# Pyrethroid resistance of insect pests in oilseed rape in Germany

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# Surprise in the biotest

Since 2017 a new roller with less revolutions

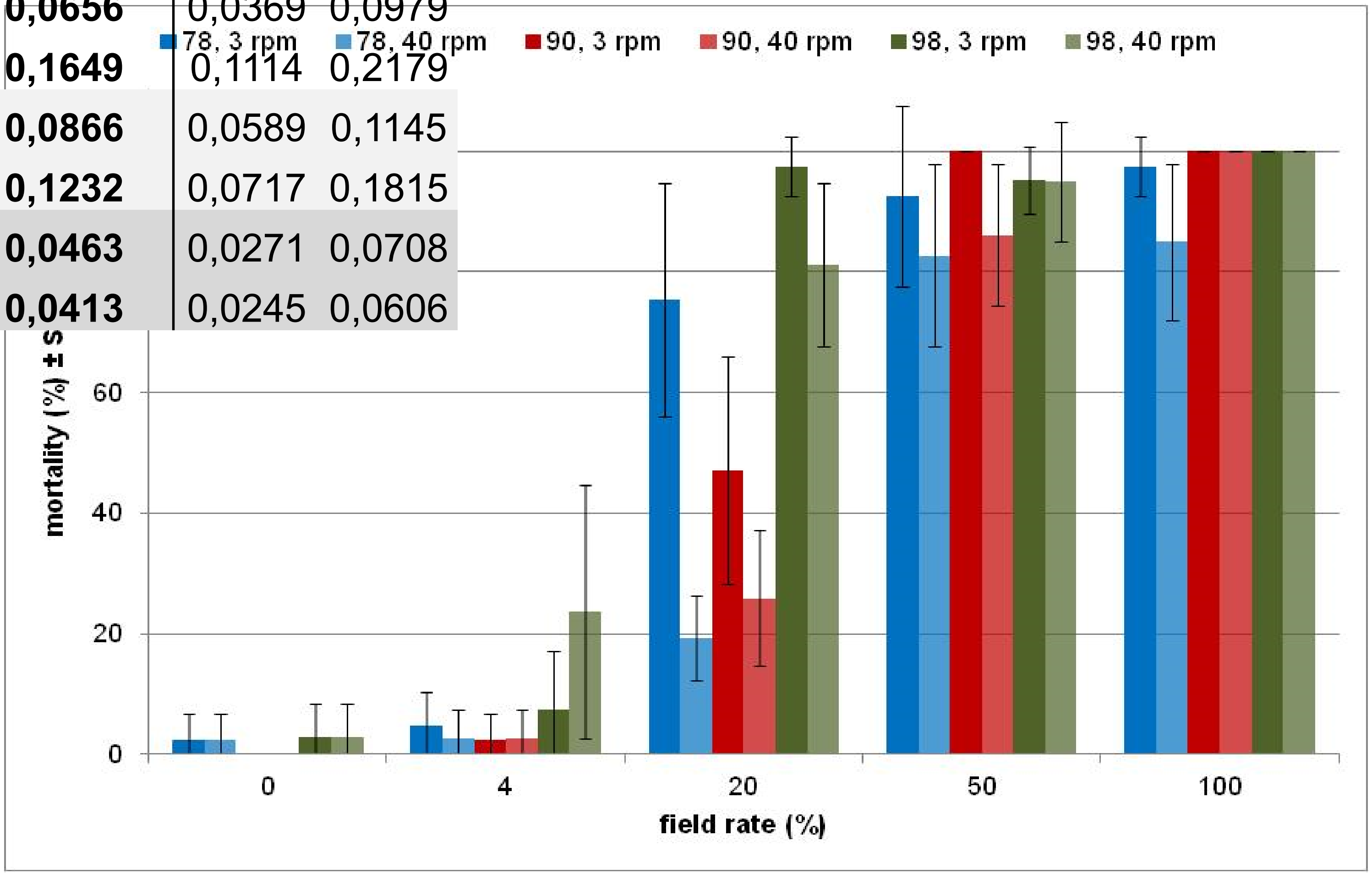
2005 - 2016: 40 revolutions per minute
Since 2017: 3 revolutions per minute

Surprise: until 2017 a relevant % of the a.i. coated to the glasses left the exposure area, residue analysis of exposure is on the way

