



Insekticid Resistens

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Insekter

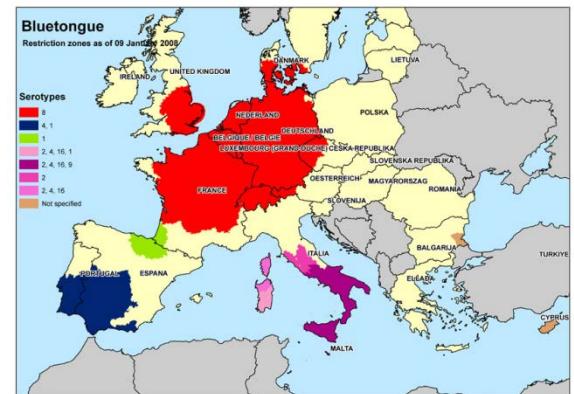
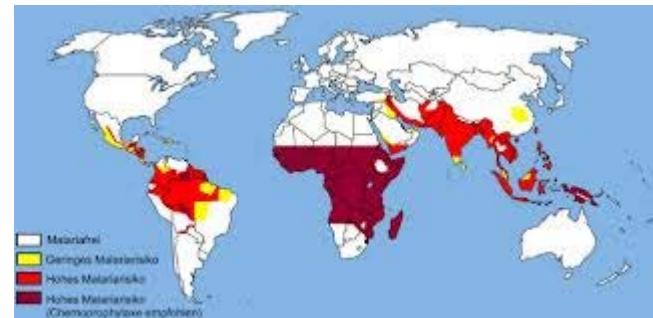


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Insekter som skadedyr

- Humane sygdomsvektorer; stikmyg der overfører fx malaria, dengue-feber, ...
- Veterinære sygdomsvektorer; mitter der overfører bluetongue virus, ...
- Planteskadegører; insekter der spiser planter og evt. overfører sygdomme fx. bladlus, glimmerbøsser, ...
- Lagerskadedyr.
- Skadedyr i hus og hjem.



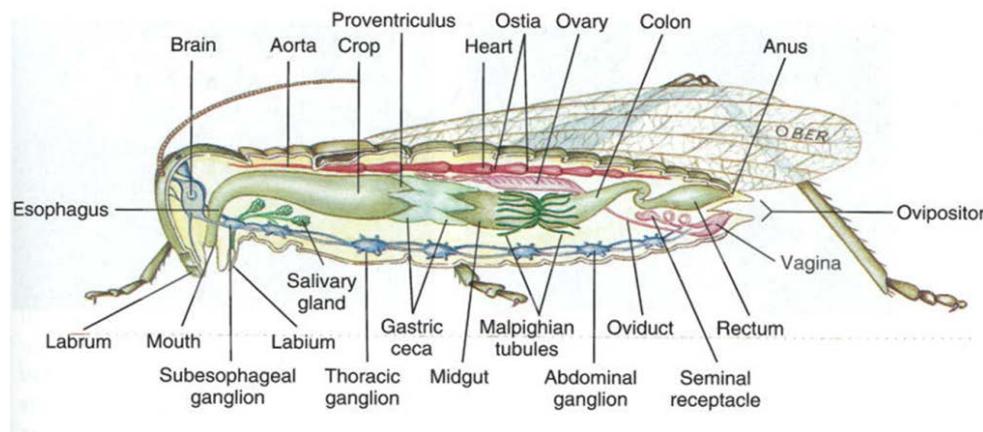
Insekter - Bekæmpelse

- Hygjne, rengøring og bygninger.
- Forebyggelse (fx sædskifte, jordbehandling, såning, sort).
- Skadetærskler, prognoser.
- Bekæmpelse med fælder, biologisk bekæmpelse og insekticider (GMO).



