Update on pesticides resistance in East & Central European and Baltic countries

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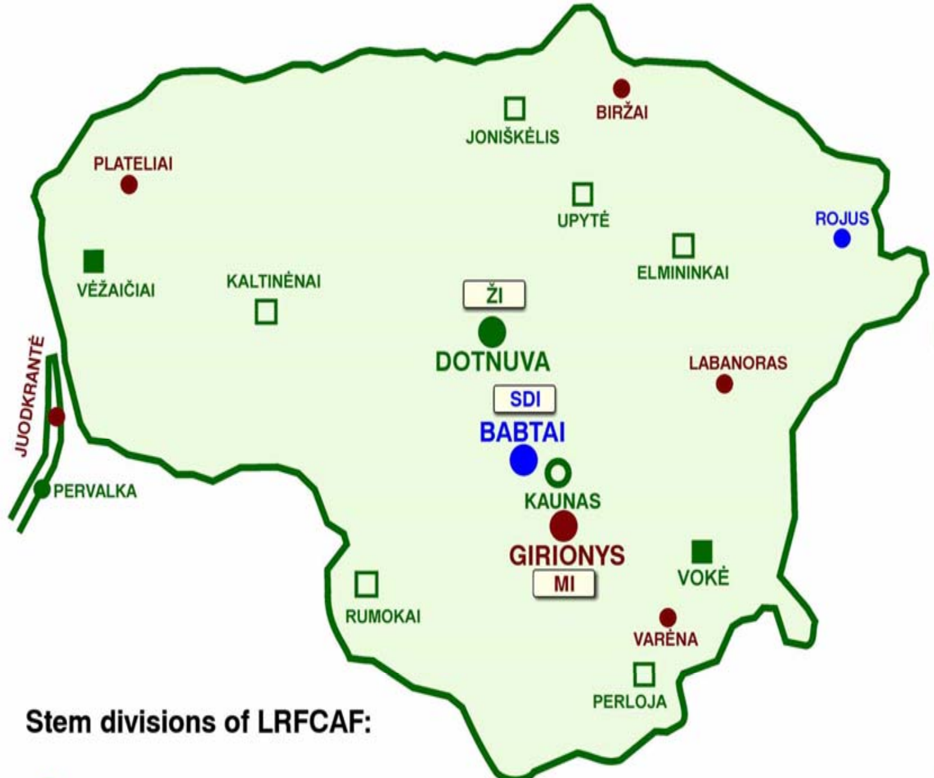
Institute of Agriculture,

Lithuanian Research Centre for Agriculture and Forestry

Lithuanian Research Centre for Agriculture and Forestry operates in 19 different locations around Lithuania



Stem divisions of LRFCAF:

- Institute of Agriculture, LRFCAF
- Institute of Horticulture, LRFCAF
- Institute of Forestry, LRFCAF

Regional divisions of LRFCAF:

- Vėžaičiai Branch
  Vokė Branch
- Elmininkai Experimental Station
  Joniškėlis Experimental Station
  Kaltinėnai Experimental Station
  Perja Experimental Station
  Rumokai Experimental Station
  Upytė Experimental Station
- Agrochemical Research laboratory

Institute of Agriculture, Dotnuva

Institute of Horticulture, Babtai

Institute of Forestry, Girionys

PhD STUDIES IN THE LRCAF

BIOMEDICAL SCIENCES (B 000)

- ✓ **AGRONOMY.** PhD studies in cooperation with Lithuanian University of Agriculture
- ✓**FORESTRY.** PhD studies in cooperation with Lithuanian University of Agriculture.
- ✓ **ECOLOGY AND ENVIRONMENT.** PhD studies in cooperation with Vytautas Magnus University.

SCIENTIFIC STAFF IN INSTITUTE OF AGRICULTURE

The institute employs 94 researches:

77 – researchers holding a scientific degree

17 –other researchers

The institute provides PhD studies for 23 doctoral students.

Resistance to pesticides

- Fungal pathogens
- Insect pests
- Weeds

The susceptibility to pesticides of economically important fungal pathogens, insect pests and weeds is monitored in many countries by researchers and agrochemical companies.

Monitoring for resistance in the Baltic countries

- *Phytophthora infestans* resistance to metalaxyl had been studied in Lithuania during 1990-1998 at the Lithuanian Institute of Agriculture (Valskyte, 2000, 2002) and at Jõgeva Plant Breeding Institute in Estonia during 2002-2005 (*E. Runno-Paurson & M Koppel, 2006)*.
- The first surveys of pathogens in cereals were carried out in 2004, later of pollen beetle (*Meligethes* spp.) in oilseed rape and weed (wind bentgrass -*Apera spica-venti*) in cereals by agrochemical companies.
- Resistance of *Mycosphaerella graminicola* and *Pyrenophora teres* to fungicides and *Meligethes* spp. to pyrethroids has been studied at the Institute of Agriculture, since 2008.
- Since 2009, monitoring for fungicide, herbicide and insecticide resistance in the Nordic Baltic region has been carried out according to NORBARAG (Nordic and Baltic resistance action group) activities.

NORBARAG
Nordic-Baltic Resistance Action Group

NORBARAG was set up in 2008 as an informal group of representatives from official research institutes of Denmark, Estonia, Finland, Latvia, Lithuania, Norway and Sweden involved in pesticide resistance research and pesticide efficacy evaluation and representatives of agrochemical companies.

The 3 subgroups (on herbicide, fungicide and insecticide resistance) of NORBARAG deal with the issues related to the specific groups of pesticides, test methodologies and strategies.

NORBARAG is independent but maintains contacts with HRAC, FRAC and IRAC which only have representation from the agrochemical industry.