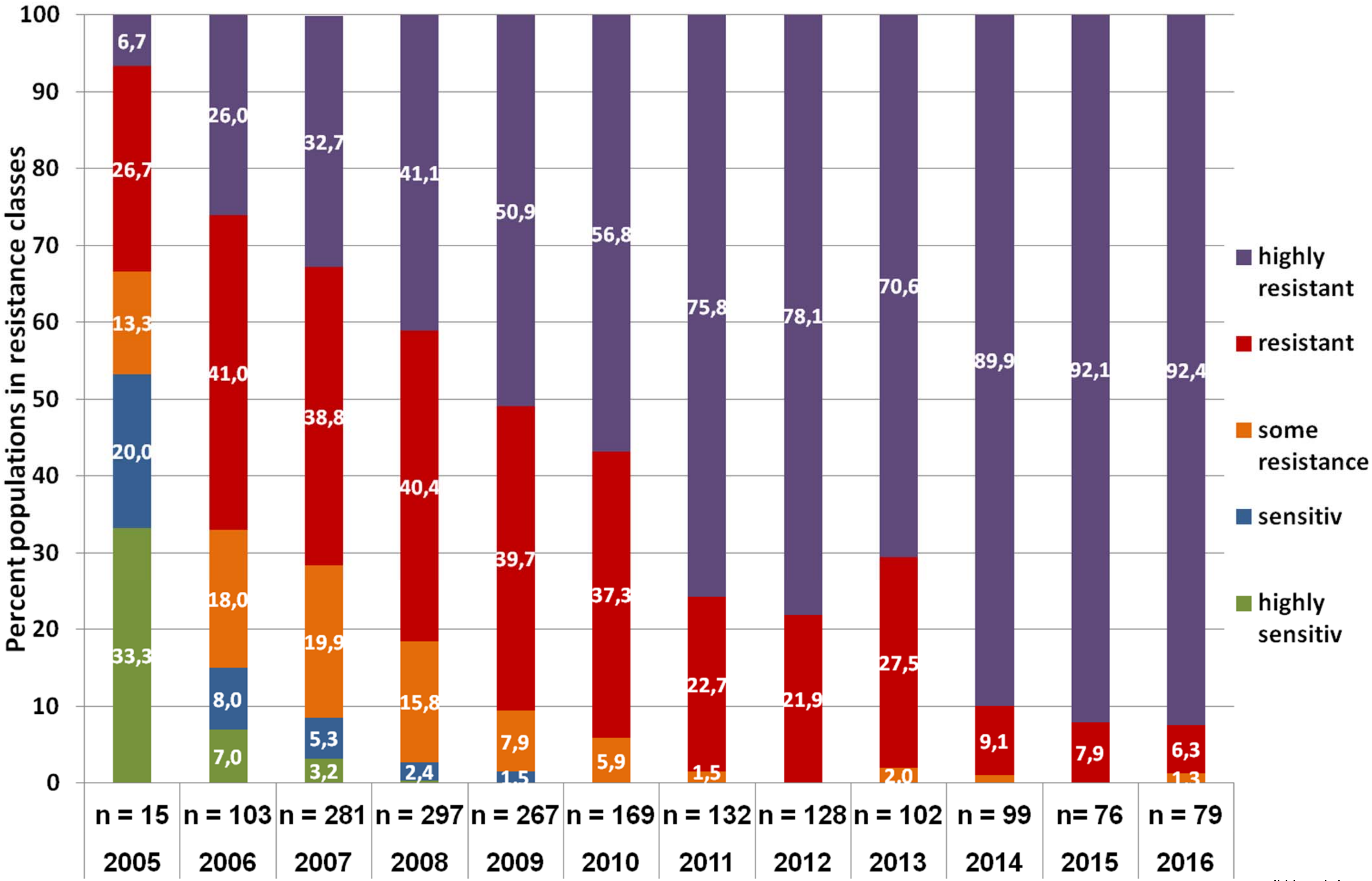
This seems to be the case only for a.i. solved in pure acetone, but no problem for water/acetone mixtures!

