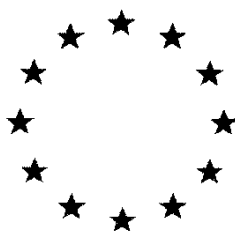


European Commission



**Draft Renewal Assessment Report prepared according to the Commission
Regulation (EU) N° 1107/2009**

Flufenacet **Volume 3 – B.3 (AS)**

Rapporteur Member State: Poland
Co-Rapporteur Member State: France

Version History

When	What
August 1997	Initial assessment. Draft Assessment Report for first inclusion to Annex I. RMS: FR
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B.3. DATA ON APPLICATION

B.3.1. USE OF THE ACTIVE SUBSTANCE

Flufenacet is a soil herbicide, primarily taken up by roots and transported in the apoplast of germinating weeds to meristematic root and shoot regions and to the leaves. Flufenacet is distributed in the soil top layer. Flufenacet is broken down fairly rapidly (half-life in soil 10-34 days). The weed spectrum of Flufenacet includes annual dicotyledons but focuses on annual grasses. Another active ingredient should then be added to strengthen the effects on annual dicotyledons. Crop selectivity is based on position of the roots of the weeds. The deeper rooting system of wheat (drilled 2-3 cm below the soil surface) is not in contact with the product.

Products containing Diflufenican + Flufenacet SC 600 (200+400 g/L) are used pre- and early post emergence in cereals (wheat, barley, rye).

B.3.2. FUNCTION

The active substance Flufenacet in mixture with Diflufenican can be considered as a basis for selective cereal weeding in autumn. E.g. the formulation HEROLD SC, containing 400g/L of Flufenacet and 200g/L Diflufenican, controls a wide weed spectrum including annual dicotyledons and annual grasses.

B.3.3. EFFECTS ON HARMFUL ORGANISMS

Flufenacet is a soil herbicide, primarily taken up by roots and transported in the apoplast of germinating weeds to meristematic root and shoot regions and to the leaves. Flufenacet is distributed in the soil top layer. Flufenacet-methyl-sodium is the, taken up mainly by emerging leaves and acts systemically. The inhibition of plant growth is followed by necrosis, at first apical, then basal. The activity is manifested by yellowish discoloration of the leaves and the disappearance of susceptible weed plants occur within 3 to 4 weeks.

Four metabolites of flufenacet, FOE oxalate (M01), FOE sulfonic acid (M02), FOE 5043-trifluoroethanesulfonic acid (M44) and trifluoroacetic acid (TFA) (M45) were tested for their biological activity according to the guidance document on the relevance of metabolites in groundwater (SANCO/221/2000). In these tests, none of the metabolites showed any significant herbicidal activity, i.e. the observed activity was always clearly lower than 50% compared to the parent active substance flufenacet. Since the activity threshold of 50% as given in Guidance Document Sanco/221/2000 rev. 10 (Anonymous, 2003) was never exceeded, all metabolites are considered to be non-relevant. The summaries of the respective studies are listed below:

FOE oxalate (M01)

Report: KCA 3.3/01; Hills, M.; 2009

Title: Evaluation of the pre-emergence biological activity of FOE 5043-Oxalate (code: BCS-AB16305) a metabolite of Flufenacet

Document M-353844-01-1

No.:

Guidelines: None

GLP: No

Objectives:

The test reported here was designed to determine the biological activity of FOE 5043-Oxalate (code BCS-AB16305, Batch SES 10565-3-1) a metabolite of Flufenacet. The study was conducted under standardized glasshouse conditions using a WP05 formulation of the metabolite in comparison with a WP05 formulation of the parent Flufenacet (FOE 5043, substance code AE F133402).

Materials and Methods:

Test material	Dose rates (kg a.s./ha)				
FOE -Oxalate (metabolite of flufenacet) coded BCS-AB16305 (batch SES 10564-3-1) formulated as WP05	0.600	0.500	0.250	0.125	0.060
Flufenacet coded FOE 5043 (AE F133402; Batch ID: 488) formulated as a WP05.	0.372	0.310	0.155	0.077	0.037

Jiffy pots (8 cm diameter) were to within 2 cm of the top with a silt-loam soil (20% sand, 57% silt, 23% clay, pH 6.8 and 1.4 % organic matter). Seeds of the weed species tested were sown into these pots and covered with 0.5 to 1 cm of the same soil mixed 1 to 1 with sharp sand. After sowing the pots were placed into a glasshouse set 20°C+/-2°C day and 12°C+/-2°C night and watered from the top according to need. High pressure sodium lamps (400W) were used to augment daylight during cloudy conditions and to extend the day length to 14 hours.