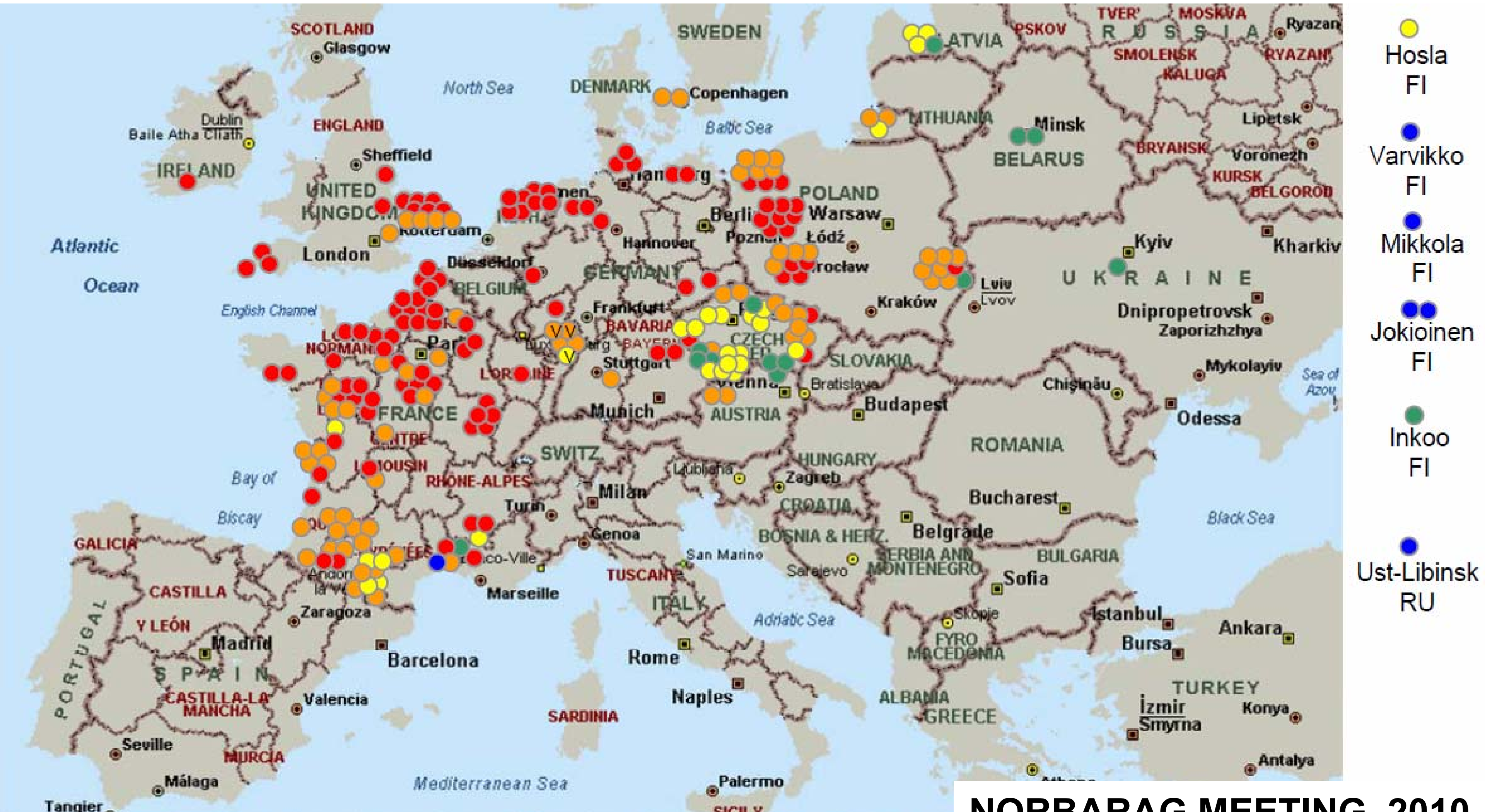
Resistance to cereal pathogens

Classification

- >75%
- >30-75%
- >10-30%
- >2-10%
- 0-2%

QoI-Monitoring - *Mycosphaerella graminicola* Europe 2009 (n=223)