# 3 pollen beetle populations tested after coating glasses with 3 and 40 rpm

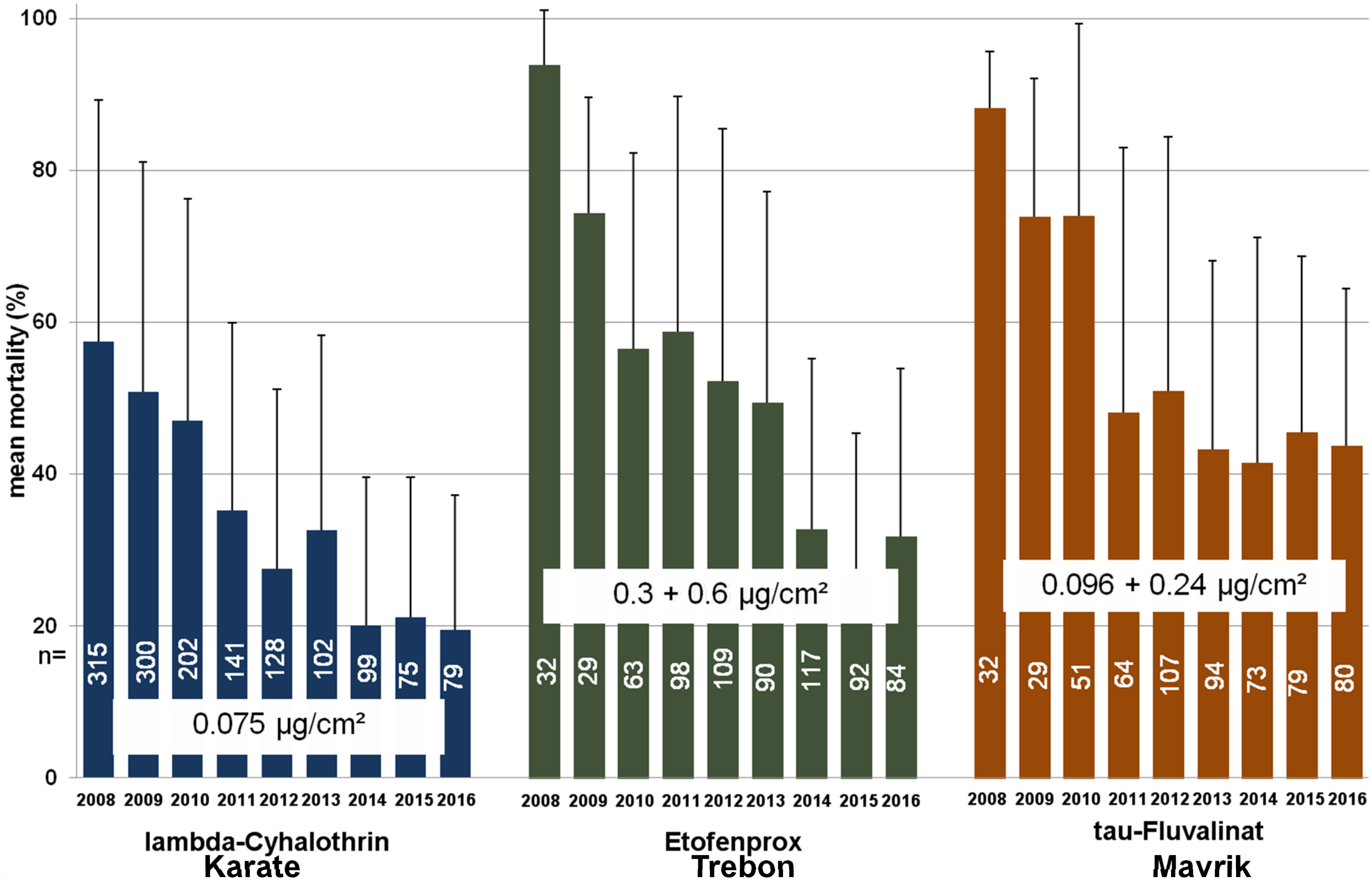
| pop. No. | revolution | $LD_{50}$ after 5h ug ai/cm² | 95% conf interv lower | upper |
|---|---|---|---|---|
| 78 | 3 rpm | **0,0656** | 0,0369 | 0,0979 |
| 78 | 40 rpm | **0,1649** | 0,1114 | 0,2179 |
| 90 | 3 rpm | **0,0866** | 0,0589 | 0,1145 |
| 90 | 40 rpm | **0,1232** | 0,0717 | 0,1815 |
| 98 | 3 rpm | **0,0463** | 0,0271 | 0,0708 |
| 98 | 40 rpm | **0,0413** | 0,0245 | 0,0606 |