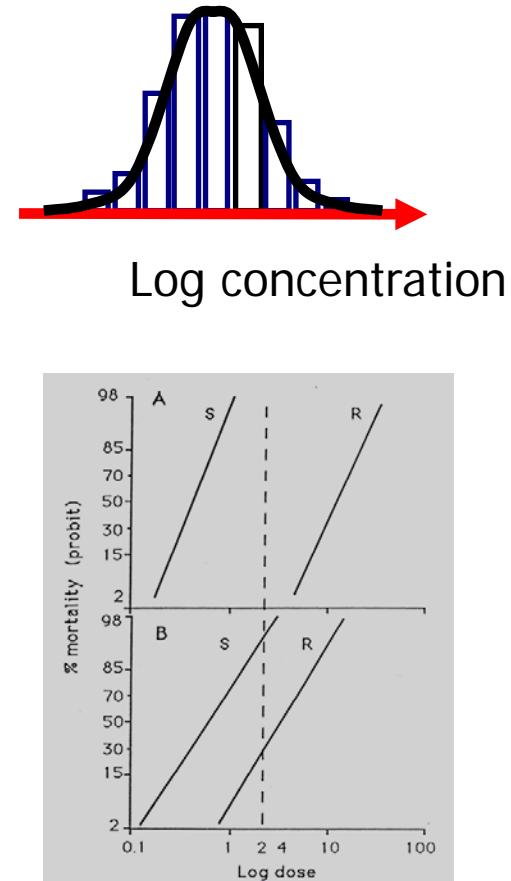
Insekta

- Insekta virker ofte på forbindelsen mellem to nerveceller – synapsen.
- Nogle midler forstyrre hormonbalancen (forplantning eller hudskifte) eller syntesen af det udvendige skelet.



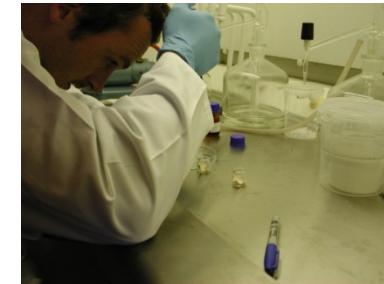
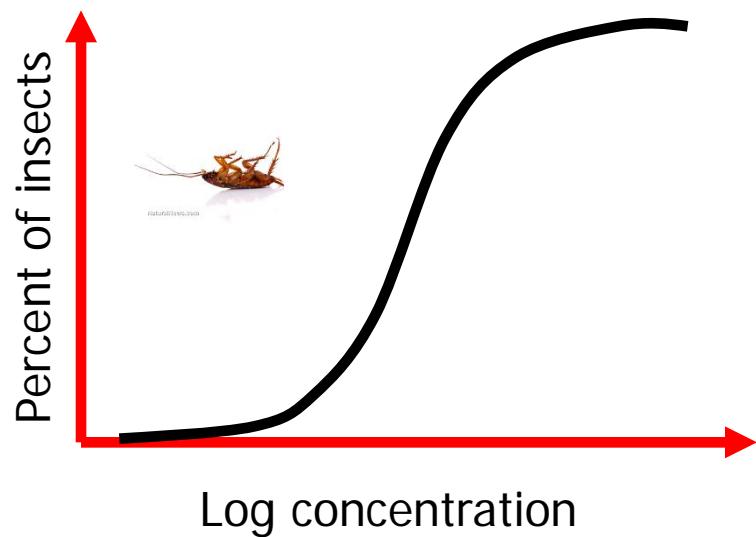
Giftighed af insekticider

- Giftigheden af insekticider varierer mellem insekt populationer. Stor variationer af giftighed!
- Stor naturlig variation i tolerance er **ikke resistens**.
- **Resistens** er et genetisk respons på giftestoffer der forringør effekten af bekæmpelse.
- **Resistens** forårsager behandlingssvigt.



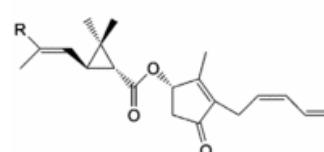
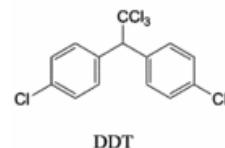
Bioassay

Måler effekten af insektgift på en population af levende insekter.



