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Pollen beetle resistance monitoring - Norway

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ACTIVE SUBSTANCES 2017

MoA-group	Active ingredient	Field rate (AI/ha)	Treatments/year	Pollen beetle	Flea beetles*, DBM*, Turnip sawfly*	Cabbage seed pod weevil	Cabbage stem weevil, Brassica pod midge
3A	Alpha-Cypermethrin	10.0 - 12.5	2	X			
	Deltamethrin	5.0 – 7.5	1	X	X	X	
	Lambda-cyhalothrin	5.0	1-2	X	X	X	
	Tau-fluvalinate	48.0	1-2	X		X	X
4A	Thiacloprid	72.0	1-2	X		X	
22A	Indoxacarb	25.5	1	X			

* Pests also in other crops

INSECTICIDES MONITORED



- **Pyrethroids**
 - Lambda-cyhalothrin (2007-2018)
 - Tau-fluvalinate (2018)
 - IRAC Method no. 011
 - Test vials in 2018 from Bayer AG and ADAMA Northern Europe
- **Thiacloprid/Biscaya OD 240 (2010-2018)**
 - IRAC Method no. 021
 - Test vials in 2018 from Bayer AG
- **Indoxacarb/Avaunt 150 EC (2012-2019)**
 - IRAC Method no. 027
 - Test vials in 2018 from FMC Agricultural Solutions
- Pollen beetles from **spring oilseed rape and spring turnip rape**

Susceptibility to **lambda-cyhalothrin** in pollen beetles collected from spring oilseed rape in Akershus and Østfold (Southeast-Norway) during May and June 2018, and tested with IRAC Method no. 011 - adult vial test.

Values are percentage dead and affected beetles \pm SD

Population	# of beetles	Rate (ng lambda-cyhalothrin/cm ²)			Resistance category
		0	15	75	
AK7-Ås-2018	89	3,3 \pm 4,7	66,0 \pm 17,9	100,0 \pm 0,0	F, code 2
AK9-Ski-2018	156	6,1 \pm 0,2	54,6 \pm 4,4	88,2 \pm 11,8	R, code 4
AK10-Algarheim-2018	146	9,7 \pm 6,0	89,0 \pm 4,2	100,0 \pm 0,0	F, nivå 2
AK11-Leirsund-2018	62	8,0 \pm 0,5	-	92,3 \pm 7,7	MR, nivå 3
ØF9-Rakkestad-2018	89	0,0 \pm 0,0	44,8 \pm 2,7	74,6 \pm 15,0	R, code 4
Mean of collected field strains		5,4 \pm 3,9	63,6 \pm 3,9	91,0 \pm 10,5	