# MELIAE resistance classes 2005 – 2016, lambda-cyhalothrin, biotest after 5 h



# MELIAE mortality using different pyrethroids 2008 – 2016, biotest after 5 h



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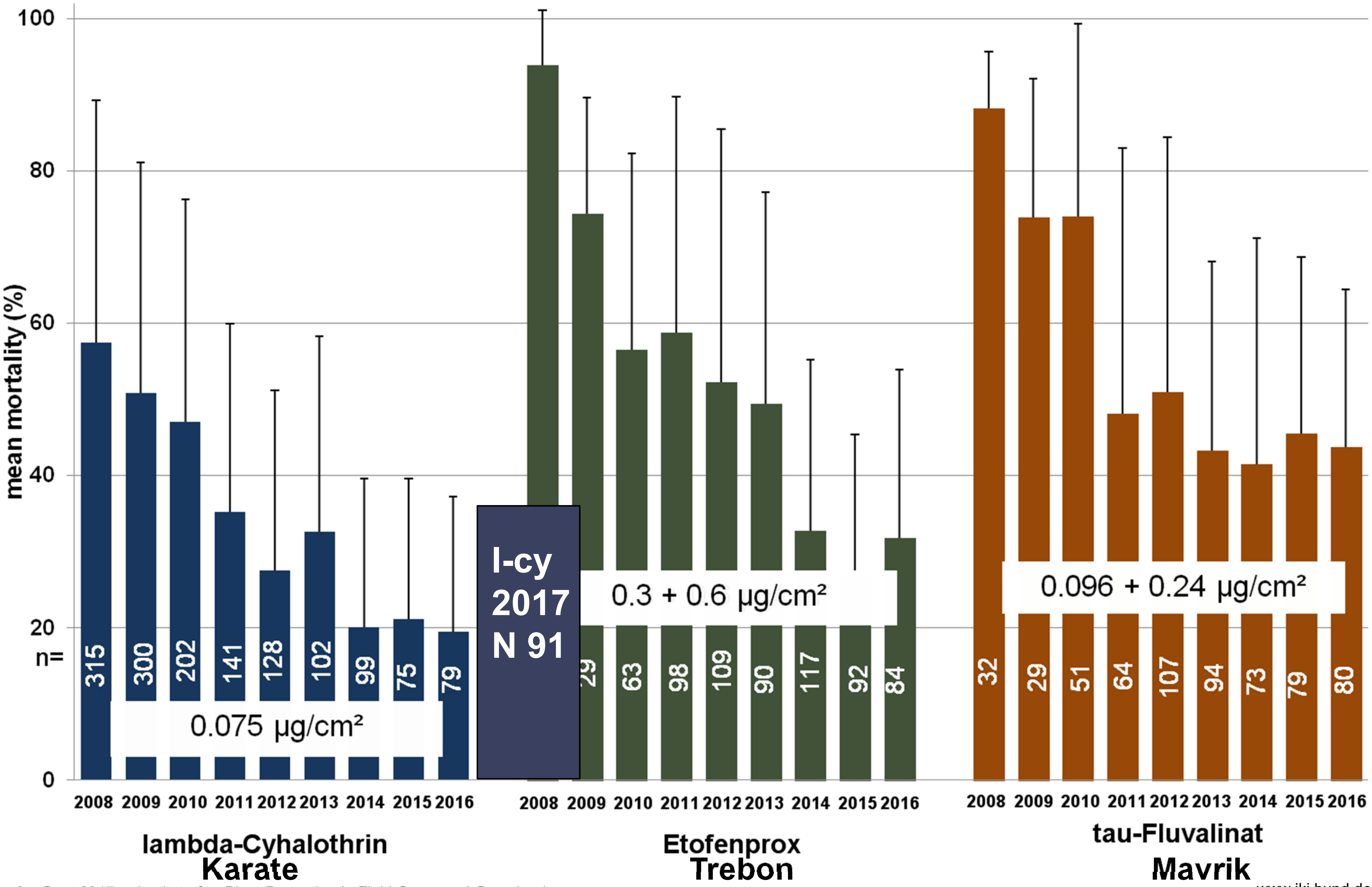
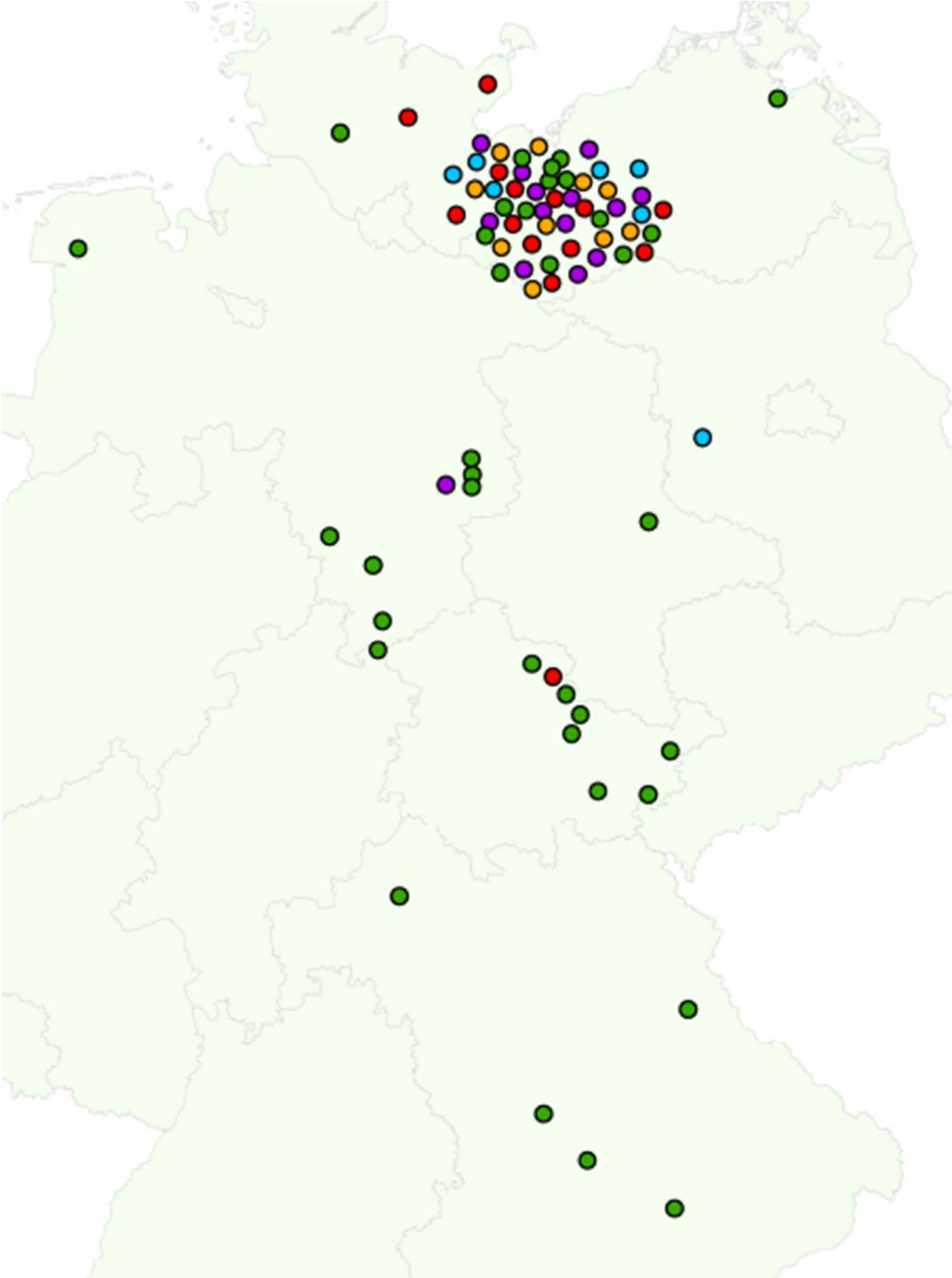