The parent Flufenacet and metabolite formulations were diluted in de-ionized water to obtain the required dose rates. Flufenacet was applied at 600 / 500 / 250 / 125 / 60 g a.s./ha. BCS-AB16305 the Oxalate metabolite was applied with the equivalent dose rate of 372 / 310 / 155 / 77 / 37g a.s./ha. Four weeks after application the treated plants were visually assessed for injury compared with the untreated control plants. The assessments were on a percentage basis (0 = no effects, 100 = complete kill).

The plant species tested were selected as those which have a relatively high sensitivity to flufenacet.

Plant species	Assigned number
<i>Triticum aestivum</i> (TRZAW)	1
<i>Zea mays var vulgaris</i> (ZEAMA)	2
<i>Glycine max</i> (GLXMA)	3
<i>Alopecurus myosuroides</i> (ALOMY)	4
<i>Apera spica venti</i> (APESV)	5
<i>Digitaria sanguinalis</i> (DIGSA)	6
<i>Echinochloa crus-galli</i> (ECHCG)	7
<i>Panicum miliaceum</i> (PANMI)	8
<i>Setaria viridis</i> (SETVI)	9
<i>Sorghum halepense</i> (SORHA)	10
<i>Amaranthus retroflexus</i> (AMARE)	11
<i>Ambrosia artemisiifolia</i> (AMBEL)	12
<i>Chenopodium album</i> (CHEAL)	13
<i>Galium aparine</i> (GALAP)	14

Results:

The results of the visual assessments are presented as means from the 2 replications. Flufenacet demonstrated excellent control of all of the 11 weed species tested and some severe damage to wheat and corn crops with some degree of selectivity on soya beans.

The metabolite BCS-AB16305 showed no biological activity on any of the 14 tested plant species.

Species name	kg a.s/ha	1	2	3	4	5	6	7	8	9	10	11	12	13	14	MEAN
Observed injury (%) of plants, 28 days after application																
Flufe-nacet	0.600	96	63	20	100	100	100	100	100	100	100	100	96	96	98	99
	0.500	95	40	20	99	100	100	100	100	100	100	100	93	95	98	99
	0.250	93	20	20	98	100	100	100	99	100	100	98	75	95	96	96
	0.125	73	15	25	97	99	99	100	97	99	97	75	50	85	92	90

	0.060	65	0	0	97	99	99	99	97	90	97	55	18	75	85	83
FOE oxalate	0.372	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.310	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.155	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.077	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	0.037	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Conclusions:

In a direct comparison study, it could be shown, that FOE 5043-Oxalate (BCS-AB16305), a metabolite of Flufenacet, had no pre-emergence biological activity, when tested on a range of weeds under highly sensitive screening conditions.

FOE sulfonic acid (M02)

Report: KCA 3.3/02; Dahmen, P.; 2004

Title: Screening and Efficacy Data for WAK6222 (metabolite of FOE5043)

Document M-089475-01-1

No.:

Guidelines: None

GLP: No

Objectives:

This pre-emergence test was conducted to determine differences in the biological activity of Flufenacet and its metabolite WAK6222 (FOE sulfonic acid).

Materials and Methods:

WAK6222 (Fraction 0-0). a.s. (purity 100%), metabolite of FOE5043.

Seeds of all mentioned plant species were planted into soil (sandy loam, organic matter of 2.5 - 3 %) in greenhouse pots (420 cm² surface, pot T59). Seeds were sown 24 hours prior to application of the test substance. The soil used allowed good germination.

The plants were kept at a day/night cycle of 22°C/15 °C respectively. The relative humidity in the test chamber was set at 50% and the illumination at 8000 lux under a 14-hour day cycle. Plants used for pre-emergence treatments were sown, sprayed with the test material and then directly placed under the specified growing conditions. The final evaluation was taken 21 days after treatment initiation.

Evaluation of phytotoxicity was done by visual observations using a rating scale of 0 to 100%, where 100% represented complete destruction of above ground parts and 0% represented no visual damage (normal growth) as compared to untreated plants.

