13	25.4	-
<i>Avena sativa</i> (Oat) <sub>m</sub>	Vegetative vigour	15.9	8.5	24	41	80	-
<i>Sorghum bicolor</i> (Sorghum) <sub>m</sub>	Vegetative vigour	3.00	1.6	4.6	7.7	15	-
<i>Zea mays</i> (Corn) <sub>m</sub>	Vegetative vigour	>136	73	209	349	680	-
<i>Beta vulgaris</i> (Sugarbeet) <sub>d</sub>	Vegetative vigour	1.61	<b>0.86</b>	2.5	4.1	8	3
<i>Brassica napus</i> (Oilseed Rape) <sub>d</sub>	Vegetative vigour	3.99	2.1	6.1	10	20	-
<i>Cucumis sativus</i> (Cucumber) <sub>d</sub>	Vegetative vigour	31.4	17	48	81	157	-
<i>Glycine max</i> (Soybean) <sub>d</sub>	Vegetative vigour	11.1	5.9	17	28	56	-

<i>Lycopersicon esculentum</i> (Tomato) <sub>d</sub>	Vegetative vigour	>136	73	209	349	680	-
<i>Pisum sativum</i> (Pea) <sub>d</sub>	Vegetative vigour	10.6	5.7	16	27	53	-

TER: toxicity to exposure ratio. TER values shown in **bold** fall below the relevant trigger of 1

**Table 3.5-6: Calculated TER for GF-3969 on adjacent crops and corresponding buffer zone - Assessment using AF = 1 and 75 % drift reduction technology**

Test species	Most Sensitive Study endpoint	ER <sub>50</sub> (g f.p./ha)	Theoretical drift dose (g f.p./ha, according Ganzelmeier table) reaching the adjacent crops located at				Buffer (m)
			1 m	3 m	5 m	10 m	
			0.94	0.32	0.19	0.10	
			Calculated TER on adjacent crops				
<i>Allium cepa</i> (Onion) <sub>m</sub>	Seedling emergence	5.07	5.4	15.8	27	51	-
<i>Avena sativa</i> (Oat) <sub>m</sub>	Vegetative vigour	15.9	16.9	49.7	83.7	159	-
<i>Sorghum bicolor</i> (Sorghum) <sub>m</sub>	Vegetative vigour	3.00	3.2	9.4	15.8	30	-
<i>Zea mays</i> (Corn) <sub>m</sub>	Vegetative vigour	>136	144.7	425	715.8	1360	-
<i>Beta vulgaris</i> (Sugarbeet) <sub>d</sub>	Vegetative vigour	1.61	1.7	5	8.5	16.1	-
<i>Brassica napus</i> (Oilseed Rape) <sub>d</sub>	Vegetative vigour	3.99	4.2	12.5	21	39.9	-
<i>Cucumis sativus</i> (Cucumber) <sub>d</sub>	Vegetative vigour	31.4	33.4	98.1	165.3	314	-
<i>Glycine max</i> (Soybean) <sub>d</sub>	Vegetative vigour	11.1	11.8	34.7	58.4	111	-
<i>Lycopersicon esculentum</i> (Tomato) <sub>d</sub>	Vegetative vigour	>136	144.7	425	715.8	1360	-
<i>Pisum sativum</i> (Pea) <sub>d</sub>	Vegetative vigour	10.6	11.3	33.1	55.8	106	-

TER: toxicity to exposure ratio. TER values shown in **bold** fall below the relevant trigger of 1

Based on the risk assessment provided above, as well as considering the drift mitigation technologies, the proposed mitigation measures for GF-3969 formulation for adjacent crops should therefore be:

- for onion, oat, corn, oilseed rape, cucumber, soybean, tomato and pea: neither buffer zones, nor drift reduction technology is needed,
- for sorghum, a 3-m buffer or 50% drift reduction technology is required whereas
- Sugar beet requires at least 75% drift reducing technology or a 3-m buffer

Acceptable risk to each of the species tested is shown based on the maximum application rate of 1 x 135 g product/ha, when appropriate mitigation is applied. Full details of the terrestrial plant studies are provided in DuPont 50803 CEU: SECTION 9.

**Comments of zRMS:**

Based on the submitted trial results, it can be concluded that the above warnings which should be placed on the label of GF-3969 are justified.  
 For further details on GF-3969 please refer to the Registration Report Part B Section 9.