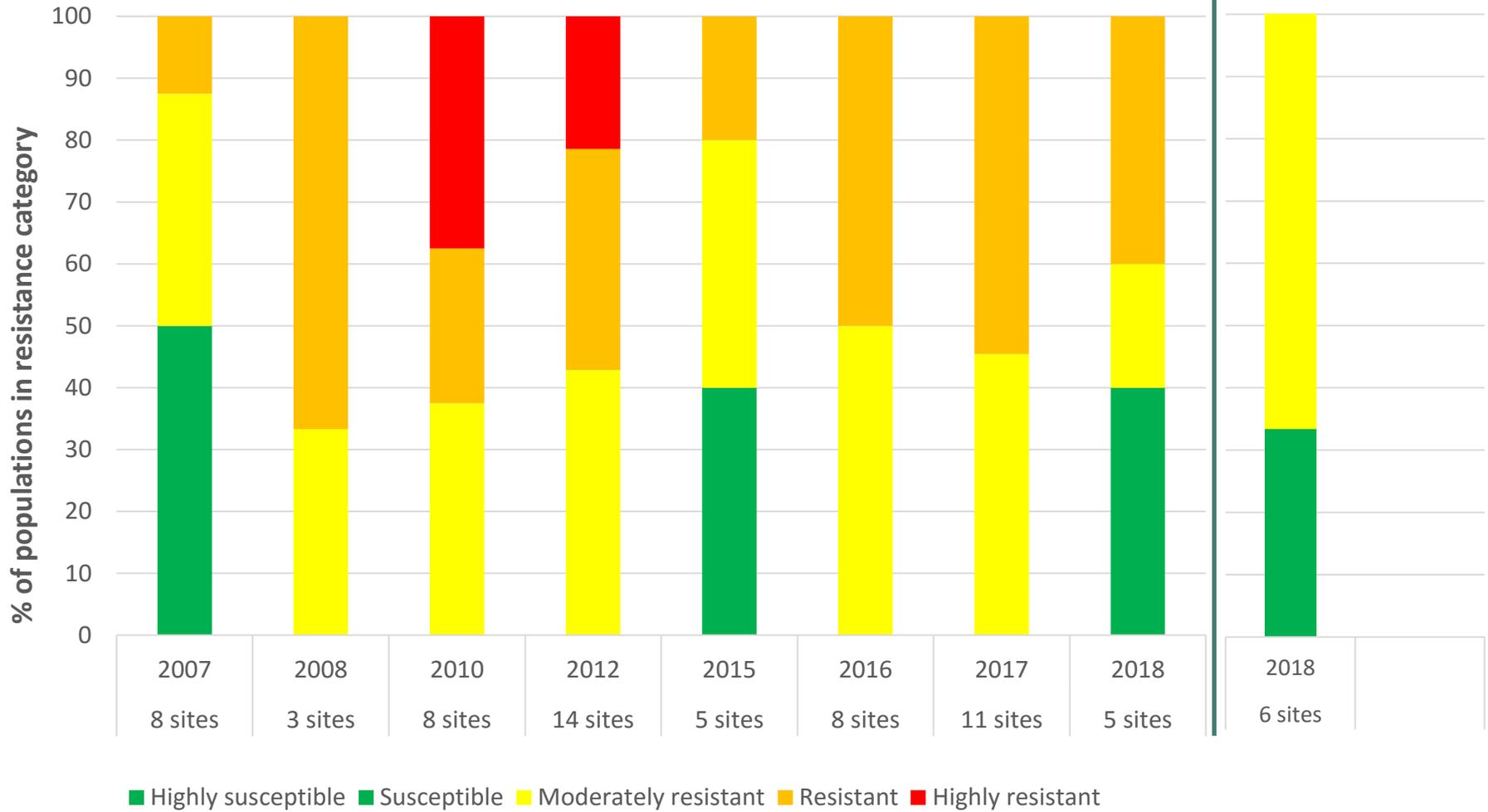
Susceptibility to **tau-fluvalinate** in pollen beetles collected from spring oilseed rape in Akershus and Østfold (Southeast-Norway) during May and June 2018, and tested with IRAC Method no. 011 - adult vial test.

Values are percentage dead and affected beetles \pm SD

Strain	# beetles in test	Rate (ng tau-fluvalinate/cm ²)						Resistance category (tests 2018)	
		0,0	19,2	96	192	480	960	tau-fluvalinate	lambda-cyhalothrin
AK7-Ås-2018	363	8 \pm 3	22 \pm 10	79 \pm 8	93 \pm 5	98 \pm 3	100 \pm 0	MR, code 3	S, code 2
AK9-Ski-2018	407	5 \pm 3	0 \pm 0	56 \pm 14	61 \pm 13	100 \pm 0	100 \pm 0	S, code 2	R, code 4
AK10-Algarheim-2018	393	3 \pm 4	10 \pm 9	78 \pm 4	85 \pm 11	100 \pm 0	100 \pm 0	S, code 2	S, code 2
AK11-Leirsund-2018	222	3 \pm 5	6 \pm 5	25 \pm 2	66 \pm 7	92 \pm 0.4	100 \pm 0	MR, code 3	MR, code 3
ØF8-Rolvstøl-2018	137	2 \pm 4	-	31 \pm 25	-	96 \pm 8	100 \pm 0	MR, code 3	R, code 4 in 2017
ØF9-Rakkestad-2018	361	0 \pm 0	7 \pm 5	42 \pm 20	72 \pm 22	98 \pm 3	100 \pm 0	MR, code 3	R, code 4
Mean of collected field strains		4 \pm 4	9 \pm 10	53 \pm 25	76 \pm 17	98 \pm 4	100 \pm 0		