9 monocotyledonous and 5 dicotyledonous plant species were tested:

Plant species	
Monocotyledonous	Dicotyledonous
<i>Triticum aestivum</i> (TRZAW)	<i>Soybean</i> (GLXMA)
<i>Zea mays</i> (ZEAMX)	<i>Amaranthus retroflexus</i> (AMARE)
<i>Alopecurus myosuroides</i> (ALOMY)	<i>Ambrosia elatior</i> (AMBEL)
<i>Apera spica venti</i> (APESV)	<i>Chenopodium album</i> (CHEAL)
<i>Digitaria sanguinalis</i> (DIGSA)	<i>Gallium aparine</i> (GALAP)
<i>Echinochloa crus-galli</i> (ECHCG)	
<i>Panicum miliaceum</i> (PANMI)	
<i>Setaria viridis</i> (SETVI)	
<i>Sorghum halepense</i> (SORHA)	

Results:

FOE5043 (flufenacet)	H2	Results (% injury) at different application rates				
Pre-emergence (g a.s./ha)						
Test species	Code	600	500	250	125	60
Monocotyledonae						
<i>Triticum aestivum</i>	TRZAW	5	0	0	0	0
<i>Zea mays</i>	ZEAMX	5	0	0	0	0
<i>Alopecurus myosuroides</i>	ALOMY	100	100	100	100	100
<i>Alpera spica-venti</i>	APESV	100	100	100	100	100
<i>Digitaria sanguinalis</i>	DIGSA	100	100	100	100	100
<i>Echinochloa crus-galli</i>	ECHCG	100	100	100	100	0
<i>Panicum miliaceum L.</i>	PANMI	100	100	99	99	99
<i>Setaria viridis</i>	SETVI	100	100	100	100	100
<i>Sorghum halepense</i>	SORHA	100	100	100	100	100
Dicotyledonae						
<i>Glycine max</i>	GLXMA	0	0	0	0	0
<i>Amaranthus retroflexus</i>	AMARE	100	100	100	90	20
<i>Ambrosia elatior</i>	AMBEL	95	90	70	40	40
<i>Chenopodium album</i>	CHEAL	99	99	95	60	40
<i>Gallium aparine</i>	GALAP	99	95	95	95	20

H2 = Screening Laboratory (H01SV)

WAK6222 (FOE sulfonic acid)	H2	Results (% injury) at different application rates				
Pre-emergence (g a.s./ha)						
Test species	Code	455	379	189	95	45
Monocotyledonae						
<i>Triticum aestivum</i>	TRZAW	0	0	0	0	0
<i>Zea mays</i>	ZEAMX	0	0	0	0	0
<i>Alopecurus myosuroides</i>	ALOMY	0	0	0	0	0
<i>Alpera spica-venti</i>	APESV	0	0	0	0	0
<i>Digitaria sanguinalis</i>	DIGSA	0	0	0	0	0
<i>Echinochloa crus-galli</i>	ECHCG	0	0	0	0	0
<i>Panicum miliaceum L.</i>	PANMI	0	0	0	0	0
<i>Setaria viridis</i>	SETVI	0	0	0	0	0
<i>Sorghum halepense</i>	SORHA	0	0	0	0	0
Dicotyledonae						
<i>Glycine max</i>	GLXMA	0	0	0	0	0
<i>Amaranthus retroflexus</i>	AMARE	0	0	0	0	0
<i>Ambrosia elatior</i>	AMBEL	0	0	0	0	0
<i>Chenopodium album</i>	CHEAL	0	0	0	0	0
<i>Gallium aparine</i>	GALAP	0	0	0	0	0

H2 = Screening Laboratory (H01SV)

Conclusions:

All tested rates did not show any significant phytotoxic effects. Therefore no further dose response relationships have to be determined.

FOE 5043-trifluoroethanesulfonic acid (M44)

Report: KCA 3.3/05; Noeding, S.; 2012
Title: Evaluation of the pre-emergence biological activity of Flufenacet and its metabolite BCS-CU 62474
Document M-460336-01-1
No.:
Guidelines: None
GLP: No

Objectives:

This pre-emergence test was conducted to determine differences in the biological activity of Flufenacet and its metabolite BCS-CU 62474.

The study was conducted under standardized glasshouse conditions using WP20 formulations of both Flufenacet and its metabolite and BCS-CU 62474.