**3.5.3 Effects on beneficial and other non-target organisms (KCP 6.5.3)**

For an herbicide, where beneficial are not important in controlling the plant species, further testing is not required. As such no specific considerations are required for beneficial arthropods.

The risk to arthropods is presented in Part B Section 9 (Ecotoxicology). A low risk was identified for the standard indicator arthropod species *Aphidius* and *Typhlodromus* for both in-field and off-field exposure and so a low risk to arthropods from the intended use.

The Tier I laboratory studies showed acceptable in-field and off-field effects for *Aphidius rhopalosiphi* and *Typhlodromus pyri* from applications of GF-3969 according to the proposed use pattern. All details are given in DuPont 50803 CEU: SECTION 9.

**Table 3.5-7: Endpoints and effect values relevant for the risk assessment for non-target arthropods – GF-3969**

Species	Substance	Exposure System	Results	Reference
<b>Tier-1</b>				
<i>Typhlodromus pyri</i> (protonymphs)	GF-3969 plus surfactant DPX-KG691	Laboratory test glass plates (2D)	LR <sub>50</sub> >135 g product/ha	Moll, M., 2018 (DuPont-49935)
<i>Aphidius rhopalosiphi</i> (adults)	GF-3969 plus surfactant DPX-KG691	Laboratory test glass plates (2D)	LR <sub>50</sub> >135 g product/ha	Moll, M., 2018 (DuPont-49934)
<i>Typhlodromus pyri</i> (protonymphs)	GF-3969 plus surfactant Codacide	Laboratory test glass plates (2D)	LR <sub>50</sub> >135 g product/ha	Moll, M., 2018 (DuPont-49973)
<i>Aphidius rhopalosiphi</i> (adults)	GF-3969 plus surfactant Codacide	Laboratory test glass plates (2D)	LR <sub>50</sub> >135 g product/ha	Moll, M., 2018 (DuPont-49972)
Field or semi-field tests				
Not required.				

### Risk assessment for non-target arthropods due to the use of GF-3969 formulation in maize

The evaluation of the risk for non-target arthropods was performed in accordance with the recommendations of the “Guidance Document on Terrestrial Ecotoxicology”, as provided by the Commission Services (SANCO/10329/2002 rev.2 (final), October 17, 2002), and in consideration of the recommendations of the guidance document ESCORT 2.

The in-field exposure (predicted environmental rate (PER)) is calculated according to ESCORT 2 using the following equation:

$$PER_{in-field} = \text{Application rate (g/ha)} * \text{MAF}$$

The potential risk of GF-3969 to in-field non-target arthropods was assessed by calculation of the hazard quotients ( $HQ_{in-field} = \text{exposure/toxicity}$ ) with the predicted environmental rate ( $PER_{in-field}$ ) and the lowest lethal rate ( $LR_{50}$ ) values according to the following equation:

$$HQ_{in-field} = \frac{PER_{in-field} \left(\frac{g}{ha}\right)}{LR_{50} \left(\frac{g}{ha}\right)}$$

**Table 3.5-8: First- and higher-tier assessment of the in-field risk for non-target arthropods due to the use of GF-3969 in maize**

<b>Intended use</b>	Maize		
<b>Active substance/product</b>	GF-3969 plus surfactant DPX-KG691		
<b>Application rate (g/ha)</b>	1 × 135 g product/ha		
<b>MAF</b>	1		
<b>Test species Tier I</b>	<b>LR<sub>50</sub> (lab.) (g/ha)</b>	<b>PER<sub>in-field</sub> (g/ha)</b>	<b>HQ<sub>in-field</sub> criterion: HQ ≤ 2</b>
<i>Typhlodromus pyri</i>	>135	135	1
<i>Aphidius rhopalosiphii</i>	>135		1

MAF: Multiple application factor; PER: Predicted environmental rate; HQ: Hazard quotient

The in-field HQ values are below the trigger of 2 for both species and so indicate acceptable risk to in-field non-target arthropods.