LAMBDA-CYHALOTHRIN

TAU-FLUVALINAT

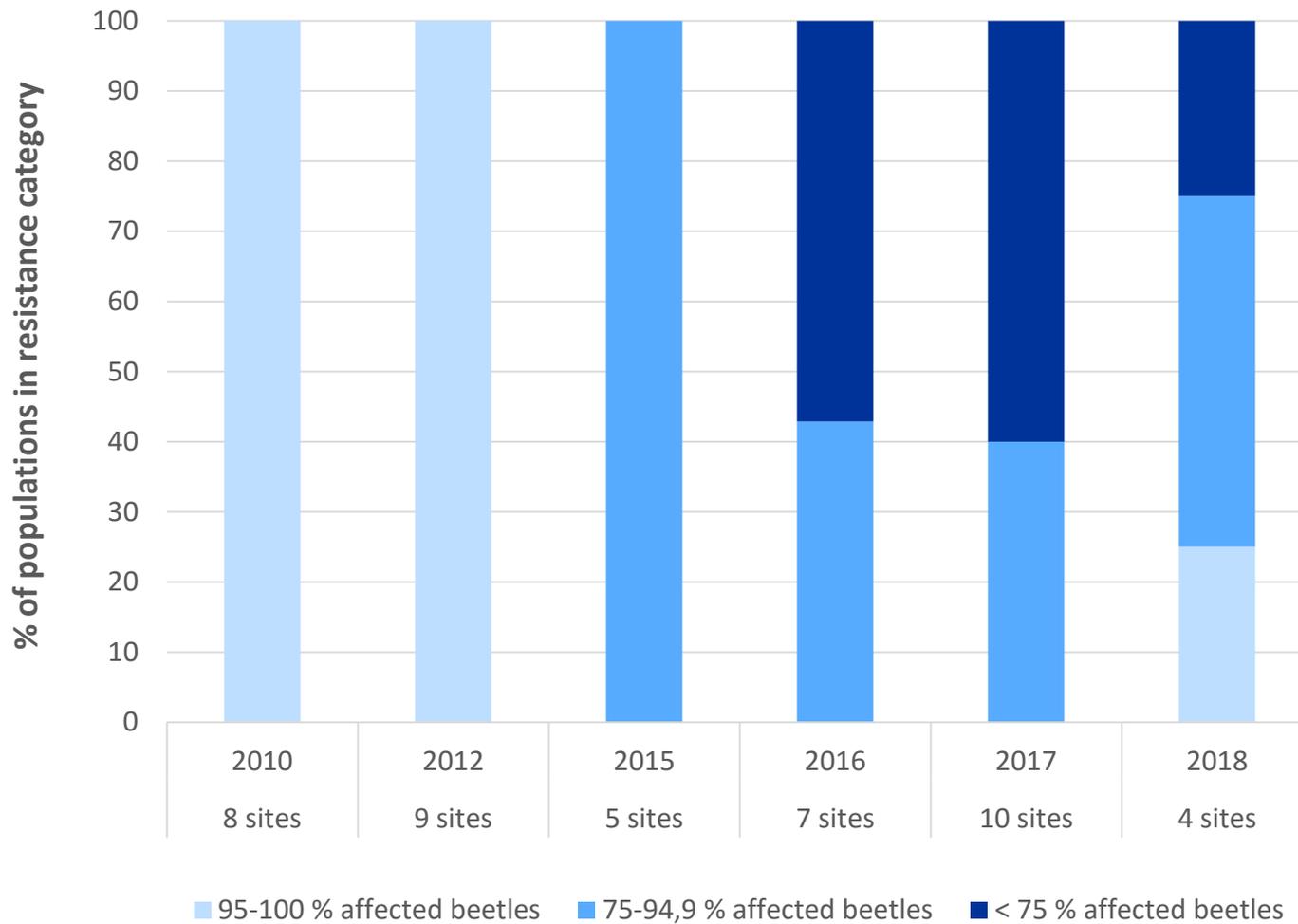


Susceptibility to **tiakloprid** in pollen beetles collected from spring oilseed rape in Akershus and Østfold (Southeast-Norway) during May and June 2018, and tested with IRAC Method no. 021 - adult vial test.