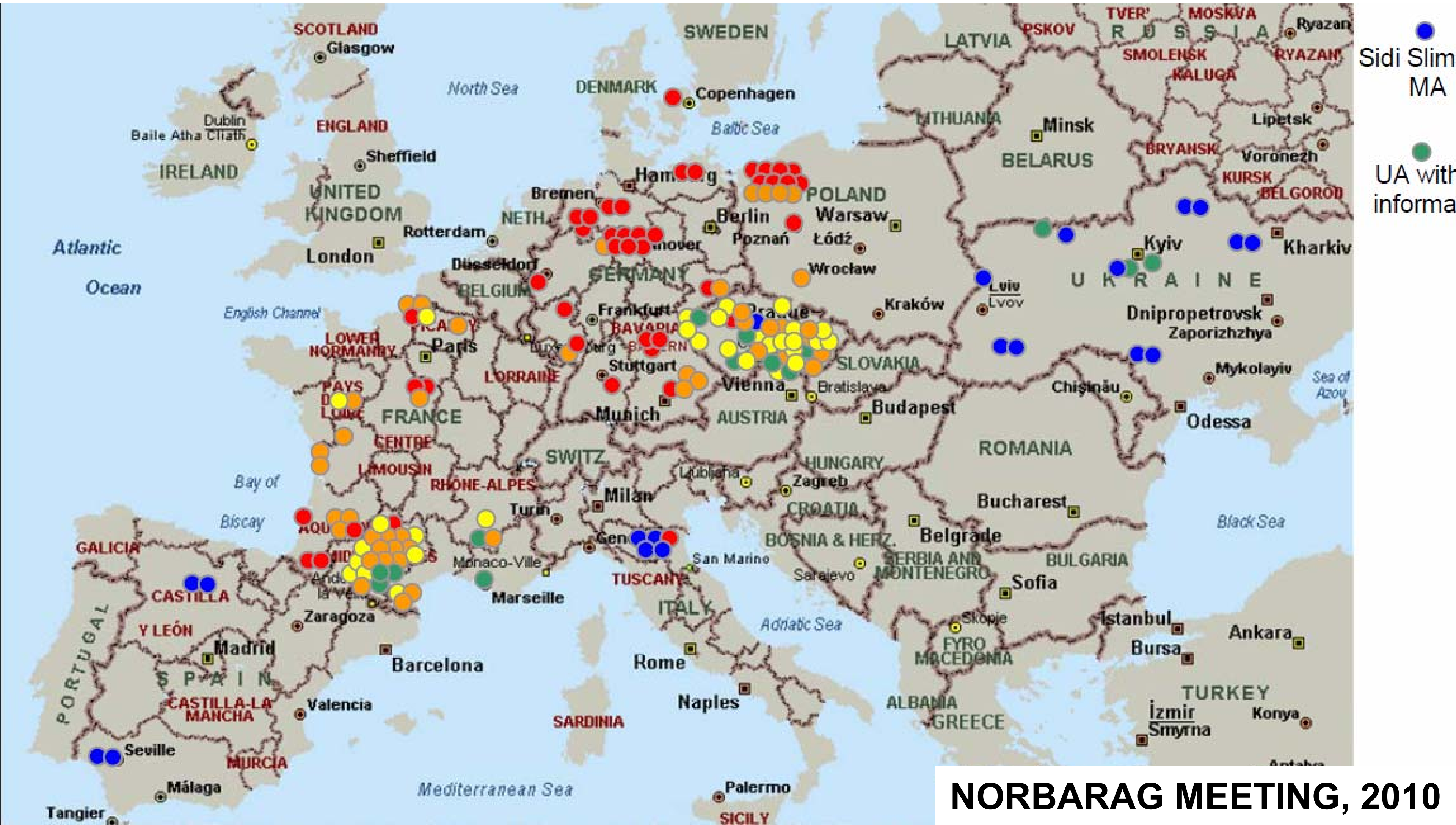
BASF monitoring data



NORBARAG MEETING, 2010

Qol-Monitoring - *Mycosphaerella graminicola* Europe 2010 (n=154)

BASF monitoring data

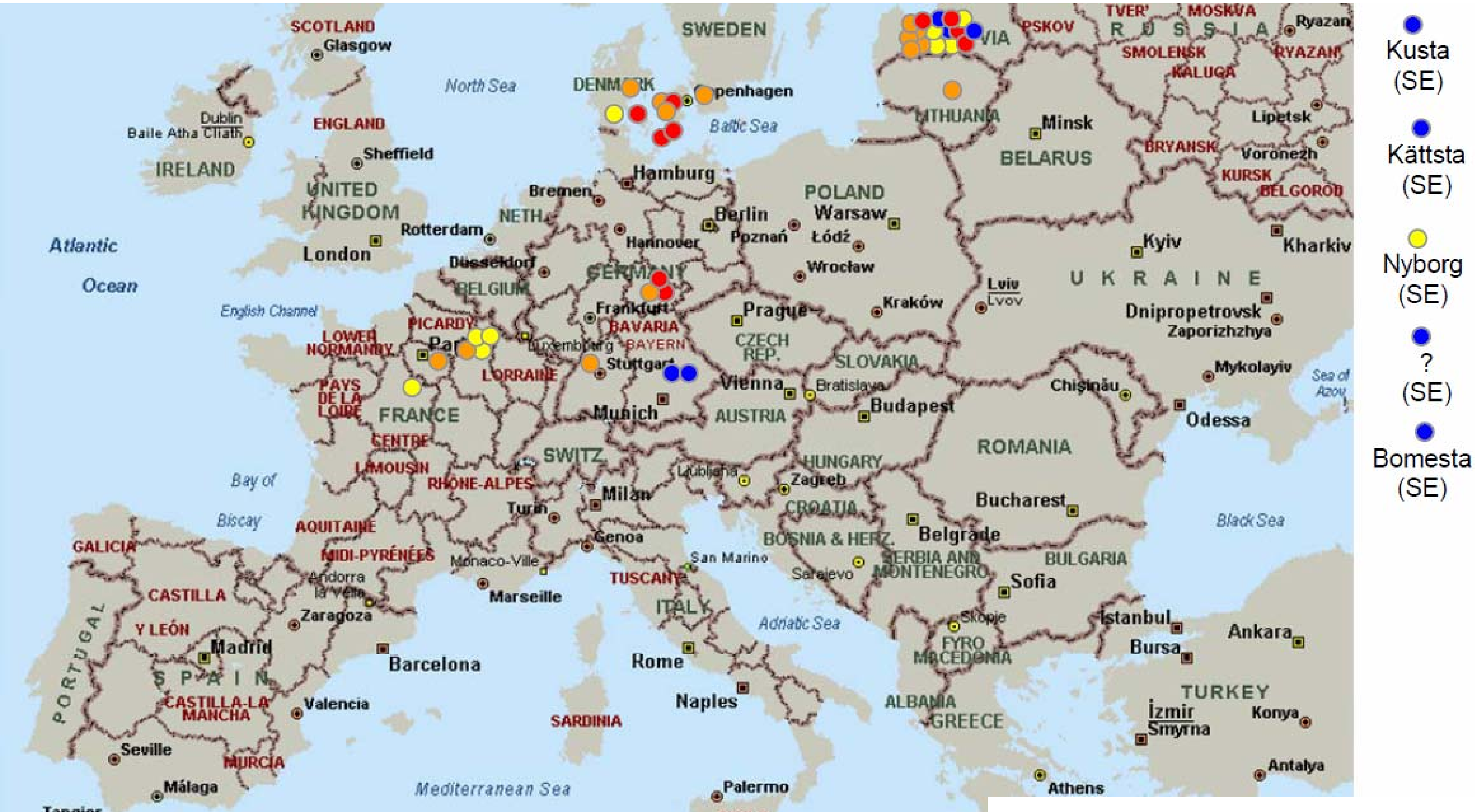


NORBARAG MEETING, 2010

QoI-Monitoring - *Pyrenophora tritici-repentis F129L or G137R*
Europe 2010 (n=43, status 08.09)
BASF monitoring data