Off-field foliar PER values were calculated from in-field foliar PERs in conjunction with drift values published by the Rautmann *et al.* (2000)<sup>4</sup> as shown in the following equation:

$$PER_{off-field} = \frac{\text{Maximum } PER_{in-field} \times \left(\% \frac{\text{Drift}}{100}\right)}{\text{Vegetation distribution Factor}}$$

The potential risk of GF-3969 to off-field non-target arthropods was assessed by calculation of the hazard quotients (HQ) with the predicted environmental rate ( $PER_{off-field}$ ) and the lowest lethal rate ( $LR_{50}$ ) values according multiplied by a correction factor according to the following equation:

$$HQ_{off-field} = \frac{PER_{off-field} \left(\frac{g}{ha}\right)}{LR_{50} \left(\frac{g}{ha}\right)} \times \text{Correction factor}$$

<sup>4</sup> Rautmann, D., Strelake, M., Winkler, R. (2001). New basic drift values in the authorisation procedure for plant protection products. In Forster, R., Strelake, M. Workshop on Risk Assessment and Risk Mitigation Measures in the Context of the Authorization of Plant Protection Products (WORMM). Mitt. Biol. Bundesanst. Land-Forstwirtschaft. Berlin-Dahlem, Heft 381.

**Table 3.5-9: First- and higher-tier assessment of the off-field risk for non-target arthropods due to the use of GF-3969 in maize**

<b>Intended use</b>		Maize			
<b>Active substance/product</b>		GF-3969 plus surfactant DPX-KG691			
<b>Application rate (g/ha)</b>		1 × 135 g product/ha			
<b>MAF</b>		1			
<b>Vdf</b>		5 (Tier 1) <sup>a</sup>			
<b>Test species Tier I</b>	<b>LR<sub>50</sub> (lab.) (g/ha)</b>	<b>Drift rate</b>	<b>PER<sub>off-field</sub> (g/ha)</b>	<b>CF</b>	<b>HQ<sub>off-field</sub> criterion: HQ ≤ 2</b>
<i>Typhlodromus pyri</i>	>135	2.77%	135 x 0.0277 / 5 = 0.7479	10	0.05
<i>Aphidius rhopalosiphi</i>	>135				0.05

MAF: Multiple application factor; vdf: Vegetation distribution factor; (corr.) PER: (corrected) Predicted environmental rate; CF: Correction factor; HQ: Hazard quotient. Criteria values shown in bold breach the relevant trigger.

a The vegetation distribution factor of 5 is used instead of 10 according to EFSA Supporting Publication 2019:EN-1673.

The off-field HQ values are below the trigger of 2 for both species and so indicate acceptable risk to off-field non-target arthropods.

### Summary and conclusion

**Succeeding crop section:** According to the calculations, there is no risk for succeeding crops concerning GF-3969, which degrade very fast in soil as showing for all TER values above 1. Based on these results and following the recommendation from the EPPO guidance 207: *If the TER values are >1 (or the specific national level, if higher), then no further testing is necessary.* No further field studies were conducted. Label recommendations must be followed.

**Adjacent crop section:** Acceptable risk to each of the species tested is shown based on the maximum application rate of 1 x 135 g product/ha, when appropriate mitigation is applied.

**Non-target arthropods:** A low risk was identified for the standard indicator arthropod species *Aphidius* and *Typhlodromus* for both in-field and off-field exposure and so a low risk to arthropods from the intended use.

#### Comments of zRMS:

Based on the submitted trial results, it can be concluded that GF-3969 is safe for non-target arthropods. A low risk was identified for the standard indicator arthropod species *Aphidius* and *Typhlodromus* for both in-field and off-field exposure and so a low risk to arthropods from the intended use.  
For further details on GF-3969 please refer to the Registration Report Part B Section 9.

## 3.6 Other/special studies

### 3.6.1 Rainfastness

No information is available.

#### Comments of zRMS:

Accepted.

## 3.6.2 Cleaning application equipment

### Tank cleaning

A study was conducted to establish a proper cleaning procedure of application equipment by following the EPPO PP 1/292 (1) standard. This standard was carried out on GF-3969 containing 14.8% rimsulfuron + 9.25% thifensulfuron methyl + 11.11 % isoxadifen ethyl present in a dispersible granules formulation (DuPont coded as DPX-V4B07).

The objective of this study was to ensure that the recommended tank cleanout procedure after GF-3969 application is efficient to remove all potential residues from the spray tank. Hence, spraying after cleanout procedure will not have any unintentional effects on the treated crop thereafter.

An ED<sub>50</sub> model was established to set up a dose curve response as described in EPPO 1/292. The ED<sub>50</sub> value is then compared to the amount of residues found in the chemical tank clean out evaluation. If the ED<sub>50</sub> is superior to the amount of residue then the tank clean out procedure is validated.

