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NORSK INSTITUTT FOR BIOØKONOMI

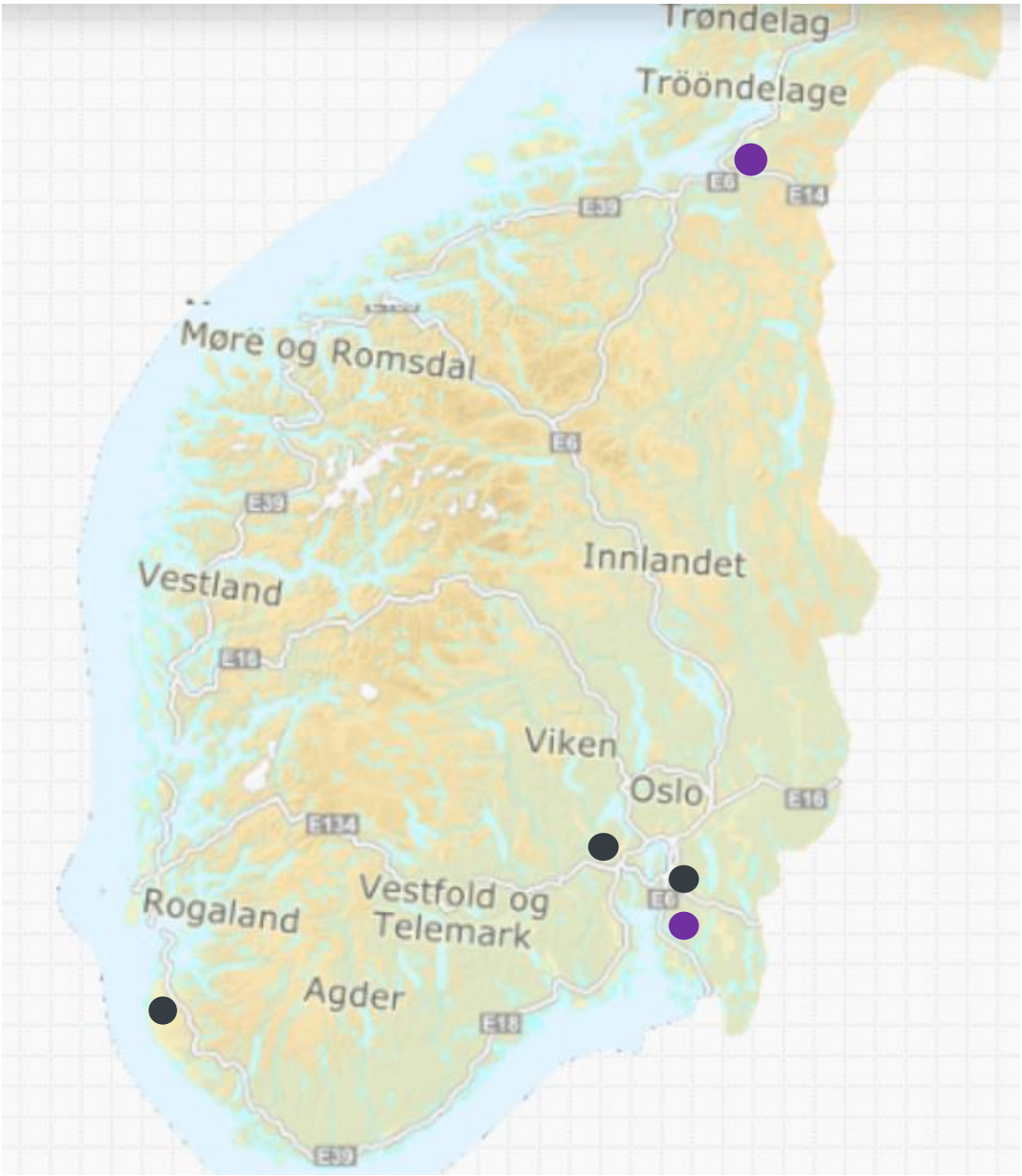
Plant protection products and resistance monitoring Norway 2019 and 2020

Nina Svae Johansen, Annette Folkedal Scjøll , Andreas Beachell, Marta Bosque Fajardo.
NORBARAG-meeting April 14th, 2021, Zoom

Resistance monitoring Norway: Diamondback moth

Collection sites

- 2016 and ● 2019



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Resistance monitoring: Diamondback moth 2016 and 2019

IRAC Method no. 018: Leaf dip bioassay (larvae collected from white cabbae and broccoli in June-July

Year	Strain	Insecticide	Active ingredient	% mortality			
				100% Rec.dose (25.0 mg AI/L)	50% Rec.dose (12.5 mg AI/L)	25% Rec.dose (6.25 mg AI/L)	Control
2016	Sus. Reference	Karate 5SC	λ-cyhalothrin	100	100	-	0
	Østfold	Karate 5SC	λ-cyhalothrin	23	18	-	13
	Nord-Trøndelag	Karate 5SC	λ-cyhalothrin	10	8	-	8
2019	Sus. Reference	Karate 5SC	λ-cyhalothrin	-	-	100	7
	Jæren	Karate 5SC	λ-cyhalothrin	55	65	35	0
	Kråkstad	Karate 5SC	λ-cyhalothrin	68	45	25	8
	Lier	Karate 5SC	λ-cyhalothrin	86	85	60	3