Materials and methods:

Test material	Dose rates (g a.s./ha)			
BCS-CO 62474 WP20 (SP102000027669)	123	62	31	15
AE F133402 WP20 (Flufenacet, SP102000027667)	240	120	60	30

Jiffy pots (7 cm diameter) were filled to within 2 cm of the top with a silt-loam soil (20% sand, 57% silt, 23% clay, pH 6.8 and 1.4% organic matter). Seeds of the weed were sown into these pots and covered with 0.5 to 1 cm of the same soil mixed 1 to 1 with sharp sand. The sowing density was selected based on prior experience to provide approximately 60-70% soil cover by the plants at application timing. After sowing the pots were watered slightly.

After application, the pots were placed into a glasshouse set 21°C+/-2°C day and 12°C+/-2°C night and watered according to need. High pressure sodium lamps (400W) were used to augment daylight during cloudy conditions and to extend the day length to 14 hours.

Two weeks and four weeks after application, the treated plants were visually assessed for injury compared with the untreated control plants. The assessments were on a percentage basis (0 = no effects, 100 = complete kill).

A total of nine plant species were tested.

Plant species (EPPO Code)

Zea mays (ZEAMA)

Triticum aestivum (TRZAS)

Aleopecurus myosuroides (ALOMY)

Apera spica venti (APESV)

Digitaria sanguinalis (DIGSA)

Echinochloa crus-galli (ECHCG)

Setaria viridis (SETVI)

Sorghum halepense (SORHA)

Lolium perenne (LOLPE)

Results:

The results of the visual assessments are presented as means from the 2 replicates.

Results of the phytotoxicity assessments on day 14 and 28 after application

Species name	g a.s./ha	ZEA MA	TR ZAW	ALO MY	APE SV	DIG SA	ECH CG	SET VI	SOR HA	LOL PE
Observed injury (%) of plants, 14 days after application										
flufenacet	240	0	40	97	99	99	95	95	99	99
	120	0	20	90	98	99	95	95	99	99
	60	0	10	93	97	99	98	93	96	75
	30	0	0	65	95	99	90	93	96	40
BCS-CU62474 (FOE 5043-trifluoroethanesulfonic acid)	123	0	0	15	0	0	0	30	30	0
	62	0	0	15	0	0	0	30	20	0
	31	0	0	0	0	0	0	30	10	0
	15	0	0	0	0	0	0	30	n.a	0
Blank formulation WP20	960	0	0	0	0	0	0	0	0	0
	480	0	0	0	0	0	0	0	0	0
	240	0	0	0	0	0	0	0	0	0

Species name	g a.s/ha	ZEA MA	TR ZAW	ALO MY	APE SV	DIG SA	ECH CG	SET VI	SOR HA	LOL PE
	120	0	0	0	0	0	0	0	0	0
Observed injury (%) of plants, 28 days after application										
flufenacet	240	0	50	97	100	100	99	97	99	100
	120	0	20	88	100	100	98	94	97	99
	60	0	0	98	97	100	92	88	85	68
	30	0	0	80	92	100	96	40	63	35
BCS-CU62474 (FOE 5043- trifluoroethanesulfonic acid)	123	0	0	0	0	0	0	0	0	0
	62	0	0	0	0	0	0	0	0	0
	31	0	0	0	0	0	0	0	0	0
	15	0	0	0	0	0	0	0	0	0
Blank formulation WP20	960	0	0	0	0	0	0	0	0	0
	480	0	0	0	0	0	0	0	0	0
	240	0	0	0	0	0	0	0	0	0
	120	0	0	0	0	0	0	0	0	0

Conclusions:

In a direct comparison study under highly sensitive glasshouse screening conditions, the metabolite BCS-CU 62474 showed no biological activity 28 days after treatment against the range of weeds tested.

Report: KCA 3.3/06; Jans, D.; 2013

Title: Evaluation of the post emergence herbicidal activity of Trifluoroethanesulfonicacid sodium-salt (metabolite of Flufenacet) in comparison with Flufenacet

Document M-460341-01-1

No.:

Guidelines: None

GLP: No

Objectives:

The purpose of this specific study was to evaluate the post emergence herbicidal activity of Trifluoroethanesulfonicacid sodium-salt (BCS-CU62474) in comparison to the parent substance Flufenacet following an application onto the foliage of nine plant species at the 2-4 leaf stage.

Materials:

In order to facilitate the application on plants the test substances were formulated as WP 20. Test item 1: Flufenacet WP, purity: 20.1% w/w, Batch ID.: 2012-005245. Specification No.: 102000027667.