The tests were done to comply with the European Union data requirements specified in EU commission directive 284/2013, Annex A, Section 4.2 Procedures for Cleaning Application Equipment. The standard EPPO 1/292 was used as testing guidelines. Detail information on the methodology use can be found on the internal report<sup>5</sup>. GF-3969 at a use rate of 135 g fp/ha (47.5 g a.s./ha) in 200L/ha has been used for application on one sensitive crops like Sunflower. The chemical analysis of residues after tank cleanout procedure as well as the TER value calculation demonstrated that the recommended tank cleanout procedure, see below, is validated and that no further testing is required.

### Rinsing

After the end of application, thoroughly rinse sprayers and flush hoses, boom, filters and nozzles with clean water to reduce risk of forming hardened deposits which might become difficult to remove.

Rinse all other associated application equipment. Diluted spray solution can be sprayed over the treated crop/field at high speed lower pressure without exceeding the registered rate. Drain the tank.

### Cleaning

The application equipment should be cleaned using ALL CLEAR<sup>®</sup> EXTRA NF sprayer cleaner, following those instructions:

1. After the spraying is finished, drain the tank completely.
2. Thoroughly rinse all interior tank surfaces (including lid) with clean water (use at least 10% of the tank capacity). Take care to remove any visible deposits. The rinsing water may be sprayed on the crop that has just been treated.
3. Fill the sprayer \* with at least 10 % of tank capacity with clean water and add 0.5% of All Clear Extra NF per 100 L of water. Flush through hoses and boom, and let circulate for 10 to 15 minutes with tank wall cleaning device active.
4. Empty the sprayer through the boom and hoses and drain the tank over a safety area for waste management. Rinse the sprayer with clear water (at least 10% of tank capacity) until the complete disappearance of the yellow tracer.
5. Nozzles and filters should be removed and cleaned separately with ALL CLEAR<sup>™</sup> EXTRA NF in the same concentration as cleaning of the sprayer.
6. Do not forget to clean the sprayer on the outside

---

<sup>5</sup> AT-18-009: Rimsulfuron 14.8% + Thifensulfuron methyl 9.25% + Isoxadifen ethyl 11.11% WG (DPX-V4B07 35.18% WG) Laboratory Study of Spray Tank Clean out.

Alternatively All Clear Extra can be replaced either by 3% household ammonia to get 1% solution (1 L ammonia /100 L of water) or by 6.2 % Sodium hypochlorite solution (0.4 L/100L of water)

\* For those sprayers having not an internal tank cleaning device, fill the tank completely.

**Comments of zRMS:**

Based on the trials submitted by the Applicant, it can be concluded that triple rinse with tank cleaner, is sufficient to remove of active substances residues included in GF-3969, on the safe level for the next crops. In the opinion of zRMS the cleaning procedure should be include to the product label:

*“Rinse the inside of the tank with clean water, using at least a tenth of the spray volume. After flushing through the pump and spray-lines, drain and repeat the entire procedure twice more to provide a triple rinse procedure. Add a sprayer cleaner to the second rinse”*

Disposal of spray-tank washings should be conducted in accordance with national legislation.

### 3.6.3 Justification for recommended water volumes

In order cover the spray volume ranges include in the GAP for the countries under the Central regulatory zone, a field trial at European Research Development Centre in the spring of 2017 was carried out. The objective of the trial was to evaluate the impact of different spray volumes on the efficacy and selectivity of GF-3969 (DuPont coded as DPX-V4B07). Four different spray volumes were tested to cover the GAP, 50 L/ha, 100 L/ha, 300 L/ha and 500 L/ha, and efficacy was recorded on key maize weeds: *Chenopodium album*, *Amaranthus retroflexus*, *Setaria viridis*, *Echinochloa crus-galli* as well as on the crop selectivity on maize.

The field plot was infested in 2016 with SETVI and ECHCG seeds on spring to ensure a sufficient and homogeneous infestation of the plot. In this report, data on MERAN and SONOL has also been included despite a low level of infestation (below 5/m<sup>2</sup>).

Post-emergence applications were made at BBCH 15-16 of the crop, BBCH 16-18 of broadleaf weeds and BBCH14 of grasses. The tested product GF-3969 was compared to the reference, Elumis® 105OD (nicosulfuron+mesotrione).