All strains were susceptible to Steward (31,9, 63,8 og 127,5 mg indoksakarb/L) and Conserve (30, 60 and 120 mg spinosad/L)

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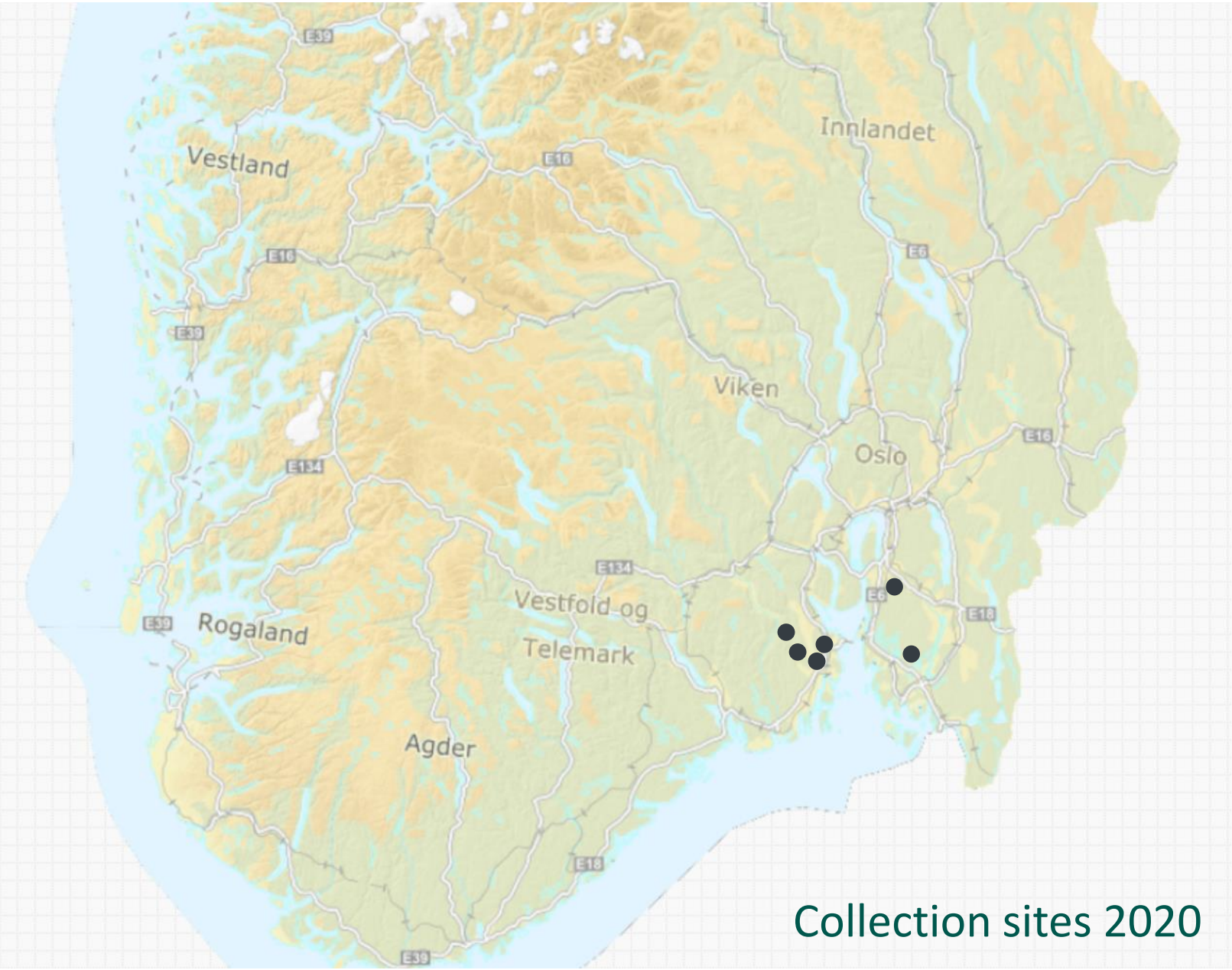
Resistance monitoring Norway: Pollen beetles



Collection sites 2020

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Pollen beetles susceptibility in Norway 2020

Population	Date collected (2020)	Crop	Insecticides used before collection (2020)	Resistance level		
				λ-cyhalothrin (75 ng/cm^2)	τ -Fluvalinate (480 ng /cm^2)	Avaunt (indoxocarb 255 ng/ cm^2)
AK7-Ås-2020	June 16th	WOSR		HS	S*	S
VF9-Andebu-2020	June 29th	SOSR	June 2nd Karate; Juni 13th Steward	-	S*	S*
VF1/8-Stokke-2020	May 5th	WOSR		MR	-	S*
VF11-Svarstad-2020	June 29th	SOSR	June 2nd Karate; June 13th Biscaya; June 18th Karate	HS*	S	S
VF10-Undrumsdal-2020	May 5th	WOSR		HS*	-	
ØF1-Grålum-2020	June 4th	WOSR		S	MR	S
			Test method	IRAC no. 011	IRAC no. 011	IRAC no. 027
			Test vials from	NIBIO	ADAMA	FMC
			Expected mortality	100 %	100 %	> 90 %