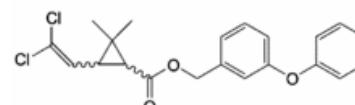
Insektafgifte - Pyrethroid

- Pyrethrum; planteekstrakt med blanding af pyrethriner som nedbrydes af UV-lys (+synergist).
- Permethrin; syntetisk, persistent.
- Binder til Na-kanalen således at denne holdes åben.
- Meget udbredt anvendelse.

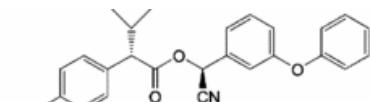


R = H Pyrethrin I

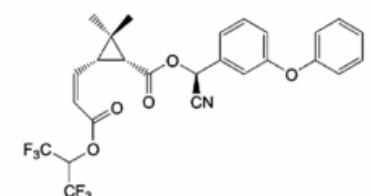
R = CO₂ Pyrethrin II



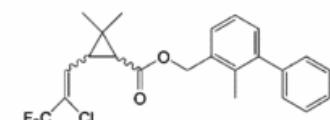
Permethrin



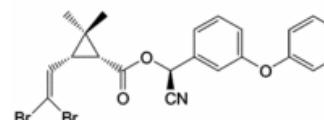
Fenvalerate



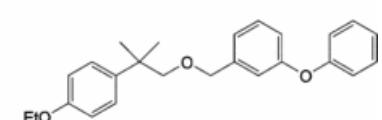
Acrinathrin



Bifenthrin

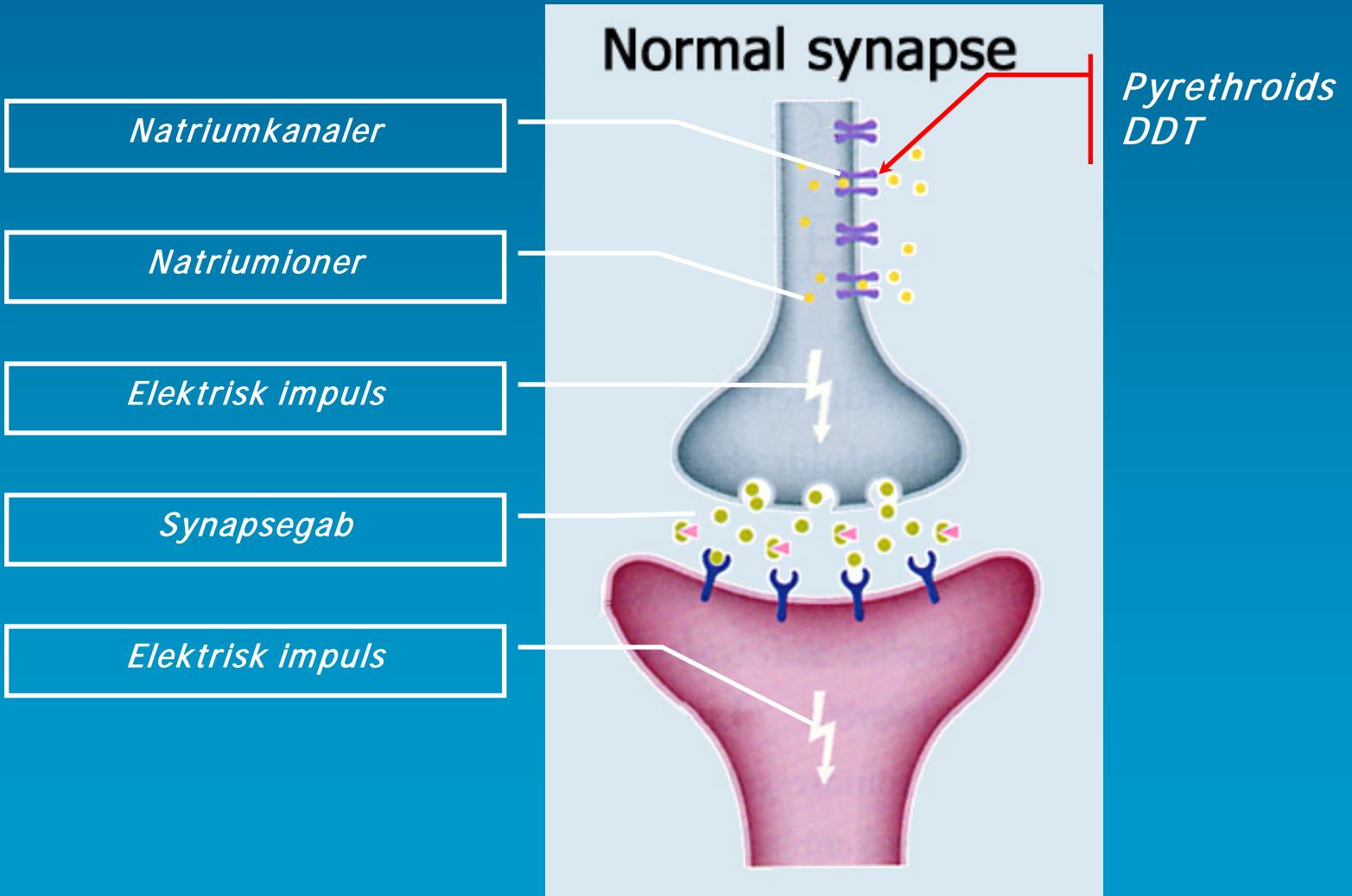


Deltamethrin



Etofenprox

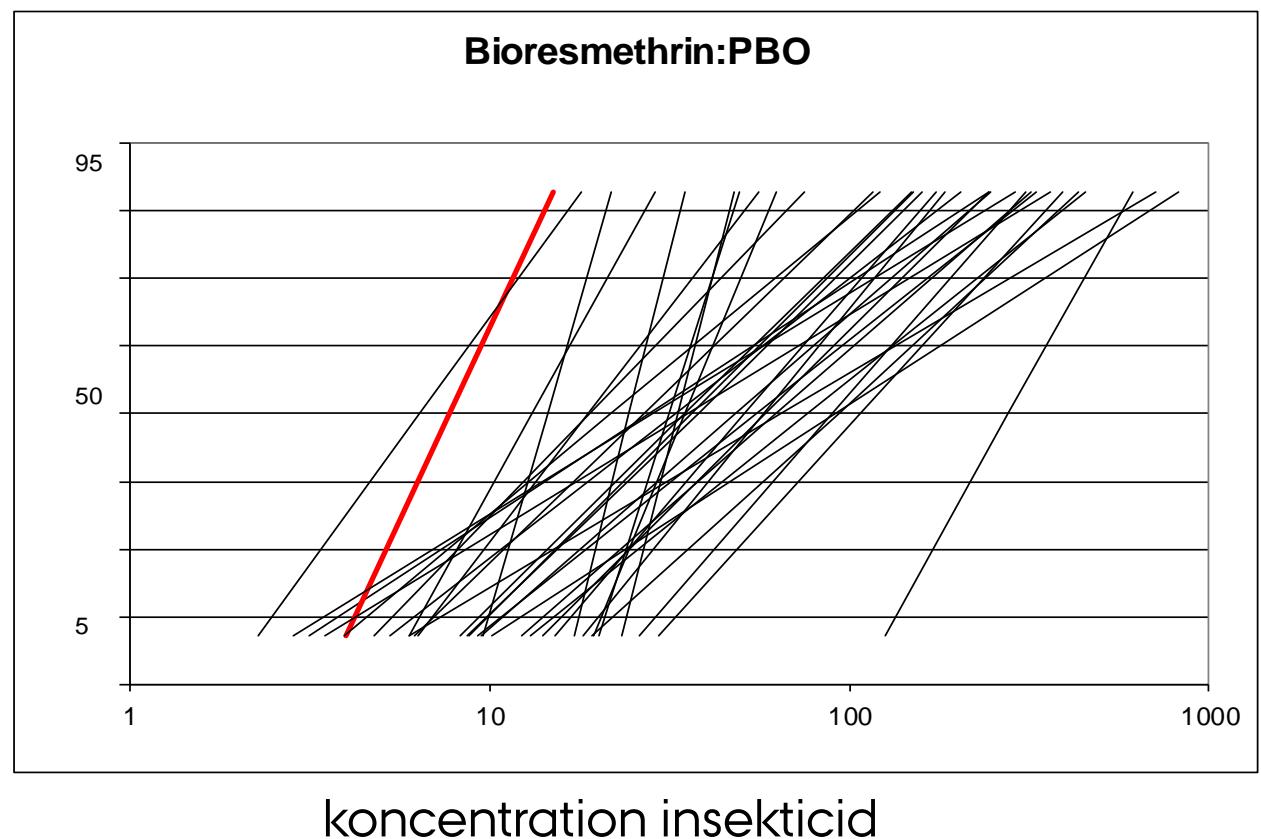
Synapse