Results showed that a slight efficacy reduction was observed at 50 L/ha only on CHEAL. Excellent control was observed on SETVI and ECHCG at all volumes, and with volume from 100L/ha good control was maintained on all weeds. More detail information could be found on the internal report<sup>6</sup>.

Regarding selectivity, GF-3969 did not show significant crop damages. With only low chlorosis and stunting symptoms (<10%) only early days after application, it was finally safe to the crop at all tested volumes. At the harvest, no impact on yield data was observed with the different volumes of application.

**Comments of zRMS:**

Taking into account that *Chenopodium album* (CHEAL) is the key maize weed, it can be concluded that the range of water volume intended in the GAP table (100-400 l/ha or 150-400 l/ha) is justified for GF-3969.

### 3.6.4 Justification for recommended nozzle types

No tests with different nozzles types were conducted with GF-3969. The presence in the maize market for long year of the actives substance in this formulated product, rimsulfuron and thifensulfuron methyl,

<sup>6</sup> PEH-17-108: Field efficacy trial to evaluate DPX-V4B07 at different water volumes in Corn.

and no concerns were raised during this type, indicate that efficacy and crop safety of this product is not affected by the nozzle type.

**Comments of zRMS:**

Accepted.

### 3.6.5 Compatibility studies

#### 3.6.5.1 Biology Compatibilities studies

No biology compatibility studies have been conducted with GF-3969 as the actives rimsulfuron and thifensulfuron methyl are in the maize market for many years and no particular issues of compatibility causing crop damage have been identified up today.

**Comments of zRMS:**

Accepted.

#### 3.6.5.2 Physical and chemical compatibility studies

**Summary:** GF-3969 was tested with 21 potential tank mix partners in two, three, four-way mixture combinations and they were found to be physically compatible. Within the time frame of the tests, no pH and temperature significant variation was noticed and no gas generation was observed which is considered as evidence of no potentially disadvantageous chemical reaction.

**Comments of zRMS:**

Accepted.

### 3.7 List of test facilities including the corresponding certificates

**Table 3.7-1: List of test facilities**

Organisation	Town	Country	Valid From	Valid To	Link
Syntech Research Hungary Kft.	Taplanszentkereszt	Hungary	15-Aug-2016	15-Aug-2021	<a href="#">1d657f522c3</a>
Redebel SA	Saint-Amand	Belgium	20-Jan-2017	20-Jan-2022	<a href="#">1d657f5223d</a>
Eurofins Agrosience Services Ltd (UK)	Derby	UK	1-Jan-2018	31-Dec-2022	<a href="#">1d657f5221c</a>
Agro Research Consulting	Lowicz	Poland	6-Mar-2018	5-Mar-2023	<a href="#">1d657f521dc</a>
Exploras Agro Development	Dongen	Netherlands	18-Jan-2016	18-Jan-2022	<a href="#">1d657f5218a</a>
Krasne Udoli, Ing. Jitka Mareckova	Touzim	Czech Republic	1-Sep-2016	31-Aug-2021	<a href="#">1d657f52169</a>

<b>Organisation</b>	<b>Town</b>	<b>Country</b>	<b>Valid From</b>	<b>Valid To</b>	<b>Link</b>
Krasne Udoli, Ing. Jitka Mareckova	Touzim	Czech Republic	1-Sep-2016	1-Sep-2021	<a href="#">1d657f5214e</a>
Agritec, Research, Breeding and Services Ltd	Sumperk	Czech Republic	1-Sep-2016	1-Sep-2021	<a href="#">1d657f52140</a>
Zkusebni Stanice Trutnov. s.r.o.	Trutnov	Czech Republic	1-Sep-2016	1-Sep-2021	<a href="#">1d657f52116</a>
Agrartest GmbH	Aarbergen-Panrod	Germany	2-May-2016	2-May-2020	<a href="#">1d657f520dd</a>
Neutex Beteti Tarsasag	Godollo	Hungary	31-Mar-2014	31-Mar-2019	<a href="#">1d657f520d6</a>
Field Research Support (PL)	Koscian	Poland	7-Jun-2013	31-Dec-2100	<a href="#">1d657f520c9</a>
FYSE s.r.o. Odd. AgroLab Kolare	Kolare	Slovakia	4-Feb-2016	4-Feb-2021	<a href="#">1d657f5209d</a>
Staphyt Belgium	Inchy en Artois	France	8-Jan-2015	26-May-2020	<a href="#">1d657f5209b</a>
Eurofins Agrosience Services GmbH (Germany)	Stade	Germany	15-Jan-2016	15-Jan-2021	<a href="#">1d657f5209c</a>
Agreco Sp. z o.o.	Wroclaw	Poland	11-Mar-2013	31-Dec-2100	<a href="#">1d657f52099</a>
DuPont de Nemours (Deutschland) GmbH	Neu-Isenburg	Germany	17-Aug-2015	31-Dec-2100	<a href="#">1d657f52033</a>
Eurofins Agrosience Services Srl (Romania)	Timisoara	Romania	27-Feb-2015	27-Feb-2020	<a href="#">1d657f5202a</a>
ATC - Agro Trial Center GmbH Versuchsstation Gerhaus	Rohrau	Austria	26-Mar-2014	31-Dec-2018	<a href="#">1d657f51f6f</a>
Hetterich Fieldwork GbR	Schwarzach	Germany	20-Jun-2014	20-Jun-2019	<a href="#">1d657f51f5e</a>