* Control mortality >20%

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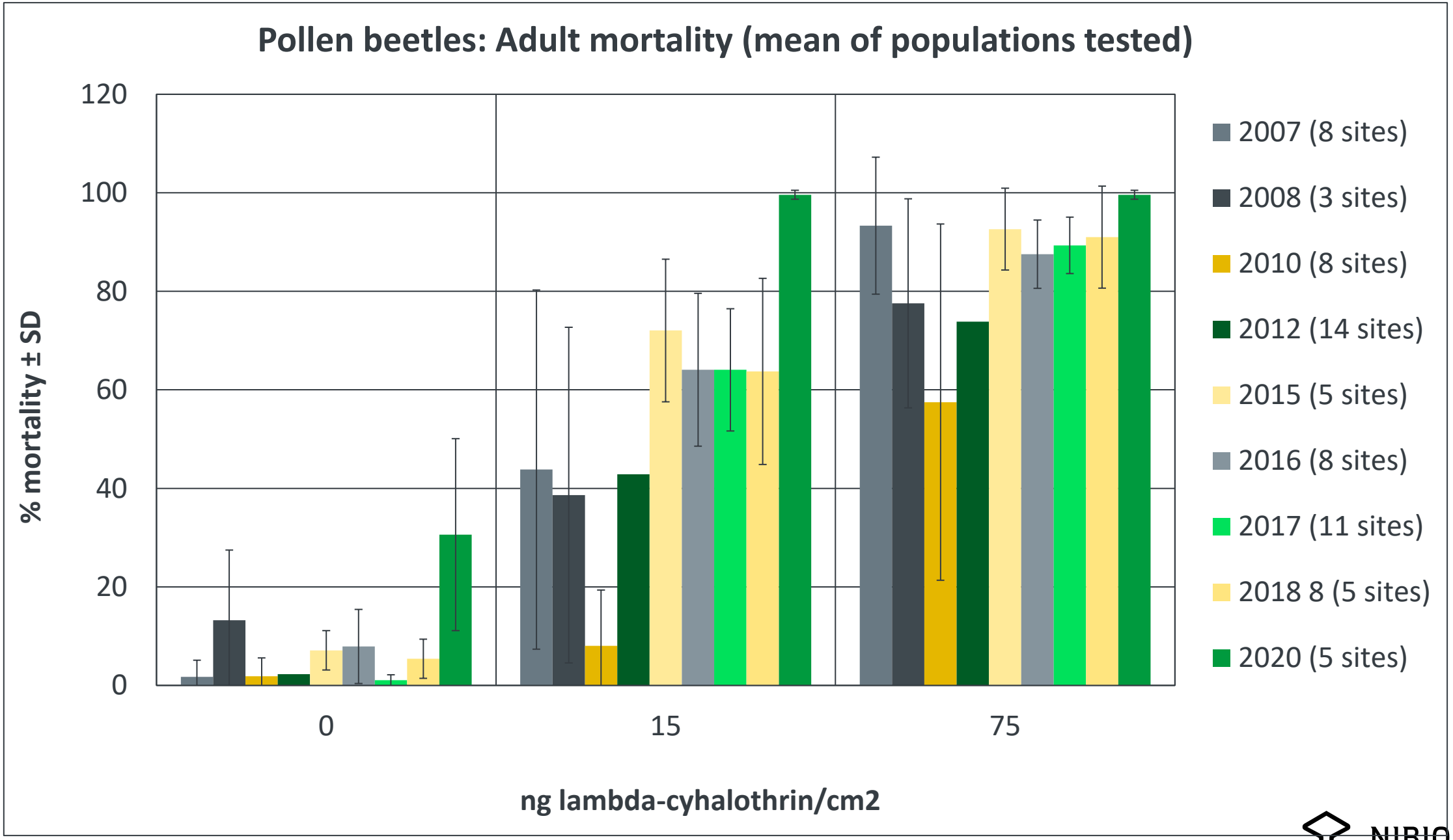
Pollen beetles: Adult mortality (mean of populations tested)
% mortality ± SD
120
100
80
60
40
20
0
0
15
75
ng lambda-cyhalothrin/cm2
2007 (8 sites)
2008 (3 sites)
2010 (8 sites)
2012 (14 sites)
2015 (5 sites)
2016 (8 sites)
2017 (11 sites)
2018 8 (5 sites)
2020 (5 sites)