Served as a positive control in order to allow a comparison with the test item 2 Trifluoroethanesulfonicacid sodium-salt WP 20, purity: 19.4% w/w, Batch ID.: 2012-005249. Specification No.: 102000027669.

Test system:

A total of nine plant species of the family Poaceae were tested.

Species name	Common name	Family	EPPO code
<i>Aleopecurus yosuroides</i>	Meadow foxtail	Poaceae	ALOMY
<i>Apera spica venti</i>	Silky wind grass	Poaceae	APESV
<i>Digitaria sanguinalis</i>	Hairy fingergrass	Poaceae	DIGSA
<i>Echinochloa crus-galli</i>	Cockspur grass	Poaceae	ECHCG
<i>Lolium perenne</i>	Ryegrass	Poaceae	LOLPE
<i>Setaria viridis</i>	green foxtail	Poaceae	SETVI
<i>Sorghum halepense</i>	Johnson grass	Poaceae	SORHA
<i>Triticum aestivum</i>	Spring wheat	Poaceae	TRZAS
<i>Zea mays</i>	Corn	Poaceae	ZEAMA

The seeds were supplied from commercial sources. The seeds had no chemical treatments or pesticide coatings. Routine germination tests were carried out to ensure the viability of the seeds.

The test environment was greenhouse conditions where the temperature was regulated to get 23°C at day and 18°C at night. Relative humidity was regulated to maintain 70%. Light/dark cycle 16:8 h. With a light intensity > 15000 lux the lamps turned off.

Test procedure:

To reach the 2-4 leaf stage at the start of testing, sowing was started prior to testing. Seeds were introduced manually in the soil. The spray solution was applied once at test initiation onto the leaves and above-ground portions of the plants using a linear cabinet track sprayer. The treatments in this study were:

Control:	200 L/ha deionised water
Test item 1 (Flufenacet):	140, 180 and 240 g a.s./ha in 200 L deionised water
Test item 2 (BCS-CU62474):	72, 92 and 123 g a.s./ha in 200 L deionised water (rates are adjusted according to the molecular weight of test item 2 in comparison with test item 1, see 2)

After application the pots of each plant species were transferred to the greenhouse and placed on the tables within one species. One to four days prior to the final assessment, the pots of each plant species were arranged according to their treatment level as a benefit for the final assessment.

After application bottom watering was performed with saucers standing below each pot. Water was given and retained within the saucer according to the need of the plants in order to have an optimal water supply for plant growth.

Results:

Results of the phytotoxicity assessments on day 7, 14 and 21 after application

Species name	g a.s./ha	ZEA MA	TRZA S	ALO MY	APES V	DIGS A	ECHC G	SETV I	SORH A	LOLP E
Observed injury (%) of plants, 7 days after application										
Control	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
flufenacet	240	0.0	5.0	20.0	52.5	40.0	42.5	42.5	40.0	37.5
	180	0.0	5.0	27.5	52.5	32.5	42.5	40.0	32.5	27.5
	140	0.0	2.5	30.0	52.5	30.0	35.0	27.5	35.0	22.5
BCS-CU62474 (FOE 5043- trifluoroethane- sulfonic acid)	123	0.0	7.5	0.0	12.5	0.0	0.0	0.0	0.0	0.0
	92	0.0	5.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0
	72	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Observed injury (%) of plants, 14 days after application										
Control	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
flufenacet	240	0.0	0.0	40.0	100.0	75.0	82.5	80.0	90.0	62.5
	180	0.0	0.0	55.0	97.5	70.0	80.0	82.5	80.0	47.5
	140	0.0	0.0	50.0	95.0	70.0	75.0	65.0	72.5	42.5
BCS-CU62474 (FOE 5043- trifluoroethane- sulfonic acid)	123	0.0	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0
	92	0.0	0.0	0.0	12.5	0.0	0.0	0.0	0.0	0.0
	72	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Observed injury (%) of plants, 21 days after application										
Control	-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
flufenacet	240	0.0	5.0	77.5	100.0	90.0	92.5	92.5	97.5	90.0
	180	0.0	0.0	67.5	100.0	87.5	87.5	92.5	90.0	72.5
	140	0.0	0.0	32.5	95.0	85.0	85.0	80.0	85.0	65.0

Species name	g a.s./ha	ZE MA	TR ZA S	ALO MY	APES V	DIGS A	ECHC G	SETV I	SORH A	LOLP E
BCS-CU62474 (FOE 5043- trifluoroethane- sulfonic acid)	123	0.0	0.0	0.0	20.0	7.5	0.0	0.0	0.0	0.0
	92	0.0	0.0	0.0	10.0	2.5	0.0	0.0	0.0	0.0
	72	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	0.0