# Pyrethroid resistance, **biotest** after 5 h Germany 2007-2016 ***Psylliodes chrysocephala***

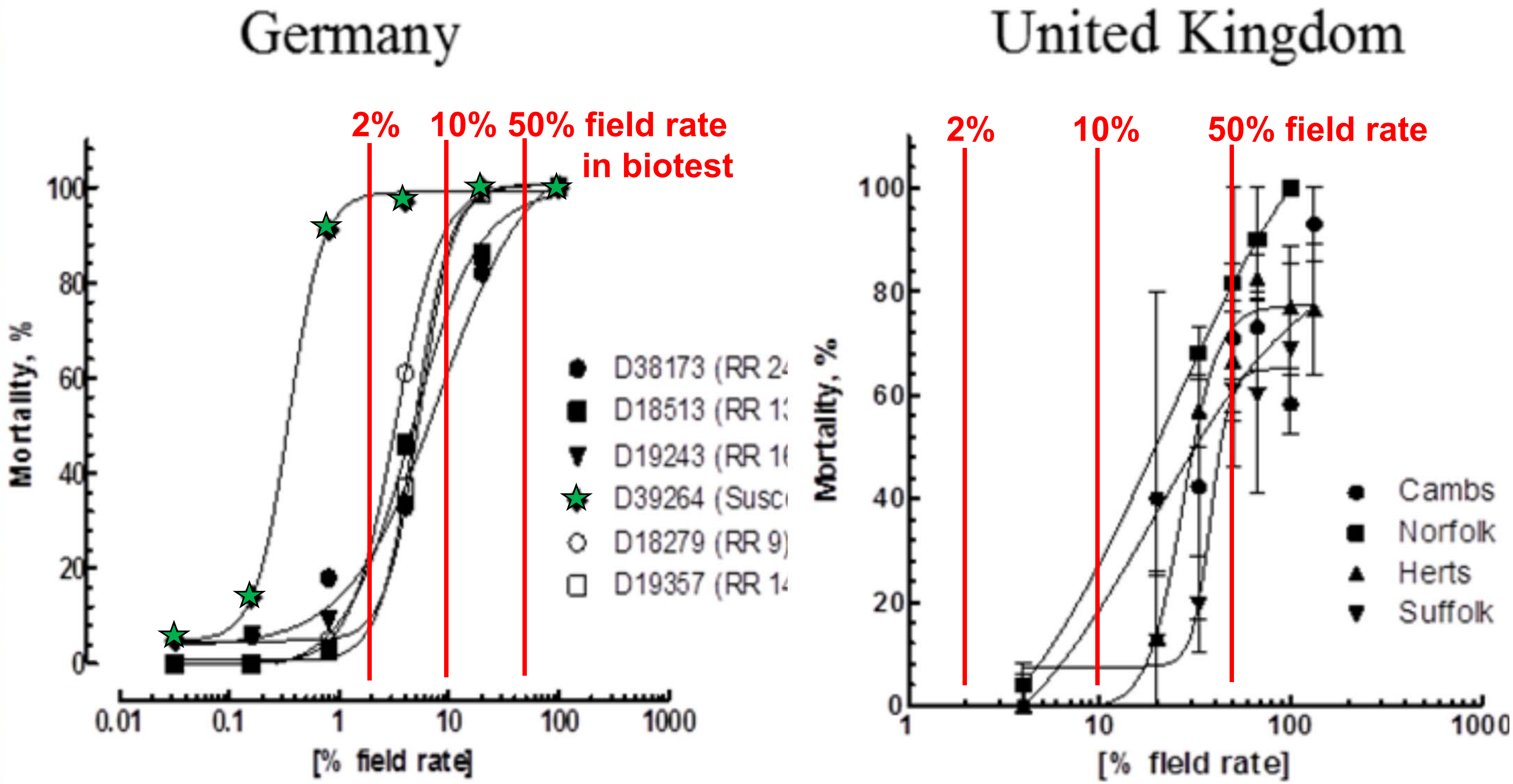
## *Resistance factor: 20.6*

***$LD_{50}$ values of 10 most sens. to 10 most res. N = 70***

- highly sensitive
- sensitive
- some resistance
- resistant
- highly resistant



# Effects on *P. chrysocephala* in biotests, additional resistance mechanism in UK




adapted to: Hojland, Nauen, Foster, Williamson, Kristensen. PLOS ONE, Dez. 2015, DOI:10.1271/journal.pone.0146045