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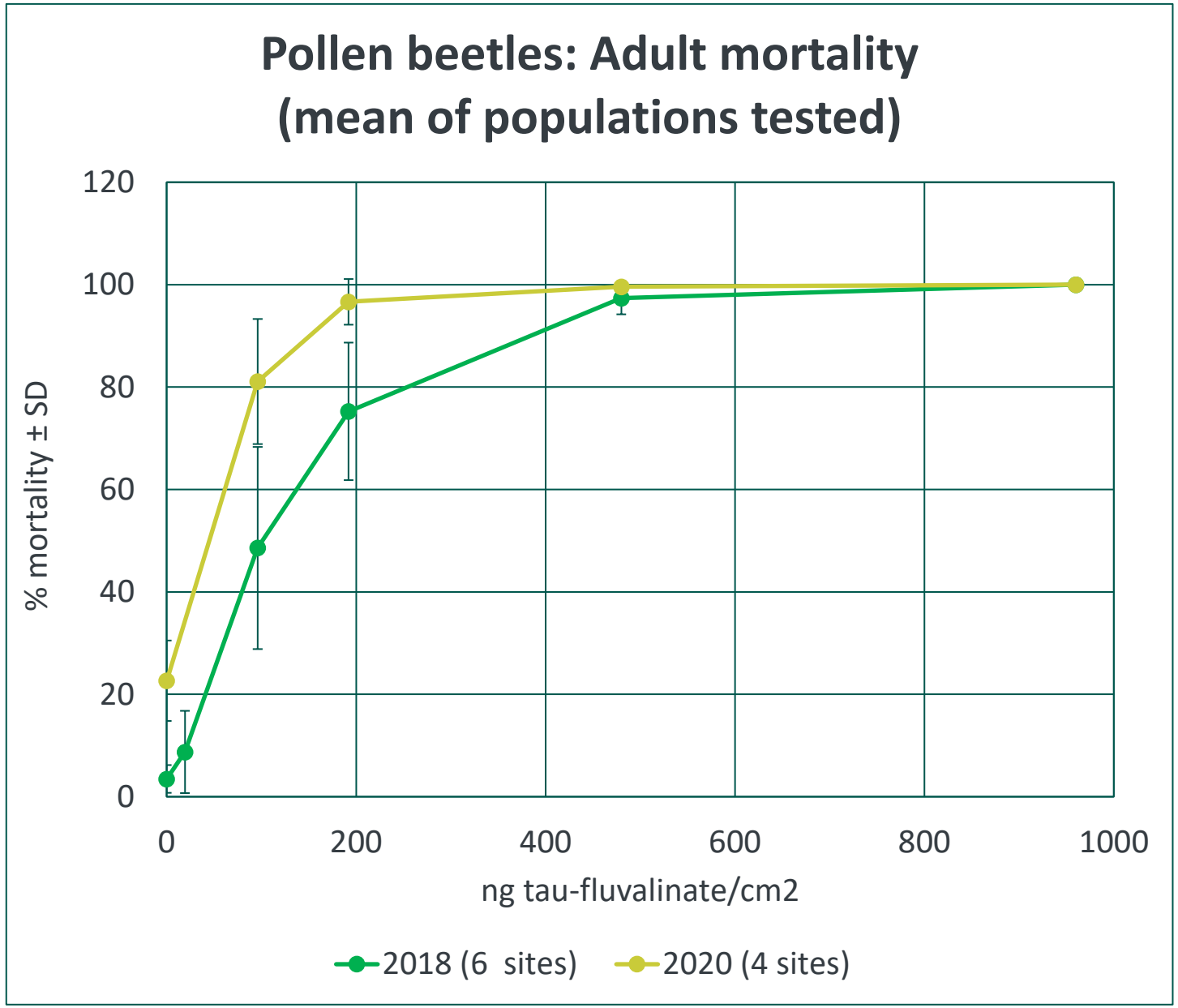
Pollen beetles: Adult mortality
(mean of populations tested)
% mortality ± SD
120
100
80
60
40
20
0
0
200
400
600
800
1000
ng tau-fluvalinate/cm2
2018 (6 sites)
2020 (4 sites)