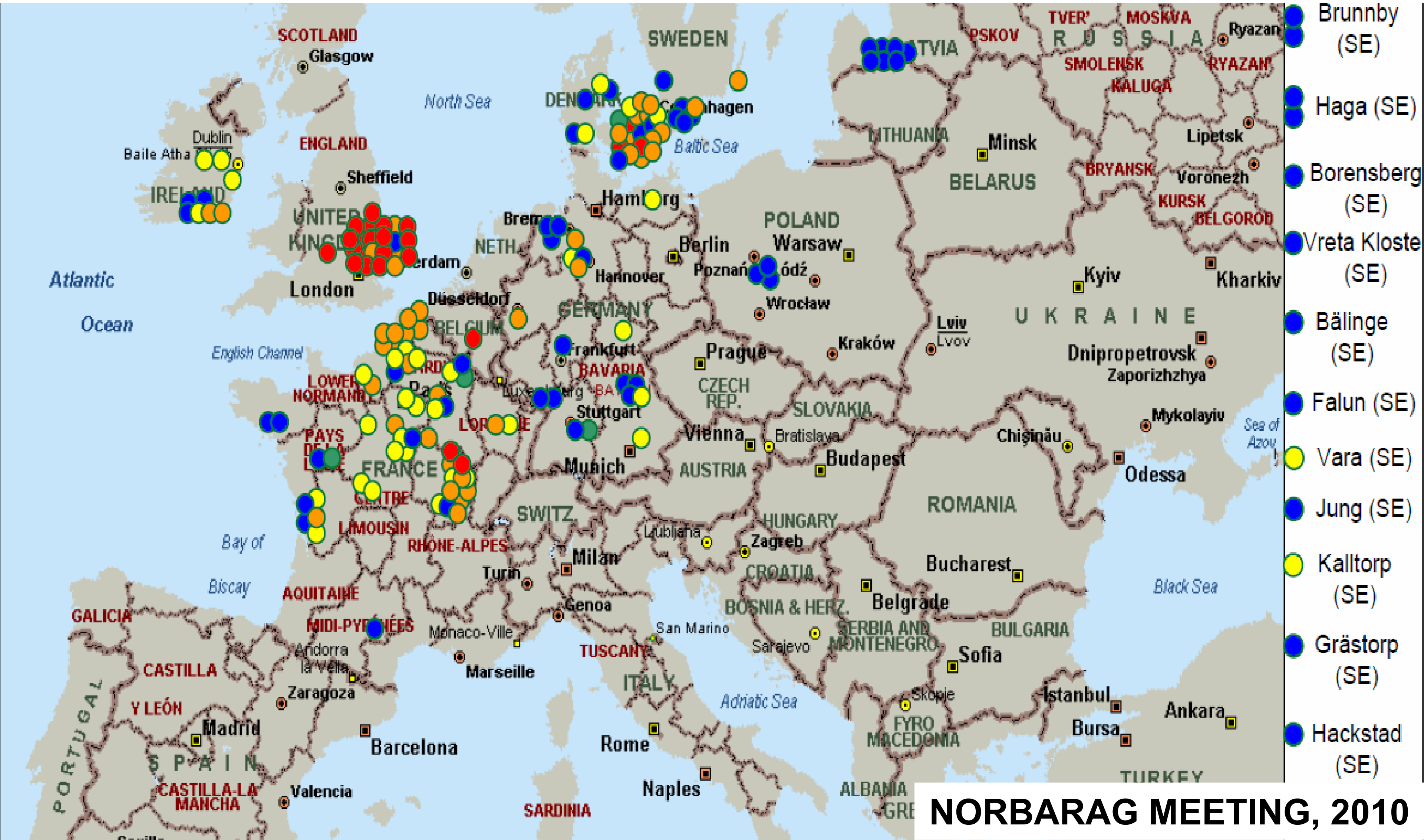
NORBARAG MEETING, 2010

QoI-Monitoring - *Pyrenophora tritici-repentis G143A*
Europe 2010 (n=43)
BASF monitoring data



NORBARAG MEETING, 2010

QoI-Monitoring - *Pyrenophora teres F129L or G137R*
Europe 2010 (n=225)
BASF monitoring data



Mycosphaerella graminicola resistance in Lithuania

- The first surveys on *M. graminicola* resistance to the QoI group fungicides were made by agrochemical companies in Lithuania in 2004, and the first resistance isolates were found in 2005 and reported by FRAC.
- After assessing 20 isolates in 2009 and 112 isolates in 2010 year at the Institute of Agriculture it was found that *M. graminicola* is resistant to azoxystrobin and prothioconazole. While the isolates of *M. graminicola* fungi appeared to be sensitive to epoxyconazole and cyproconazole.

NORBARAG recommendations on fungicide resistance management in Nordic-Baltic region for 2011

- Give preference to disease tolerant varieties.
- Prefer field practices that reduce the disease risk, in particular those that can limit primary inoculums (for example rotation, ploughing, sowing date, etc) or progression of a disease (density, nitrogen).
- **Treat only if necessary**, according to the climate, cultivation conditions, models and observations.
- Reflect and decide treatment times according to the disease development, using reliable observation methods, risk analysis and symptoms monitoring.
- Limit the number of seasonal applications of active ingredients from the same chemical mode of action (usually characterized by a positive cross resistance).
- Alternate or use mixtures or co-formulations with different modes of action in treatment programs.
- **Strobilurins are to be applied preferably not more than once per season and** should be used in mixtures with other mode of action fungicides.
- Reduced efficacy to some DMI's on Septoria and net blotch has been noted. It is recommended to choose the most efficient DMI products in high risk situations. Their performance will be improved if they are associated with some other modes of actions.
- As mildew resistance to metrafenon in wheat has been found elsewhere in Europe, it is now recommended to treat only once per season with this active ingredient.

EPPO Workshop on Azole fungicides and Septoria leaf blotch control
Harpenden (GB), 2010-12-07/09

- **Specific resistance strategies**

- **IPM**

- **Dissemination of resistance strategies**
  - Farmers need guidance regarding the complexity of the resistance situation with clear messages on effective strategies. The overall message in terms of resistance management should be communicated in a simple but reliable and trustworthy way.

- **Future focus for research**

Label information about fungicides resistance risk management in Lithuania

dzia Okno Pomoc

4 / 6 130% Znajdź

ATSPARUMO IŠSIVYSTYMO RIZIKOS MAŽINIMO PRIEMONĖS

Fungicidas sudarytas iš v.m. biksafeno (SDHI fungicidų grupė, pirazolkarboksamidų cheminė grupė, FRAC kodas 7) ir v.m. tebukonazolo (DMI fungicidų grupė, triazolų cheminė grupė, FRAC kodas 3). Biksafenui būdinga nuo vidutinės iki didelės atsparumo atsiradimo rizikos, tebukonazolui – vidutinė atsparumo atsiradimo rizika. FRAC rekomenduoja laikytis atsparumo išsivystymo rizikos mažinimo priemonių.

Produktą sudaro dvi veikliosios medžiagos, priklausančios skirtingoms cheminėms grupėms, todėl sumažėja galimybė išsivystyti patogenų rezistencijai. Fungicidą ZANTARA būtina naudoti pagal rekomendacijas t.y. nuo rekomenduojamų ligų, nurodytu purškimo laiku, naudojant registruotas normas. Nenaudoti mažesnės normos nei nurodyta etiketėje. Sezono metu neturėtų būti purškiama daugiau nei 2 kartus. Javų apsaugos nuo ligų programose rekomenduojama naudoti skirtingų cheminių grupių fungicidus.