Values are percentage dead and affected beetles \pm SD

Population	# of beetles	Rate (ng tiakloprid/cm ²)				Resistance category (% mortality at 1440 ng AI/L)
		0,0	144	720	1440	
AK7-Ås-2018	120	10 \pm 5	37 \pm 5	70 \pm 5	93 \pm 0	94-75 %
AK9-Ski-2018	206	8 \pm 8	38 \pm 8	65 \pm 8	85 \pm 4	94-75 %
AK10-Algarheim-2018	200	10 \pm 6	67 \pm 2	83 \pm 10	96 \pm 4	> 95 %
ØF9-Rakkestad-2018	117	0 \pm 0	17 \pm 5	60 \pm 19	60 \pm 19	74-50 %
Expected mortality in susceptible strains (IRAC 2011)		-	50 \pm 10	93 \pm 6	98 \pm 3	> 95 %

TIAKLOPRID



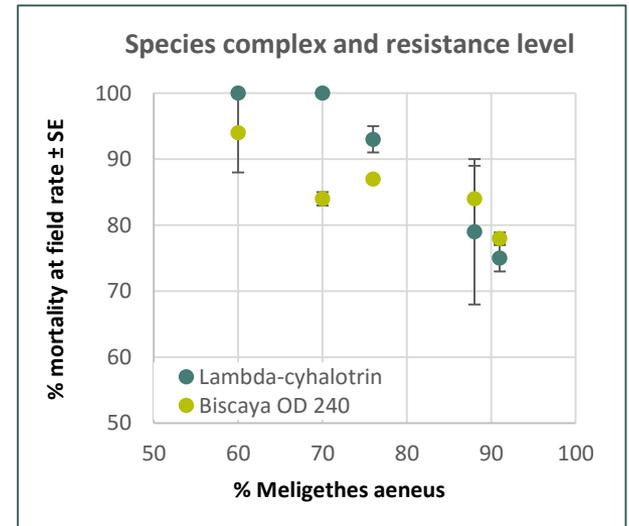
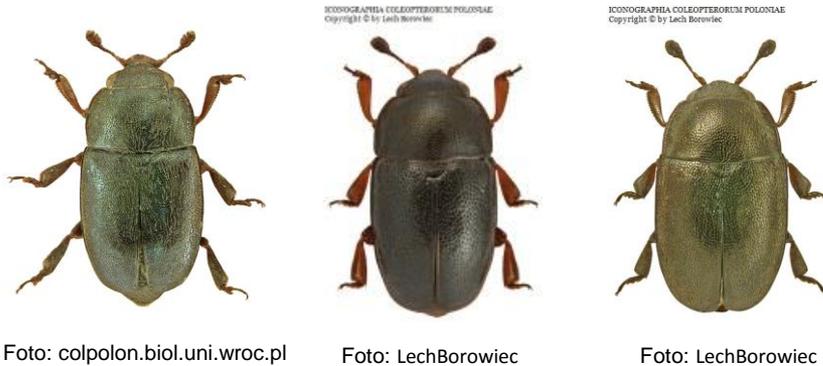
Susceptibility to **indoxacarb** in pollen beetles collected from spring oilseed rape in Akershus and Østfold (Southeast-Norway) during May and June 2018, and tested with IRAC Method no. 027 - adult vial test.

Values are percentage dead and affected beetles \pm SD

Population	Antall biller	Rate (ng indoksakarb/ cm ²)		Resistance category (% mortality at 255 ng AI/L)
		63.75	255	
AK7-Ås-2018	180	97 \pm 7	100 \pm 0	> 95 % (susceptible)
AK9-Ski-2018	205	94 \pm 5	100 \pm 0	> 95 % (susceptible)
AK10-Algarheim-2018	200	100 \pm 0	100 \pm 0	> 95 % (susceptible)
AK11-Leirsund-2018	76	-	97 \pm 3	> 95 % (susceptible)
ØF8-Rolvsøy-2018	131	95 \pm 4	100 \pm 0	> 95 % (susceptible)
ØF9-Rakkestad-2018	178	97 \pm 4	100 \pm 0	> 95 % (susceptible)
Mean of populations	162	96 \pm 4	100 \pm 2	> 95 % (susceptible)
Expected mortality in susceptible strains (IRAC 2012)		>90	>90	

MELIGETHES SPECIES COMPLEX IN NORWAY

Akershus/Østfold counties, 2015:



%	<i>M. aeneus</i>	<i>M. coeruleivirens</i>	<i>M. subaeneus</i>	<i>M. subrugosus</i>	<i>M. viridescens</i>
Askim	76	11	4	0	10
Ås	60	16	1	0	23
Kråkstad	70	15	3	2	10
Rakkestad	88	8	0	0	4
Sarpsborg	91	5	4	0	1



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Thank you for your attention!