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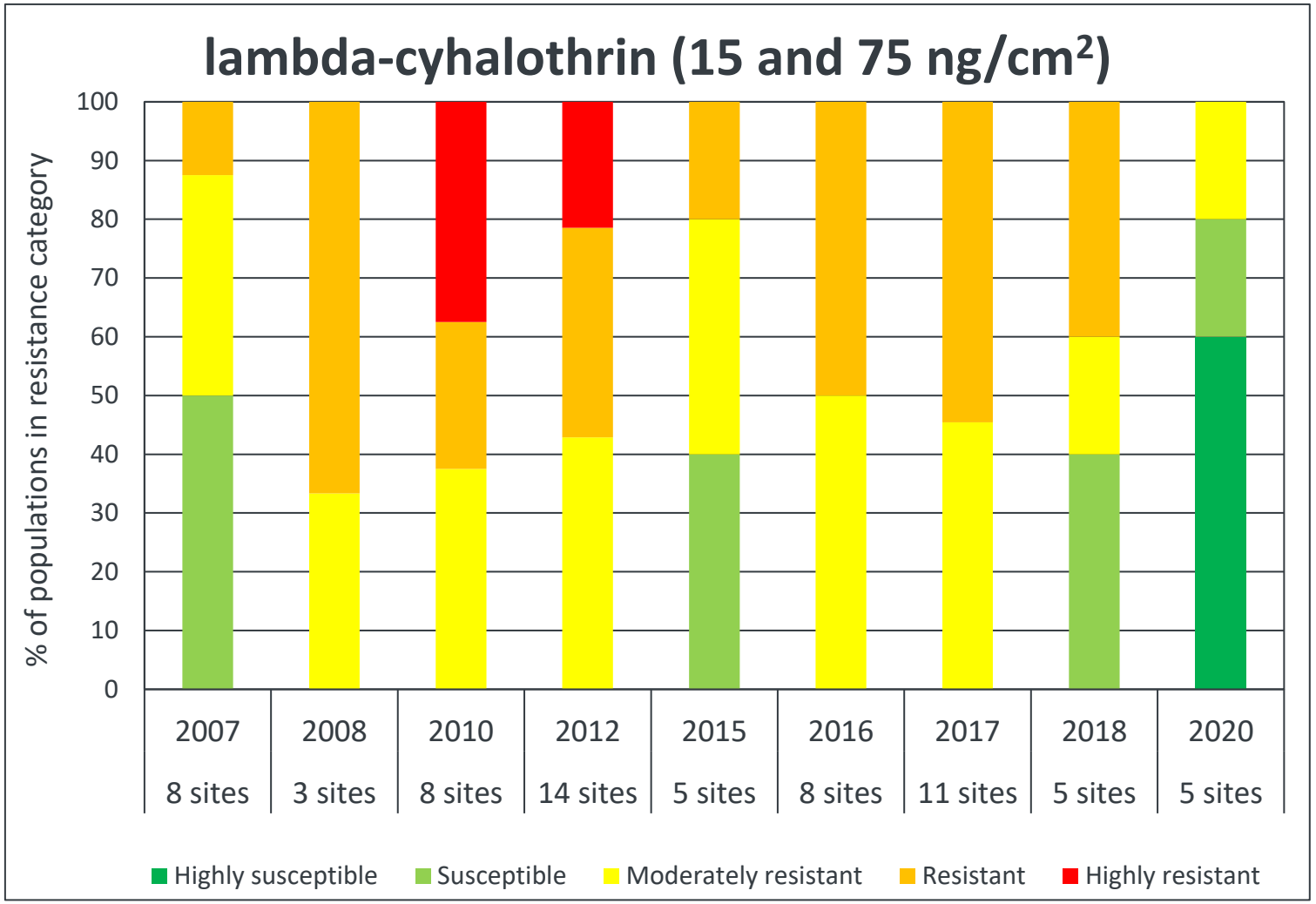
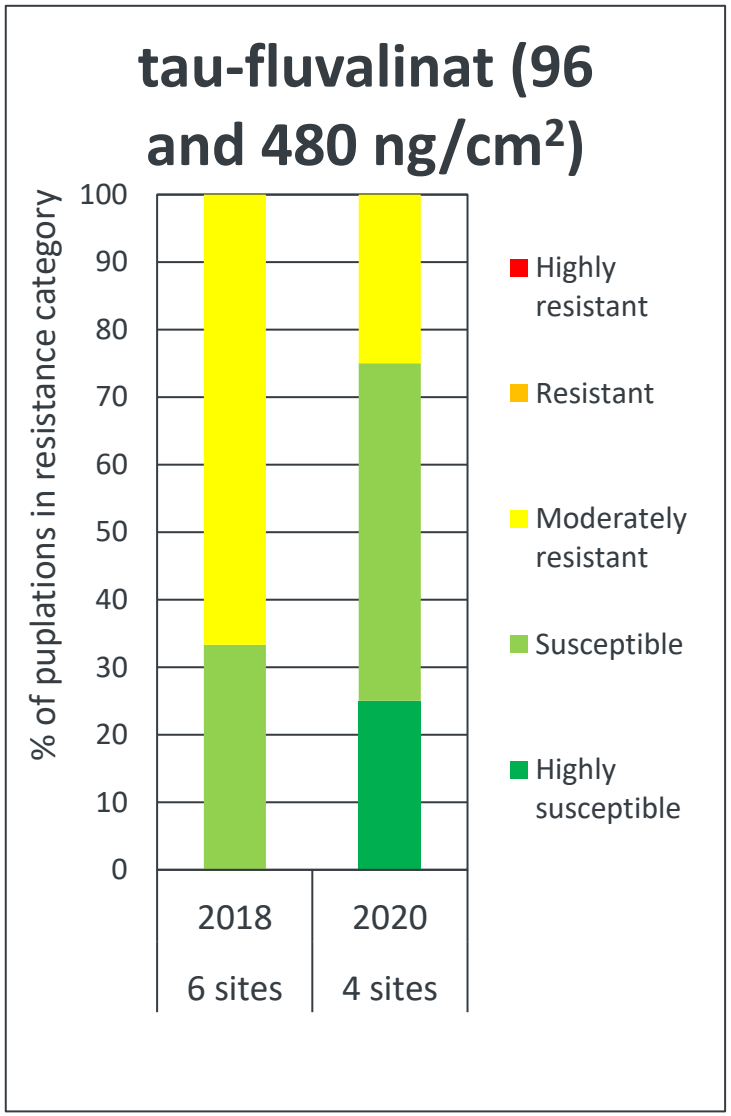

lambda-cyhalothrin (15 and 75 ng/cm²)
% of populations in resistance category
100
90
80
70
60
50
40
30
20
10
0
2007
8 sites
2008
3 sites
2010
8 sites
2012
14 sites
2015
5 sites
2016
8 sites
2017
11 sites
2018
5 sites
2020
5 sites
Highly susceptible
Susceptible
Moderately resistant
Resistant
Highly resistant


tau-fluvalinat (96 and 480 ng/cm²)
% of puplations in resistance category
100
90
80
70
60
50
40
30
20
10
0
2018
6 sites
2020
4 sites
Highly resistant
Resistant
Moderately resistant
Susceptible
Highly susceptible