Neatmetama galimybė, kad naudojant fungicidą ZANTARA gali išsivystyti atsparios patogeninių grybų populiacijos, dėl ko efektyvumas gali sumažėti.

Pollen beetle, *Meligethes aeneus*

In Europe, pollen beetle is a major pest in oilseed rape, which can dramatically reduce seed yield.
For a long time, pyrethroid insecticides were the main measure in pollen beetle control. In many countries, the common practice is more than one insecticide application per season.
Recently, control failures with pyrethroid insecticides have been reported in many European countries.

Pyrethroid resistance *of Meligethes aeneus*

- France -1999
- Denmark -2000
- Germany – 2002

- Lithuania -2008
- Latvia – 2008
- Estonia – 2008

Pyrethroid resistance *of Meligethes aeneus*

A number of pollen beetle populations, collected in Germany, France, Austria, Great Britain, Sweden, Denmark, Finland, Poland, Czech Republic and Ukraine during 2009-2010, were tested for pyrethroid resistance using lambda-cyhalothrin.

A similar resistance monitoring bioassay for the neonicotinoid insecticide thiacloprid was developed and validated by assessing baseline susceptibility data for 88 European pollen beetle populations.

CONCLUSION:

Pyrethroid resistance in many European populations of *M. aeneus was confirmed, whereas all populations are* susceptible to thiacloprid when tested in a newly designed and validated monitoring bioassay based on glass vials coated with oil-dispersion-formulated thiacloprid. Based on the homogeneous results, it is concluded that thiacloprid could be an important chemical tool for pollen beetle resistance management strategies in European winter oilseed rape.

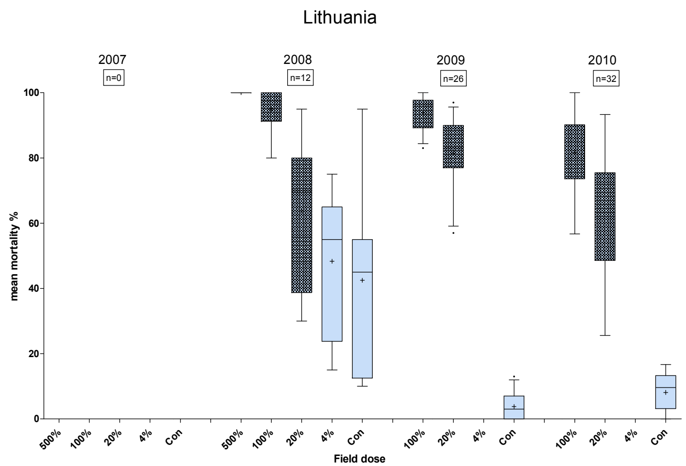
C. T. Zimmer and R. Nauen "Pyrethroid resistance and thiacloprid baseline susceptibility of European populations of *Meligethes aeneus (Coleoptera: Nitidulidae)* collected in winter oilseed rape" – Pest management Science 2011;67, 599-608.

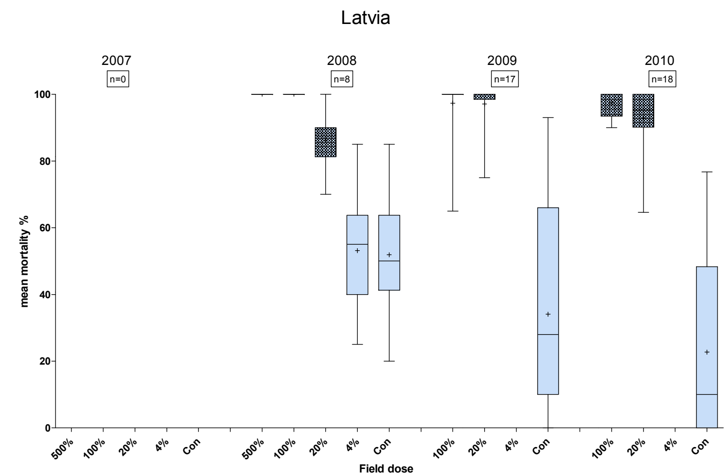
Summary of pollen beetle resistance in NORBARAG area

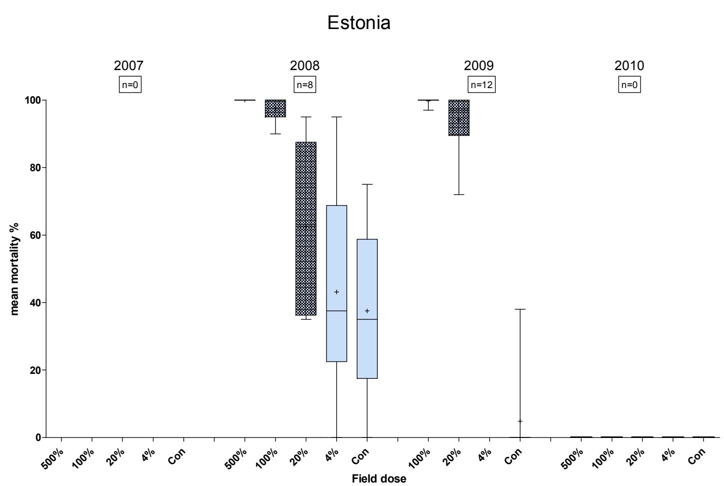
- Resistance to pyrethroid is stable/increasing.
- Tau-fluvinate provides still generally good efficacy in the field. Efficacy is similar to that in 2010 or resistance slightly increasing.
- No sign of resistance to thiachloprid.
- Indoxacarb is approved in Norway.