Conclusions:

Compared to flufenacet the herbicidal activity of the sodium salt of FOE 5043-trifluoroethanesulfonic acid is clearly reduced. 21 days after application FOE 5043-trifluoroethanesulfonic acid did not cause any phytotoxic effects in six of the nine plant species tested. The 5%-effect at 72 g a.s./ha on *Setaria viridis* is clearly not dose-related. The observed effects of FOE 5043-trifluoroethanesulfonic acid on *Apera spica-venti* and *Digitaria sanguinalis* do not exceed 20% and are clearly reduced compared to Flufenacet. Overall, it can be concluded that FOE 5043-trifluoroethanesulfonic acid has no herbicidal activity.

Trifluoroacetic acid (TFA) (M45)

Report: KCA 3.3/07; Noeding, S.; 2013

Title: Evaluation of the pre-emergence herbicidal activity of Flufenacet and its metabolite BCS-AZ 56567

Document No: M-461398-01-1

Guidelines: None

GLP: No

Objectives:

This pre-emergence test was conducted to determine differences in the biological activity of Flufenacet and its metabolite BCS-AZ 56567 (trifluoroacetic acid = TFA).

The study was conducted under standardized glasshouse conditions using WP20 formulations of both Flufenacet and its metabolite BCS-AZ 56567.

Materials and Methods:

Test material	Dose rates (g a.s./ha)
BCS-AZ 56567 WP20 = Batch ID 2013 - 002927	22.5
AE F133402 WP20 = Flufenacet, SP102000027667	60

Jiffy pots (7 cm diameter) were filled to within 2 cm of the top with a silt-loam soil (20% sand, 57% silt, 23% clay, pH 6.8 and 1.4% organic matter). Seeds of the weed species tested were sown into these pots and covered with 0.5 to 1 cm of the same soil mixed 1 to 1 with sharp sand. The sowing density was selected based on prior experience to provide approximately 60-70% soil cover by the plants at application timing. After sowing the pots were watered slightly. After application, the pots were placed into a glasshouse set 21°C+/-2°C day and 12°C+/-2°C night and watered according to need. High pressure sodium lamps (400W) were used to augment daylight during cloudy conditions and to extend the day length to 14 hours.

Two weeks and four weeks after application, the treated plants were visually assessed for injury compared with the untreated control plants. The assessments were on a percentage basis (0 = no effects, 100 = complete kill).

A total of seven plant species were tested.

Plant species (EPPO Code)
<i>Aleopecurus myosuroides</i> (ALOMY)
<i>Apera spica-venti</i> (APESV)
<i>Digitaria sanguinalis</i> (DIGSA)
<i>Echinochloa crus-galli</i> (ECHCG)
<i>Setaria viridis</i> (SETVI)
<i>Sorghum halepense</i> (SORHA)
<i>Lolium perenne</i> (LOLPE)

Results:

The results of the visual assessments are presented as means from two replicates.

	g a.i./ha	ALOM Y	APESV	DIGSA	EHC G	SETVI	SORH A	LOLPE
Observed injury (%) of plants, 14 days after application								
AE F133402 WP 20	60	60	99	99	97	94	99	95
BCS-AZ 56567	22.5	0	0	0	0	0	0	0
Blank Formulation WP20	240	0	0	0	0	0	0	0
Observed injury (%) of plants, 28 days after application								
AE F133402 WP 20	60	75	100	100	98	89	89	92
BCS-AZ 56567	22.5	0	0	0	0	0	0	0
Blank Formulation WP20	240	0	0	0	0	0	0	0

Conclusions:

In a direct comparison study under highly sensitive glasshouse screening conditions, the metabolite BCS-AZ 56567 showed no biological activity 28 days after treatment against the range of weeds tested.

B.3.4. FIELD OF USE ENVISAGED

Flufenacet is a selective herbicide used in agriculture as foliar sprays in monocot and dicot crops. However, to achieve a full spectrum Flufenacet is always combined with partner, e.g. Diflufenican. In such a mixture it can control mixed infestation of weeds like *Alopecurus* sp., *Apera* sp., *Lolium* sp. and or *Poa* sp. as well as broad leaved weeds.