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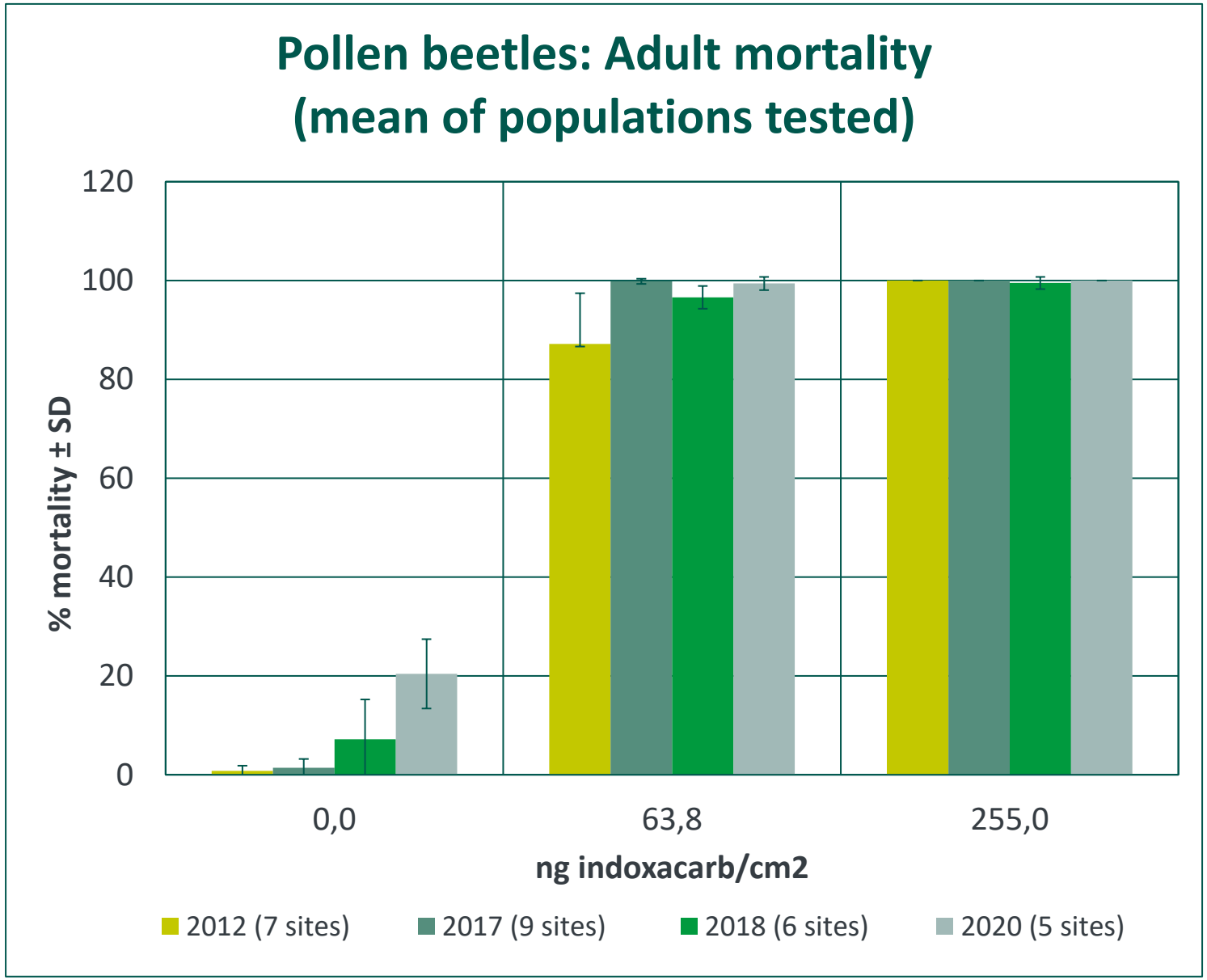
Pollen beetles: Adult mortality
(mean of populations tested)
120
100
80
60
40
20
0
% mortality ± SD
0,0
63,8
255,0
ng indoxacarb/cm2
2012 (7 sites)
2017 (9 sites)
2018 (6 sites)
2020 (5 sites)

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Insecticides and acaricides approved in Norway

(April 2021, professional use)

Many off-lable and minor use approval in addition to ordinary approval.