Meligethes aeneus resistance monitoring in Baltic countries in 2007-2010

Bayer CropScience monitoring data



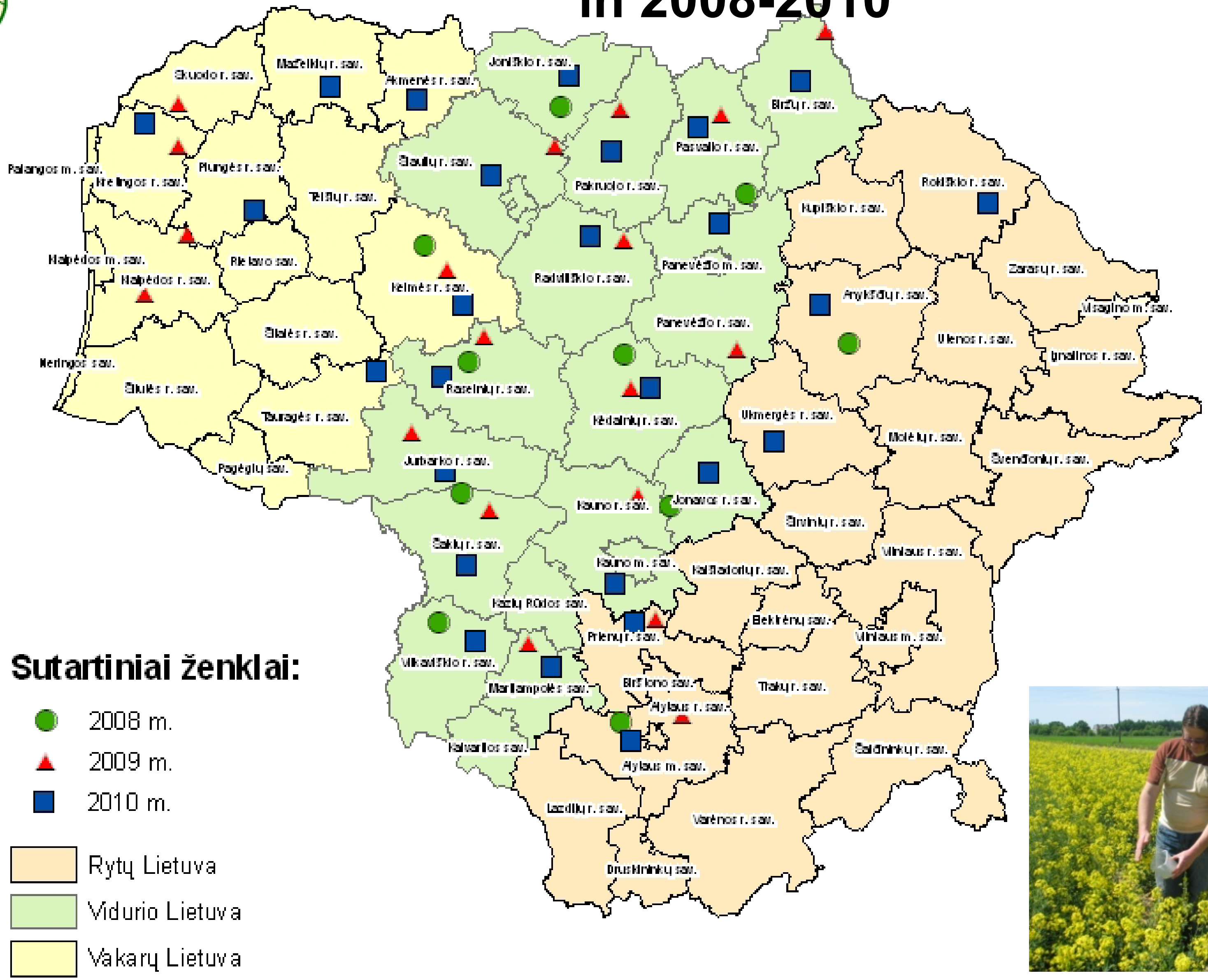




50 populations tested in 2010.
Resistance to pyrethroids is increasing.
In Estonia and Latvia pollen beetle populations seem to be less resistant than in Lithuania.
Resistance ratios in Lithuania are higher.

NORBARAG MEETING, 2010

Meligethes aeneus resistance monitoring in Lithuania in 2008-2010



Meligethes aenus susceptibility to pyrethroids (adult vial test), SOSR

2008, Institute of Agriculture (R. Šmatas data)

Region	Lambda-cyhalothrin	Alpha-cypermethrin	Deltamethrin	Tau-fluvalinate
Anykščių	Susceptible	Susceptible	Highly Susceptible	Susceptible
Alytaus	Moderatley resistant	Susceptible	Moderatley resistant	Susceptible
Vilkaviškio	Resistant	Moderatley resistant	Moderatley resistant	Susceptible
Kėdainių	Moderatley resistant	Susceptible	Susceptible	Susceptible
Jonavos	Moderatley resistant	Moderatley resistant	Resistant	Susceptible
Šakių	Susceptible	Susceptible	Moderatley resistant	Susceptible
Joniškio	Moderatley resistant	Moderatley resistant	Susceptible	Susceptible
Panevėžio	Susceptible	Moderatley resistant	Susceptible	Susceptible
Kelmės	Moderatley resistant	Susceptible	Susceptible	Susceptible
Raseinių	Moderatley resistant	Moderatley resistant	Moderatley resistant	Susceptible