## Appendix 1 Lists of data considered in support of the evaluation

### List of data submitted by the applicant and relied on – all documents

Data point	Author(s)	Year	Title Company Report No. Source GLP or GEP Status Published or not	Vertebrate study Y/N	Owner	Relied upon Y/N
KCP, 6.0/01	Freitag, N.	2020	Biological assessment dossier Detailed summary Product name: GF-3969 Chemical active substance(s): Rimsulfuron, 148.15 g/kg Thifensulfuron methyl, 92.6 g/kg Isoxadifen-ethyl, 111.1 g/kg Central registration zone Zonal rapporteur member state: Poland Core assessment DuPont-51169 CEU DuPont European Research and Development Centre (ERDC) GLP: No Published: No	N	DuPont	Y
KCP, 6.0/02	Freitag, N.	2020	GF-3969 (rimsulfuron 148.15 g/kg, thifensulfuron methyl 92.6 g/kg, isoxadifen-ethyl 111.1 g/kg): Trial reports efficacy, selectivity, and yield (central zone) DuPont-51170 CEU DuPont European Research and Development Centre (ERDC) GEP: Yes Published: No	N	DuPont	Y

<b>Data point</b>	<b>Author(s)</b>	<b>Year</b>	<b>Title Company Report No. Source GLP or GEP Status Published or not</b>	<b>Vertebrate study Y/N</b>	<b>Owner</b>	<b>Relied upon Y/N</b>
KCP, 6.1/01	Monteix, B.	2017	Field efficacy trial to evaluate DPX-V4B07 at different water volumes in corn PEH-17-108 DuPont European Research and Development Centre (ERDC) GLP: No Published: No	N	DuPont	Y
KCP, 6.1/02	Notter, J.-S.	2018	Growth chamber studies to justify each rate of active ingredient in GF-3969 (rimsulfuron + thifensulfuron + isoxadifen) on major corn weeds (2017 & 2018 Studies) PEH-18-101 DuPont European Research and Development Centre (ERDC) GLP: No Published: No	N	DuPont	Y
KCP, 6.5.1/01	Siemoneit-Gast, S.	2018	DPX-V4B07 35.18WG + surfactant Trend90. Standardised bioassay for the determination of the EC <sub>10</sub> (NOEL) and EC <sub>50</sub> values for herbicides and selected following crops in soil GEP03 Rheinland-Pfalz (RLP) AgroScience GmbH GEP: Yes Published: No	N	DuPont	Y
KCP, 6.5.2/01	Arnie, J.R., McKelvey, R.A., Aufderheide, J.A., Lockard, L.A., Zhang, L.	2020	DPX-V4B07 24 WG: Isoxadifen ethyl 50WG/Rimsulfuron 25SG/Thifensulfuron methyl 50SG (DPX-V4B07), A blend of paste extruded granules plus isodecylalcohol ethoxylated (DPX-KG691) surfactant: A greenhouse study to investigate the effects on vegetative vigor of ten terrestrial plants following foliar exposure 49942 Eurofins EAG Agrosience, LLC GLP: Yes Published: No	N	DuPont	Y
KCP, 6.5.2/02	Spatz, B.	2018	Rimsulfuron 25SG/Thifensulfuron methyl 50SG/Isoxadifen ethyl 50WG (DPX-V4B07) A blend of paste extruded granules (14.82% + 9.26% active) plus DPX-KG691 surfactant: Effects on terrestrial (non-target) plants: Seedling emergence and seedling growth test DuPont-49939 IBACON GLP: Yes Published: No	N	DuPont	Y