B.3.5. HARMFUL ORGANISMS CONTROLLED AND CROPS OR PRODUCTS PROTECTED OR TREATED

Flufenacet combined with Diflufenican is extensively used as a strong herbicide in autumn being applied from pre- to early post-emergence of the crop for the control of a wide range of annual grass and broad-leaved weeds. Here below are given a list of plant species controlled with the current registered rate of HEROLD SC which corresponds to 240g/ha of the active substance Flufenacet.

Flufenacet has mainly an action on grasses whereas Diflufenican controls broadleaf weeds. Thus, the grass control in the combination can mainly be related to Flufenacet action.

Alopecurus myosuroides currently known as Black-Grass is an annual grass, found on cultivated and waste land. It can grow up to 80 cm high, often growing in tufts. The leaves are hairless and the leaf sheath is smooth, green to purplish in colour. The leaf blade is pointed, 3 to 16 cm long, green and rough in texture. The spikelets are cylindrical and yellow-green, pale green or purple in colour. It flowers from May to August. In the UK and EPPO maritime zone on heavy soils it is a major if not the major weed of cereal crops. It produces a large amount of seeds, which are shed before the crop is cut and can produce population density beyond 1000 head/m² competing with the crop and seriously reducing the yield of crops. It has developed resistance to the two major modes of action of herbicides used to control, ACCase- and ALS-inhibitors. Fortunately, the seeds have a short period of dormancy and viability, so that their numbers may be reduced by surface cultivation after harvest.

Apera spica-venti is an annual to perennial *Poaceae*. The growth height can be up to 100 cm. The grass can produce up to 2000 seeds. Its life time is one to four years. The grass plays a commercial role almost only on lighter soils. In the central and eastern part of Europe, loose silky-bent is the main target grass.

Poa annua is another weed although much less invasive and easier to control that can be a competitor to the crop for water and nutrients. The plant is annual able in favorable situations to achieve several cycles in a season to perennial and it grows up to 30 cm high.

Flufenacet combined with Diflufenican is extensively used as a strong herbicide in autumn being applied from pre to early post emergence of the crop for the control of a wide range of annual grass and broad-leaved weeds. Here below are given a list of plant species controlled with the current registered rate of HEROLD SC, which corresponds to 240 g/ha of the active substance Flufenacet. The grass control in the combination can mainly be related to Flufenacet action on grasses

HEROLD SC efficacy at 0.6 L/ha (120 g/ha Diflufenican+240 g/ha Flufenacet)

Very susceptible weeds (Eff. > 95%)	Susceptible weeds (Eff. 85% to 94%)	Medium susceptible (Eff. 70% to 84%)	Low susceptible (Eff. < 70%)
Monocots: <i>Poa annua</i> <i>Apera spica venti</i> ----- Dicots <i>Papaver rhoeas</i> <i>Fumaria officinale</i> <i>Galium aparine</i> <i>Lamium amplexicaule</i> <i>Sinapis arvensis</i> <i>Stellaria media</i> <i>Viola</i> sp. <i>Raphanus raphanistrum</i> <i>Ranunculus arvensis</i> <i>Veronica arvensis</i> <i>Veronica Persica</i> <i>Veronica hederifolia</i>	<i>Alopecurus myosuroides</i> <i>Lolium multiflorum</i> ----- <i>Geranium dissectum</i> <i>Matricaria</i> sp.	-----	<i>Avena fatua</i> -----

B.3.6. MODE OF ACTION

Flufenacet is a soil herbicide, primarily taken up by roots and transported in the apoplast of germinating weeds to meristematic root and shoot regions and to the leaves. Flufenacet is distributed in the soil top layer. Flufenacet-methyl-sodium is the, taken up mainly by emerging leaves and acts systemically.

The inhibition of plant growth is followed by necrosis, at first apical, then basal. The activity is manifested by yellowish discoloration of the leaves and the disappearance of susceptible weed plants occur within 3 to 4 weeks.

At cellular level Flufenacet (FOE 5043) inhibits cell division and cell growth in susceptible weeds. New growth is halted and elongated tissue may become distorted. This is similar with what is observed with the chloroacetanilides herbicides. The biochemical target is the inhibition of the so called Very Long Chain fatty Acid metabolism involved in the mitosis. Flufenacet is broken down fairly rapidly (half-life in soil 10-34 days). Another active ingredient should then be added to strengthen the effects on annual dicotyledons. Crop selectivity is based on the position of the roots of weeds in the upper soil layer and the deeper rooting system of wheat (drilled 2-3 cm below the soil surface), which is not in contact with the product.