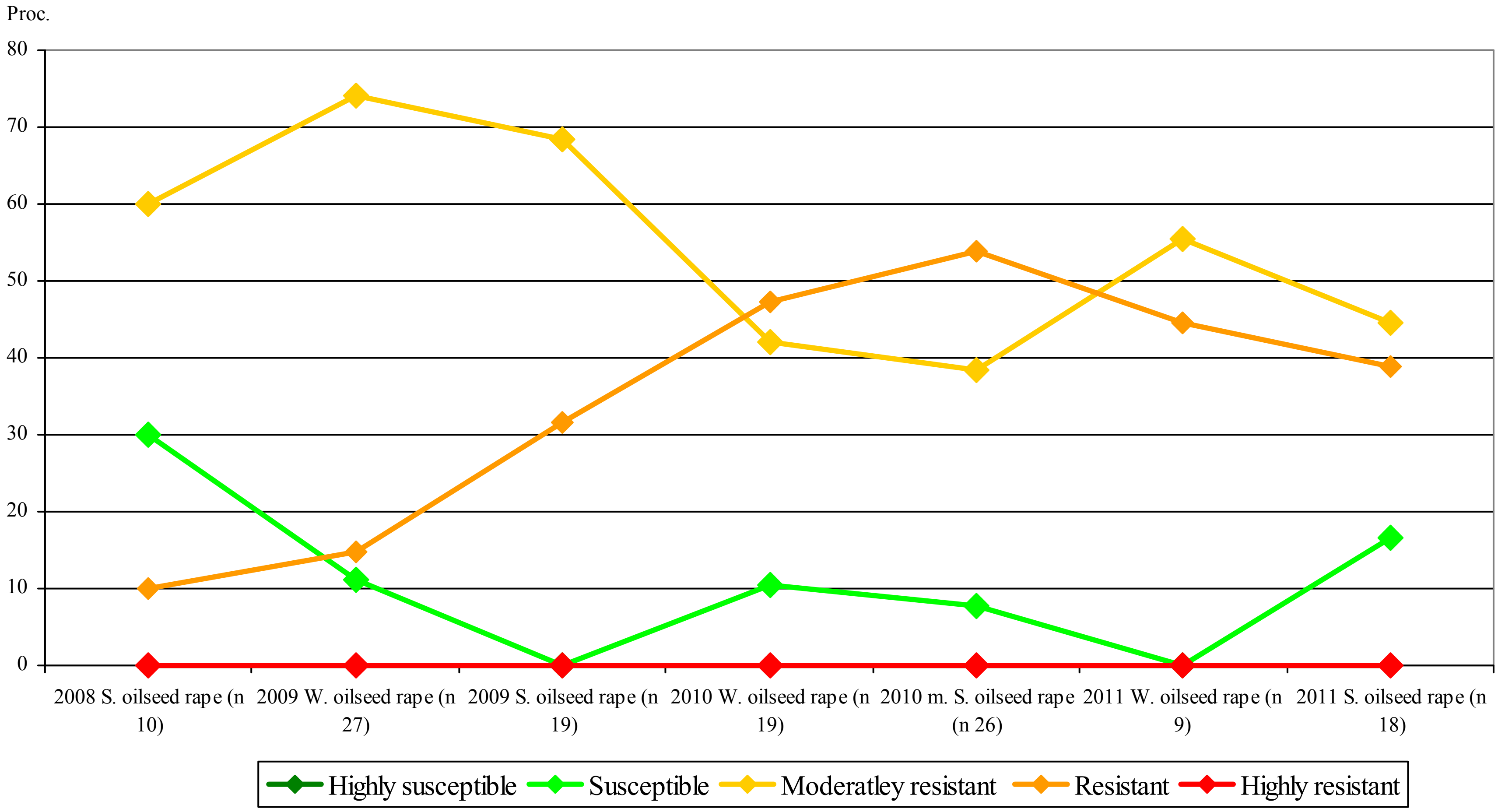
Meligethes aenus susceptibility to pyrethroids (adult vial test), SOSR 2010, Institute of Agriculture (R. Šmatas data)

Region	Lambda-cyhalothrin	Alpha-cypermethrin	Deltamethrin	Tau-fluvalinate
Akmenės	Resistant	Moderatley resistant	Resistant	Moderatley resistant
Kelmės	Resistant	Resistant	Resistant	Resistant
Kretingos	Resistant	Resistant	Resistant	Resistant
Mažeikių	Moderatley resistant	Resistant	Resistant	Resistant
Plungės	Rezistentiška	Resistant	Resistant	Resistant
Tauragės	Moderatley resistant	Moderatley resistant	Moderatley resistant	Moderatley resistant
Biržų	Susceptible	Susceptible	Highly Susceptible	Susceptible
Jonavos	Resistant	Moderatley resistant	Resistant	Moderatley resistant
Joniškio	Moderatley resistant	Moderatley resistant	Resistant	Resistant
Jurbarko	Moderatley resistant	Moderatley resistant	Moderatley resistant	Moderatley resistant
Kauno	Resistant	Resistant	Resistant	Moderatley resistant
Kėdainių	Moderatley resistant	Moderatley resistant	Moderatley resistant	Moderatley resistant
Marijampolės	Resistant	Resistant	Resistant	Moderatley resistant
Pakruojio	Resistant	Moderatley resistant	Resistant	Resistant
Panevėžio	Moderatley resistant	Moderatley resistant	Moderatley resistant	Susceptible
Pasvalio	Moderatley resistant	Moderatley resistant	Moderatley resistant	Susceptible
Prienų	Resistant	Resistant	Resistant	Moderatley resistant
Radviliškio	Resistant	Resistant	Resistant	Susceptible
Raseinių	Moderatley resistant	Resistant	Resistant	Moderatley resistant
Šakių	Resistant	Moderatley resistant	Resistant	Susceptible
Šiaulių	Resistant	Resistant	Resistant	Moderatley resistant
Vilkaviškio	Moderatley resistant	Resistant	Resistant	Susceptible
Alytaus	Resistant	Resistant	Resistant	Moderatley resistant
Anykščių	Moderatley resistant	Moderatley resistant	Resistant	Moderatley resistant
Ukmergės	Resistant	Resistant	Moderatley resistant	Moderatley resistant
Rokiškio	Susceptible	Susceptible	Susceptible	Susceptible