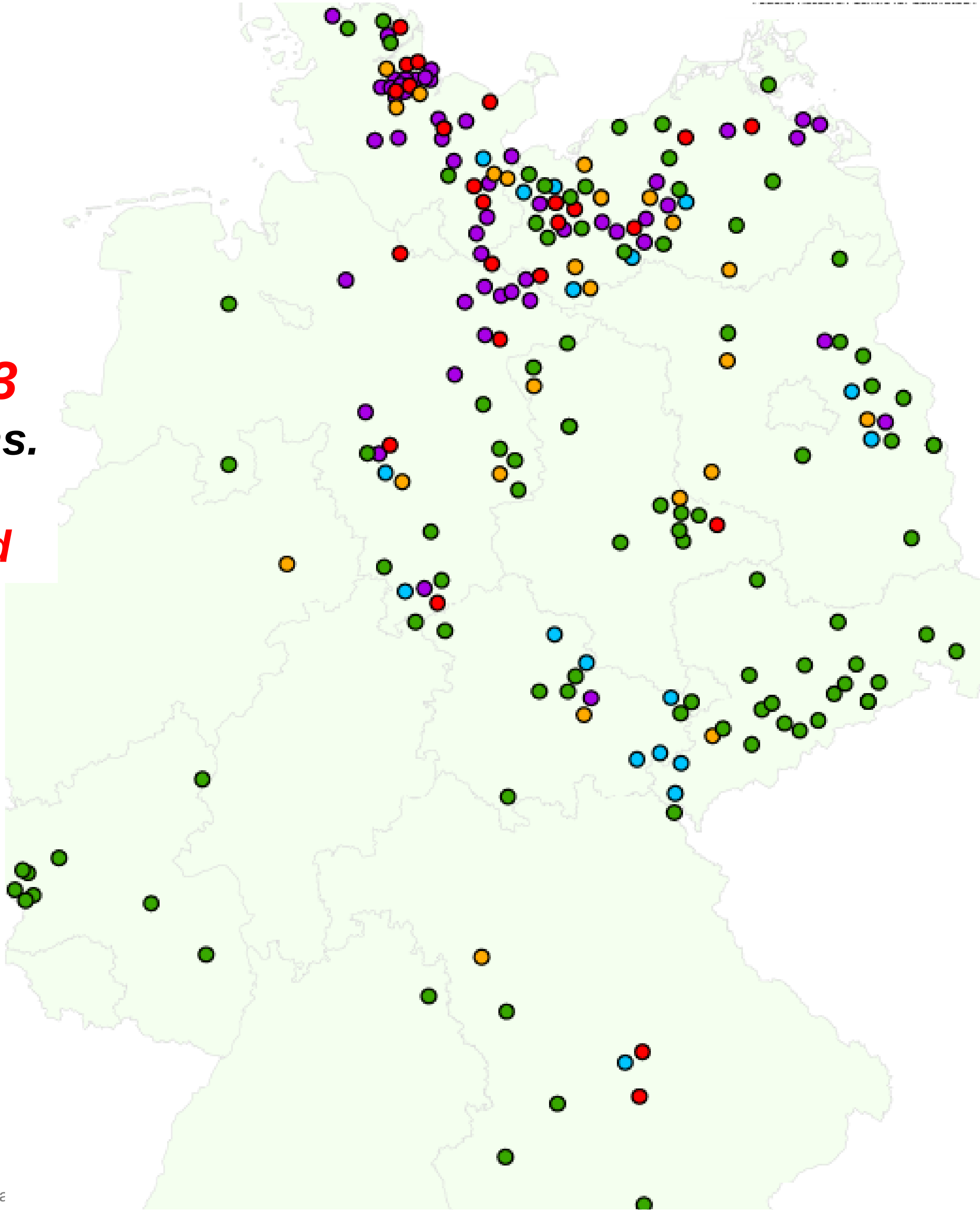
# Pyrethroid resistance, **biotest** after 5 h Germany 2005-2016 ***Ceutorhynchus obstrictus***

***Resistance factor: 67.3***

***$LD_{50}$ values of 10 most sens. to 10 most res. N = 98***

***KDR in 23 of 24 pop. tested***

- highly sensitive
- sensitive
- some resistance
- resistant
- highly resistant



# *Ceutorhynchus obstrictus* populations in biotests exposed to etofenprox and lambda-cyhalothrin

| resistance class lambda-cyhalothrin | mean % effect | sd | mean % effect | sd | N populations |
|---|---|---|---|---|---|
| | etofenprox | | lambda-cyhaltohrin | | |
| highly sensitive (1) | **96.9** | **5.4** | **95.7** | **5.7** | **22** |
| sensitive + some resistance (2+3) | **90.6** | **9.2** | **76.2** | **14.2** | **10** |
| resistance + highly resistant (4+5) | **52.5** | **28.4** | **53.9** | **21.0** | **21** |