Greenhouse only

MoA sub group		Active ingredient	Approved until
1A	Carbamates	Pirimicarb	30.04.2022
3A	Pyrethroids, pyrethrins	α-cypermetrin	31.01.2022WD
		Deltametrin	31.10.2021
		λ-cyhalothrin	31.12.2021
		τ-fluvalinate	31.12.2022
		Pyrethrin + rapeseed oil	31.08.2022
4A	Neonicotinoids	Acetamiprid	28.02.2034
		Imidacloprid	01.06.2022 WD
5	Spinosyns	Spinosad	30.04.2022
6	Avermectins, milbemycins	Abamectin	30.04.2022
		Milbemectin	31.07.2021
7C	Pyriproxyfen	Pyriproxyfen	30.06.2021 WD
20D	Bifenazate	Bifenazate	31.07.2021
21A	METI (I) insecticides and acaricides	Fenpyroximate	30.04.2022
22A	Oxadiazines	Indoxacarb	31.10.2022
23	Tetronic and tetramic acid derivatives	Spirodiclofen	31.07.2021
		Spirotretramat	30.04.2025
28	Diamides	Cyantraniliprole	14.09.2027
29	Flonicamid	Flonicamid	31.12.2024
UNF	Fungal agents …..	Paecilomyces fumosoroseus	31.12.2031
UNE	Botanical extract	Garlic extract (not on market)	31.08.2021*
		Terpenoid blend	10.08.2026
	Oils	Paraffin oil	31.12.2021
UN	Inorganic compunds	Sulphur	31.12.2021

Norway: Active substances – Oilseed rape 2021

MoA-group	Active ingredient	Approved until	Treatments/ year	Pollen beetles	Flea beetles*, DBM*, Turnip sawfly*	Cabbage seed pod weevil	Cabbage stem weevil, Brassica pod midge
3A	Alpha-Cypermethrin	31.01.2022$_{WD}$	2	X			
	Deltamethrin	31.10.2021	1	X	X	X	
	Lambda-cyhalothrin	31.12.2021	1-2	X	X	X	
	Tau-fluvalinate	31.12.2022	1-2	X		X	X
4A	Acetamiprid (NEW)	28.02.2034	1	X			
22A	Indoxacarb	31.10.2022	1	X			

* Pest also in other crops. AW=Approval withdrawn

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Norway: Active substances – Spring sown cereals 2021

Growth stage	Pest	MoA-group	Active ingredient
1-3 leaves unfolded (BBCH 11-13)	*Oscinella frit, Phorbia fumigata*	Pyrethroids (3A)	deltamethrin, λ-cyhalothrin, α-cypermethrin$_{WD}$
	Phyllotreta vittula		
3-4 leaves unfolded - tip of inflorescence emerged from sheath (BBCH 13-51)	*Rhopalosiphum padi*	Pyrethroids (3A)	τ-fluvalinate, deltamethrin, λ-cyhalothrin, α-cypermethrin$_{WD}$
		Flonikamid (29)	flonikamid
First node at least 1 cm above tillering node - flag leaf fully unrolled (BBCH 31-39)	*Chromatomyia fuscula, Oulema melanopus*	Pyrethroids (3A)	deltamethrin, λ-cyhalothrin, α-cypermethrin$_{WD}$
	Haplodiplosis marginata	Pyrethroids (3A)	τ-fluvalinate
Flag leaf sheath visibly swollen - first awns visible (BBCH 44-49)	*Thrips*	Pyrethroids (3A)	τ-fluvalinate, deltamethrin, λ-cyhalothrin, α-cypermethrin$_{WD}$
Tip of inflorescence emerged from sheath - half of inflorescence emerged (BBCH 51-55)	*Contarinia tritici*	Pyrethroids (3A)	τ-fluvalinate
30% of inflorescence emerged - inflorescence fully emerged (BBCH 53-59)	*Sitodiplosis mosellana*	Pyrethroids (3A)	τ-fluvalinate
Tip of inflorescence emerged from sheath - medium milk (BBCH 51-75)	*Sitobion avenae*	Pyrethroids (3A)	τ-fluvalinate, deltamethrin, λ-cyhalothrin, α-cypermethrin$_{WD}$
		Flonikamid (29)	flonikamid

Norway: Active substances – Field grown Strawberry 2021

Treatment time	Pest	MoA	Active ingredient	Resistance
Before flowering	*Anthonomus rubi*	Pyrethroids (3A)	deltamethrin, λ-cyhalothrin, α-cypermethrin$_{WD}$	*kdr* on 2 of 10 sites (2004). Current situation unknown
	Tetranychus urticae	Tetronic and tetramic acid derivatives (23)	spirodiclofen	Reduced susceptibility in 5 of 5 sites (2016-2018)
			spirotetramat	Not investigated
		Bifenazate (20D)	bifenazate	Reduced susceptibility on 3 of 5 sites (2016-2018)
Flowering and fruit development	*Tetranychus urticae*	Predation	predatory mites	Mitigate resistance, kill resistant mites
		Bifenazate (20D)	Bifenazate	Reduced susceptibility on 3 of 5 sites (2016-2018)
After harvest	*Tetranychus urticae (Phytonemus pallidus)*	Tetronic and tetramic acid derivatives (23)	spirodiclofen	Reduced susceptibility on 5 of 5 sites (2016-2018)
			spirotetramat	Not investigated
	Tetranychus urticae, Phytonemus pallidus	Avermectins, milbemycins (6)	abamectin	*T. urticae:* Susceptible on 4 of 4 sites investigated in 2016-2018
			Milbemectin	Not investigated