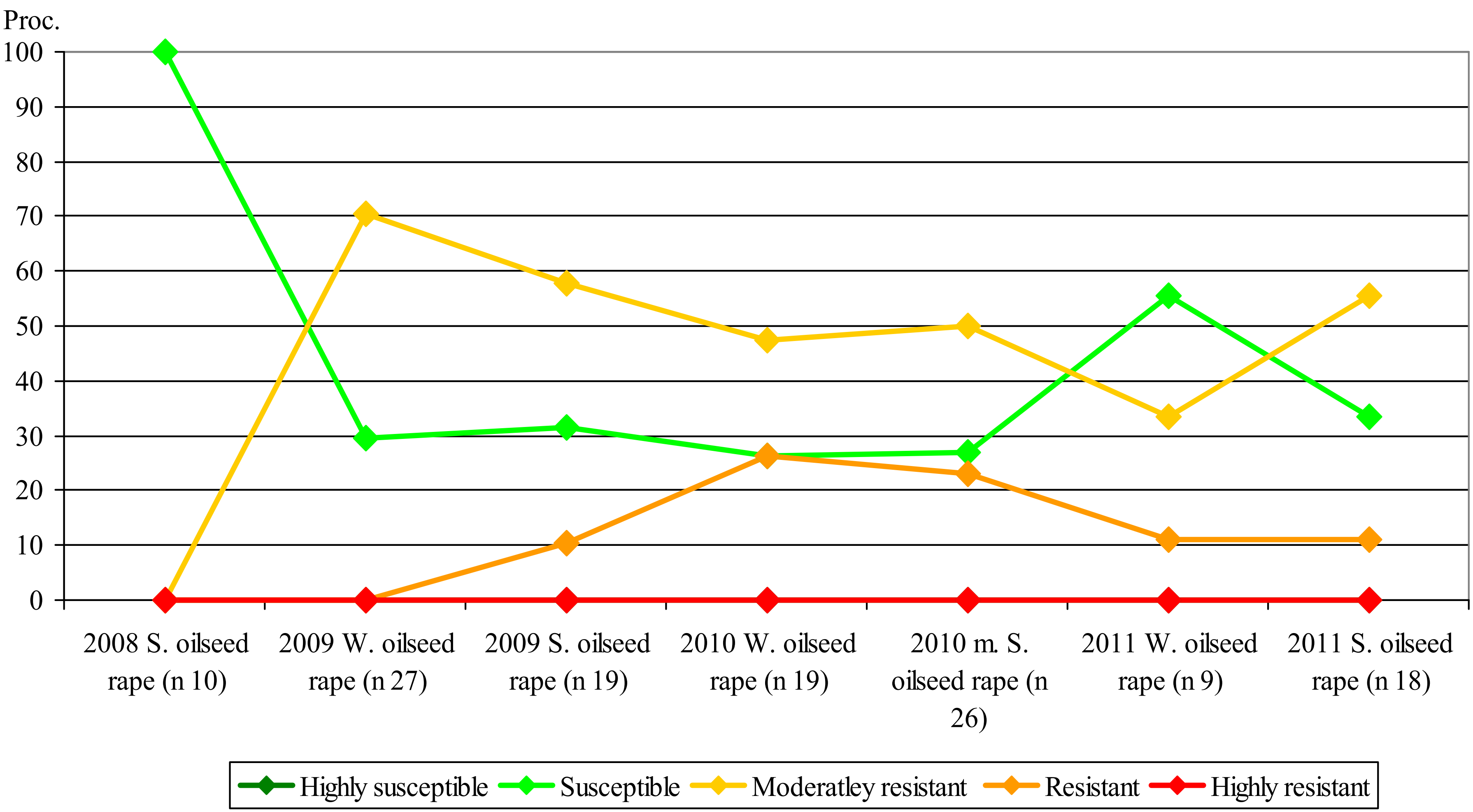
Meligethes aenus susceptibility to lambda-cyhalothrin

(adult vial test)

2008-2011, Institute of Agriculture (R. Šmatas data)



Meligethes aenus susceptibility to tau-fluvalinate
(adult vial test)
2008-2011, Institute of Agriculture (R. Šmatas data)



Resistance management strategy for pollen beetle in Lithuania

Abundance of pollen beetle must be observe in whole field.
Use treatment threshold.
Rotate between different MoA insecticides.
Pyrethroids are to be applied not more than once per season for pollen beetle control.
Proteus (thiacloprid+deltamethrin) should not be recommended for resistance management. The pyrethroid part of the product does not contribute to the effect, and selects for further pyrethroidre resistance.
New active ingredients coming to market for pollen beetle control in Lithuania.

Label information on insecticide resistance management in Lithuania

Atsparumo išsivystymo mažinimo priemonės

Neatmetama galimybė, kad gali išsivystyti rapsinių žiedinukų ir koloradų vabalų atsparumas piretroidų cheminės grupės produktams, tame tarpe ir Cyperkill 250 EC, todėl gali sumažėti insekticido efektyvumas. Insekticidą Cyperkill 250 EC būtina naudoti pagal rekomendacijas t.y. nuo rekomenduojamų kenkėjų, nurodytu purškimo laiku, naudojant registruotas normas, neviršyti purškimų skaičiaus. Nenaudoti mažesnės normos nei nurodyta etiketėje. Nepurkšti profilaktiškai, purkšti tik pasirodžius kenkėjams. Jei įmanoma, naudoti sistemoje su kitų cheminių grupių insekticidais.

Weed resistance

- The occurrence of herbicide-resistant weeds has increased.
- According to data of International Survey of Herbicide-Resistant Weeds 367 resistant biotypes, 200 species are known at this time.

Situation with herbicide-resistant weeds in Europe

Country	**Number of resistant species**	**Country**	**Number of resistant species**
Bulgaria	4	Hungary	1
Czech Republic	16	Poland	10
Denmark	3	Sweden	2
France	33	United Kingdom	24
Germany	26	Lithuania	No data

www.weedscience.org/
2011-09-06

Weed resistance

Home	Resistant Weeds	Researchers	Herbicides	Add Case	Weed Photos	Contact

HERBICIDE RESISTANT WEEDS OF POLAND

#	Species Click for details	Common Name	Year	Herbicide Site of Action
1.	*Amaranthus retroflexus*	Redroot Pigweed	1991	Photosystem II inhibitors
2.	*Apera spica-venti*	Wind Bentgrass	2005	ALS inhibitors
3.	*Capsella bursa-pastoris*	Shepherd's-purse	1984	Photosystem II inhibitors
4.	*Chenopodium album*	Lambsquarters	1991	Photosystem II inhibitors
5.	*Conyza canadensis*	Horseweed	1983	Photosystem II inhibitors
6.	*Conyza canadensis*	Horseweed	2000	ALS inhibitors
7.	*Digitaria sanguinalis*	Large Crabgrass	1995	Photosystem II inhibitors
8.	*Echinochloa crus-galli*	Barnyardgrass	1995	Photosystem II inhibitors
9.	*Epilobium ciliatum*	American willowherb	1995	Photosystem II inhibitors
10.	*Solanum nigrum*	Black Nightshade	1995	Photosystem II inhibitors

www.weedscience.org/

Weed resistance monitoring

Herbicide susceptibility of wild oats

A joint project by the herbicide subgroup of NORBARAG

Eexperiments showed no evidence of resistance to fenoxaprop-P, tralkoxydim and pinoxaden in wild oat populations in the Nordic zone zone but revealed that the susceptibility of populations may vary considerably.

Mathiassen et al. , 2011

Weed resistance monitoring in Lithuania

- Test on *Apera* resistance in 2010 (Bayer CropScience monitoring).
- 10 samples were tested – 1 was resistant to ALS herbicides.
- Resistance monitoring on *Apera* will be started in 2012 at the Institute of Agriculture.


Thank you for attention