<b>Data point</b>	<b>Author(s)</b>	<b>Year</b>	<b>Title Company Report No. Source GLP or GEP Status Published or not</b>	<b>Vertebrate study Y/N</b>	<b>Owner</b>	<b>Relied upon Y/N</b>
KCP, 6.5.3/01	Huby, J.P.	2018	DPX-V4B07 35.18WG: Laboratory study of physical compatibility in water AT-18-004 DuPont de Nemours (France) S.A.S. GLP: No Published: No	N	DuPont	Y
KCP, 6.5.3/02	Huby, J.P.	2018	Rimsulfuron 14.8% + Thifensulfuron methyl 9.25% + Isoxadifen ethyl 11.11% WG (DPX-V4B07 35.18% WG) laboratory study of spray tank clean out AT-18-009 DuPont de Nemours ERDC GLP: No Published: No	N	DuPont	Y
KCP, 6.5.3/03	Moll, M.	2018	Rimsulfuron 25SG/Thifensulfuron 50SG/Isoxadifen ethyl 50WG (DPX-V4B07). A blend paste extruded granules (14.82% + 9.26% active) plus codacide: A laboratory rate response test to evaluate the effect on the parasitoid, <i>Aphidius rhopalosiphi</i> (Hymenoptera, Braconidae) DuPont-49972 IBACON GLP: Yes Published: No	N	DuPont	Y
KCP, 6.5.3/04	Moll, M.	2018	Rimsulfuron 25SG/Thifensulfuron methyl 50SG/Isoxadifen ethyl 50WG (DPX-V4B07) a blend of paste extruded granules (14.82% + 9.26% active) plus codacide: A laboratory rate-response test to evaluate the effects on the predatory mite, <i>Typhlodromus pyri</i> (Acari, Phytoseiidae) DuPont-49973 IBACON GLP: Yes Published: No	N	DuPont	Y

Data point	Author(s)	Year	Title Company Report No. Source GLP or GEP Status Published or not	Vertebrate study Y/N	Owner	Relied upon Y/N
KCP, 6.5.3/05	Moll, M.	2018	Rimsulfuron 25SG/Thifensulfuron methyl 50SG/Isoxadifen ethyl 50WG (DPX-V4B07) a blend of paste extruded granules (14.82% + 9.26% active) plus DPX-KG691 surfactant: A laboratory rate-response test to evaluate the effects on the parasitoid <i>Aphidius rhopalosiphi</i> (Hymenoptera, Braconidae) DuPont-49934 IBACON GLP: Yes Published: No	N	DuPont	Y
KCP, 6.5.3/06	Moll, M.	2018	Rimsulfuron 25SG/Thifensulfuron methyl 50SG/Isoxadifen ethyl 50WG (DPX-V4B07) a blend of paste extruded granules (14.82% + 9.26% active) plus DPX-KG691 Surfactant: A laboratory rate-response test to evaluate the effects on the predatory mite, <i>Typhlodromus pyri</i> (acari, phytoseiidae) DuPont-49935 IBACON GLP: Yes Published: No	N	DuPont	Y

**List of data submitted by the applicant and relied on – vertebrate studies**

No vertebrate studies submitted.

**List of data submitted or referred to by the applicant and relied on, but already evaluated at EU peer review – all documents**

No studies previously submitted and relied upon.

**List of data submitted or referred to by the applicant and relied on, but already evaluated at EU peer review – vertebrate studies**

No vertebrate studies previously submitted.

**List of data submitted by the applicant and not relied on**

<b>Data point</b>	<b>Author(s)</b>	<b>Year</b>	<b>Title Company Report No. Source (where different from company) GLP or GEP status Published or not</b>	<b>Vertebrate study Y/N</b>	<b>Owner</b>
-	-	-	-	-	-

**List of data relied on not submitted by the applicant but necessary for evaluation**

<b>Data point</b>	<b>Author(s)</b>	<b>Year</b>	<b>Title Company Report No. Source (where different from company) GLP or GEP status Published or not</b>	<b>Vertebrate study Y/N</b>	<b>Owner</b>
-	-	-	-	-	-