EPPO database
on Resistance cases

MEMBERS ONLY HOME

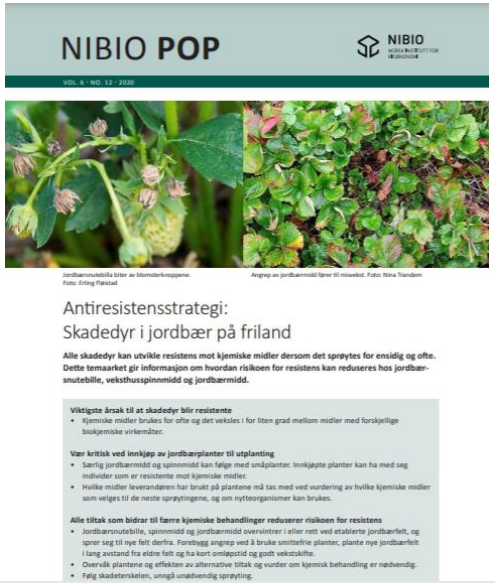
https://resistance.eppo.int/

Download excel file

Add a new resistance case

Please scroll right to see all data (32 columns) using the bar below the table.

Case id	Product type	Country	RAC classification	MoA code	Mode of action	Chemical group(s)	Active substance(s)	Pest common name(s)	Pest scientific name(s)	Pest EPPO Code(s)	Crop common name(s)	Crop scientific name(s)	Crop EPPO Code(s)	Type of information	Source of information	Documents	Mechanis of resistanc
	insecti	germ															
178	insecticide	Germany	IRAC	3A	Sodium channel modulators	Pyrethroids/Pyrethrins	Lambda-Cyhalothrin	Diamond backmoth	Plutella xylostella	PLUTMA	oilseed rape, cabbage	Brassica sp., Brassica oleracea var. capitata	BRSSS, BRSOL	Other	M. Brandes JKI		Unknown
177	insecticide	Germany	IRAC	3A	Sodium channel modulators	Pyrethroids/Pyrethrins	Lambda-Cyhalothrin	Rape winter stem weevil	Ceutorhynchus picitarsis	CEUTPI	oilseed rape	Brassica napus	BRSNN	Published in not-peer review journals	published mainly in german farmer journals		Target-site resistance (TSR)
176	insecticide	Germany	IRAC	3A	Sodium channel modulators	Pyrethroids/Pyrethrins	Lambda-Cyhalothrin	cabbage seed weevil	Ceutorhynchus obstrictus	CEUTAS	oilseed rape	Brassica napus	BRSNN	Published in not-peer review journals	published mainly in german farmer journals		Target-site resistance (TSR)



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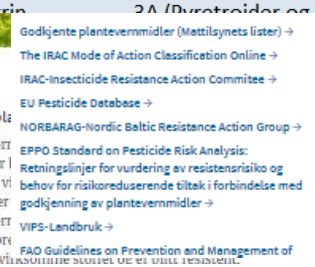
Liste over kjemiske og mikrobiologiske plantevernmidler mot skadedyr tillatt brukt i 2021 og deres biokjemiske virkemåte (jfr IPV-prinsipp 7 om resistens) og miljø-egenskaper (jfr IPV-prinsipp 5).

For informasjon om tillatt bruks- og virkeområde, se etikett på en disse lenkene: Mattilsynet Plantevernguiden

Innholdet i hver kolonne forklares dersom du peker på kolonnetittelen. Det er teksten på etiketten som bestemmer hva som er lovlig bruk.

Oppdatert per 17. mars 2021

Handelspreparat	Virksomt stoff	Biokjemisk virkemåte	Avgiftsklas	Helseklas	Miljøklas	Giftig for bier	Avstand overflatevann	Vegetert buffersone	Allmenn ferdsel	Hobby-/
Admiral 10 EC	pyriproksifen	7C (Pyriproksifen)	2	M	L	Nei	3 meter		Kun veksthus	Y
Avaunt 150 EC	indoksakarb	22A (Oksadiaziner)	4	?	?	?	?		?	Y
Confidor 70 WG	imidakloprid	4A (Neonikotinoider)	1	L	L	Ja	3 meter		Kun veksthus	Y
Conserve	spinosad	5 (Spinosyner)	1	L	L	Ja	30 m (friland=off-label)		Kun veksthus	Y
Danitron 5 SC	fenpyroksimat	21A (METI midd- og insektmidler)	3	M	M	Nei	30 meter		Ja	Y
Decis Mega EW 50	deltametrin	3A (Pyretroider og pyretriner)	3	L	H	Ja	30 meter		Ja	Y
Ecoguard flytende	hvitløks-ekstrakt	UN*(Ukjent eller usikker virkemåte)	1	L	L	Nei	3 meter		Ja	Y
Ecoguard granulat	hvitløks-ekstrakt	UN*(Ukjent eller usikker virkemåte)	1	L	L	Nei	3 meter		Ja	Y
Envidor 240 SC	spirodiklofen	23 (Tetronsyre - og tetramsyrederivater (k	4	H	M	Ja	Frukt 30 m; Bær 10 m		Ja	Y
Evure Neo	tau-fluvalinat	3A (Pyretroider og pyretriner)	2	L	M	Nei	Kål 20 m; Andre 10 m		Ja	Y
Fastac 50	alfa-cypermetrin	3A (Pyretroider og pyretriner)	3	L	H	Ja	30 meter		Nei	Y



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Nina Svae Johansen
nina.johansen@nibio.no

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