Summary information on Flufenacet

Active substance	Flufenacet
IUPAC name:	4'-fluoro- <i>N</i> -isopropyl-2-(5-trifluoromethyl-1,3,4-thiadiazol-2-yloxy)acetanilide
Chemical group:	Oxyacetamide
Mode of action:	groupe K3 HRAC inhibition of the biosynthesis of very long chain fatty acids (VLCFAs) resulting in inhibition of cell division and cell growth
Plant translocation:	Systemic, with apoplastic transport and distribution
Biological action: Harmful organism, plant growth regulator, etc.	Pre & Early Post emergence herbicide. Numerous weeds including grasses <i>Alopecurus myosuroides</i> , <i>Apera spica venti</i> , <i>Lolium multiflorum</i> , <i>Poa annua</i> and side effects on important dicots such as <i>Galium aparine</i> , <i>Matricaria</i> spp., Cruciferous
Type of uptake	Absorbed through emerging shoots and leaves, then translocated to the meristematic parts

B.3.7. INFORMATION ON THE OCCURRENCE OR POSSIBLE OF THE DEVELOPMENT OF RESISTANCE AND APPROPRIATE MANAGEMENT STRATEGIES

Flufenacet is grouped into the oxyacetamide chemical group. The mode of action is based on the inhibition of the biosynthesis of very long chain fatty acids (VLCFAs) resulting in inhibition of cell division and cell growth (HRAC group: K3). This group of herbicides is quite well known and has been applied commercially for decades without weed resistance development. Hence, no occurrence of resistant weeds has ever been reported during years of commercial application of the oxyacetamid mefenacet in rice, for instance.

B.3.8. REFERENCES RELIED ON

Annex point / reference number	Author(s)	Year	Title Source (where different from company) Company name, Report No., Date, GLP status (where relevant), published or not	Vertebrate study Y/N	Data protection claimed Y/N	Justification if data protection is claimed	Owner
KCA Section 3 /01	Dahmen, P.	2004	Screening and efficacy data for WAK6222 (metabolite of FOE5043) Bayer AG, Leverkusen, Germany Bayer CropScience, Report No.: PF-F-HB_WAK6222_01, Edition Number: M-089475-01-1 Date: 2004-06-22 GLP/GEP: no, unpublished	N	Y	Required according SANCO/221/2000 rev. 10	Bayer CropScience
KCA Section 3 /02	Hills, M.	2009	Evaluation of the pre-emergence biological activity of FOE 5043-Oxalate (code: BCS-AB16305) a metabolite of fFlufenacet Bayer CropScience, Report No.: PP09022, Edition Number: M-353844-01-1 Date: 2009-06-16 GLP/GEP: no, unpublished	N	Y	Required according SANCO/221/2000 rev. 10	Bayer CropScience
KCA Section 3 /05	Noeding, S.	2012	Evaluation of the pre-emergence biological activity of flufenacet and its metabolite BCS-CO 62474 Bayer CropScience GmbH, Frankfurt am Main, Germany Bayer CropScience, Report No.: M-460336-01-1, Edition Number: M-460336-01-1 Date: 2012-11-22 GLP/GEP: no, unpublished	N	Y	Required according SANCO/221/2000 rev. 10	Bayer CropScience

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Annex point / reference number	Author(s)	Year	Title Source (where different from company) Company name, Report No., Date, GLP status (where relevant), published or not	Vertebrate study Y/N	Data protection claimed Y/N	Justification if data protection is claimed	Owner
KCA Section 3 /06	Jans, D.	2013	Evaluation of the post emergence herbicidal activity of trifluoroethansulfonicacid sodium-salt (metabolite of flufenacet) in comparison with flufenacet Bayer CropScience, Report No.: RF13/035, Edition Number: M-460341-01-1 Date: 2013-07-04 GLP/GEP: no, unpublished	N	Y	Required according SANCO/221/2000 rev. 10	Bayer CropScience
KCA Section 3 /07	Noeding, S.	2013	Evaluation of the pre-emergence biological activity of flufenacet and its metabolite BCS-AZ 56567 Bayer CropScience, Report No.: FFS135016, Edition Number: M-461398-01-1 Date: 2013-06-26 GLP/GEP: no, unpublished	N	Y	Required according SANCO/221/2000 rev. 10	Bayer CropScience