## *Ceutorhynchus obstrictus* populations in biotests exposed to tau-fluvalinate and lambda-cyhalothrin

| resistance class lambda-cyhalothrin | mean % effect | sd | mean % effect | sd | N populations |
|---|---|---|---|---|---|
| | tau-fluvalinate | | lambda-cyhaltohrin | | |
| highly sensitive (1) | **71.0** | **24.5** | **94.2** | **6.8** | **18** |
| sensitive + some resistance (2+3) | **74.1** | **27.8** | **68.4** | **14.6** | **12** |
| resistance + highly resistant (4+5) | **44.8** | **23.2** | **55.7** | **22.0** | **24** |

## *Ceutorhynchus pallidactylus* and *C. napi* populations in DE exposed to lambda-cyhalothrin in biotests, 5 h assessment 2005 - 2017

***CEUTQU***

**20% fieldrate N= 160: 37.5% of pop. with survival**

**50% fieldrate N= 146: 6.2% of pop. with survival**

**100% fieldrate N= 43: 0% of pop. with survival**

| $LD_{50}$ (N= 58) | 10 most sens. | 10 most res. | Res. factor |
|---|---|---|---|
| | 0.00097 | 0.01357 µg/cm² | **14.1** |

***CEUTNA***

**20% fieldrate N=129: 7.0% of pop. with survival**

**50% fieldrate N=126: 0% of pop. with survival**

| $LD_{50}$ (N= 20) | 5 most sens. | 5 most res. | Res. factor |
|---|---|---|---|
| | 0.00071 | 0.00451 µg/cm² | **6.3** |

# Insect pests in oilseed rape in DE in autumn

| Insect pest | Chemical control in DE | Resistance data | Pop tested |
|---|---|---|---|
| *Delia brassicae* | - | nn | - |
| *Psylliodes* | Pyrethroids | KDR present; + | >100 |
| *Phyllotreta* | Pyrethroids | No in DE | about 10 |
| *C. picitarsis* | Pyrethroids | 3 pop. with KDR; + | about 20 |
| *Athalia rosae* | Pyrethroids | nn | - |
| *Baris coerulescens* | Pyrethroids | Very low sensitiv., resistance? ++? | about 10 |
| *Myzus persicae* | Pyrethroids | KDR + metabolism; ++ | >100 (by others) |

# Insect pests in oilseed rape in DE in spring

| Insect pest | Chemical control in DE | Resistance data | Pop tested |
|---|---|---|---|
| *C. pallidactylus* | Pyrethroids | No resistance | >100 |
| *C. napi* | Pyretrhoids | No resistance | >100 |
| *B. aeneus* | Pyrethroids, Neonics, pymetrozin indoxacarb | Metabolic resistance + KDR, ++ Neonics with sens. shifting | >1000 |
| *C. obstrictus* | Pyrethroids Neonics | KDR Resistance + metabolic??, ++ | >100 |
| *D. brassicae* | Pyrethroids Neonics | No resistance | about 10 |

# Summary

## Pyrethroid resistant oilseed rape pests

PSYICH: kdr distributed (in UK additional metabolic resistance)

CEUTPI: kdr in 3 of about 20 pop. in Baden-Wuerttemberg (2015) and Rhineland Palatinate (2016),

MELIAE: metabolic resistance (widely distributed in Europe, problems in the field)

CEUTAS: kdr distributed (partly problems in the field)

MYZUPE*:* kdr, metabolic, MACE (worldwide, almost all active ingredients affected, problems in the field)

*BARICO:* Very insensitive at 100 % field rate in biotests, resistance?

# Summary

**Resistance has developed and spread with increasing intensity in the last years.**

**Insecticides are to competitive (cheap) to allow for other IPM and even to follow threshold values.**

**Less traditional insecticidal actives will be available in future because of environmental issues.**

**There is an urgent need for non chemical control methods including resistant crops.**

**Oilseed rape is one of the most sensitive arable crops for insect pests and the cropping area will go down if not sufficient control options are available.**

## Thank you for the attention!

**Acknowledgement:**

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