Stuefluen – Pyrethroid-resistens

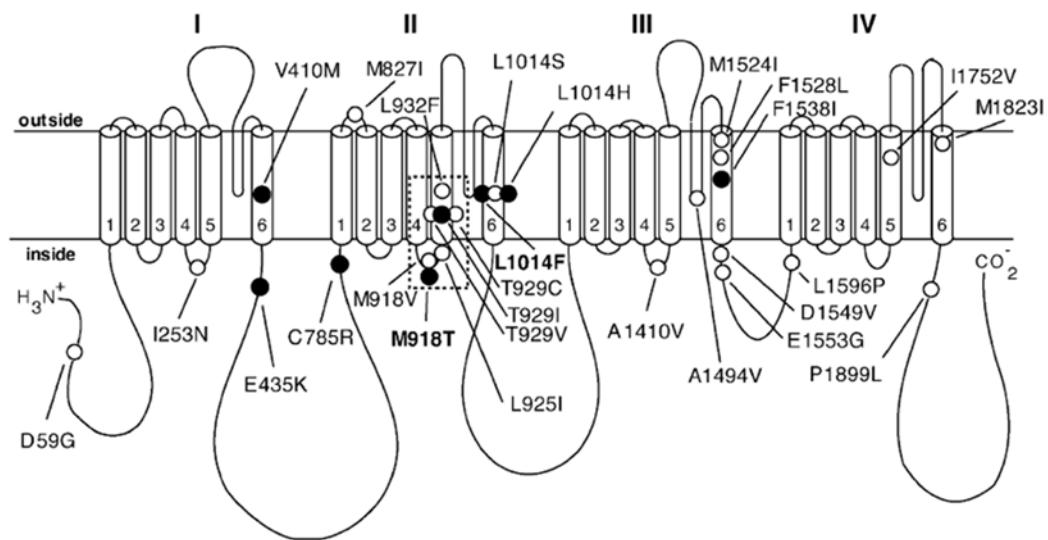


% døde

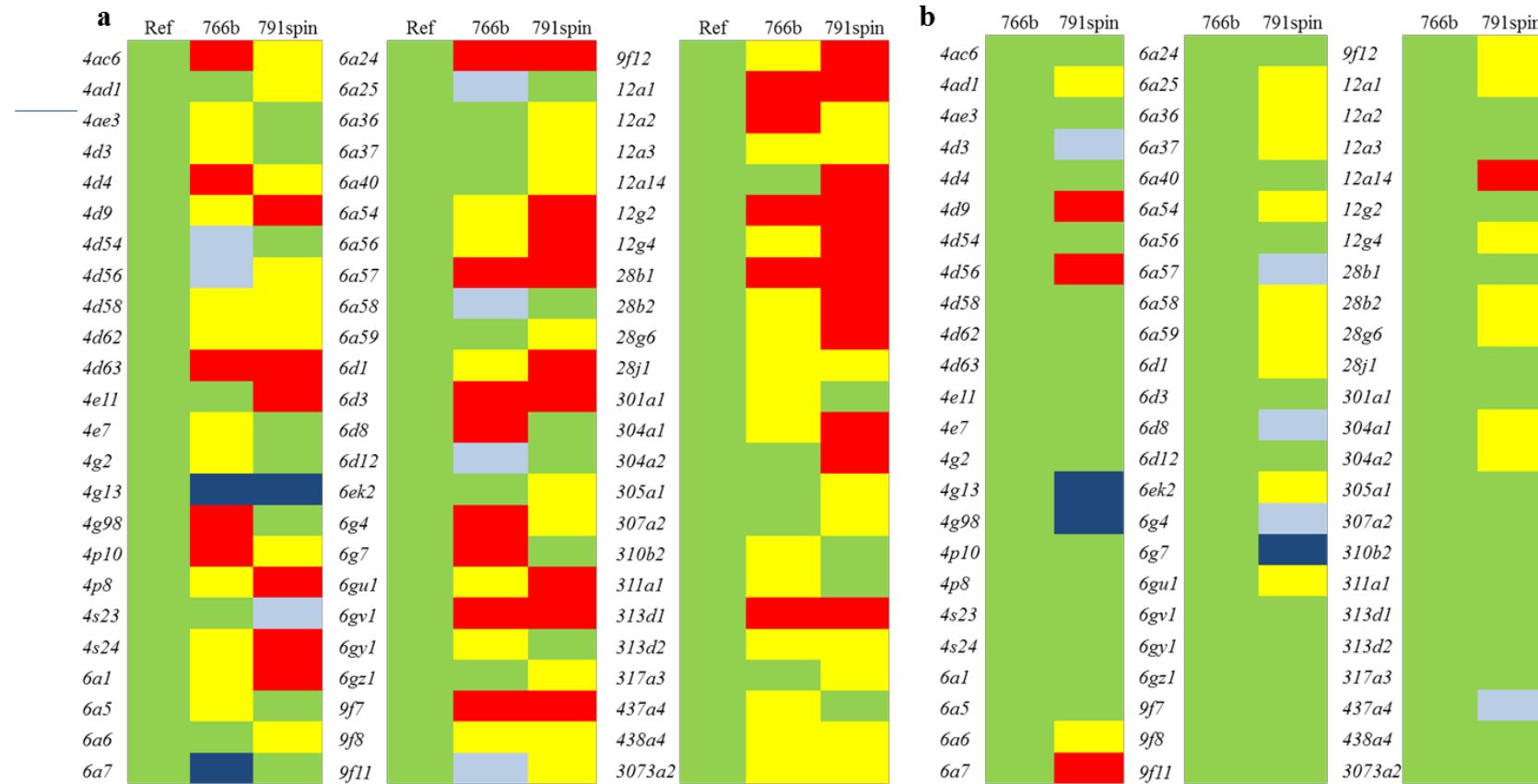


Resistenes mutation

- Mutationer i Na-kanal gener er fundet hos mange insektarter.
- Frekvensen af mutationer kan relativ nemt bestemmes molekylært med PCR.



Metabolisk resistans: Udtryk af P50 gener



Down-regulation > 5-fold , down-regulation < 5-fold , no change , up-regulation < 5-fold , up-regulation > 5-fold

Insekticid resistens

- Resistens i Danmark; Aarhus Universitet Agroøkologi, AU-Flakkebjerg
- Mange firmaer laver årlige undersøgelser.
- Norbarag (Nordic Baltic Resistance Action Group); Norden + Baltikum mødes årligt.
- IRAC (www.irac-online.org); samarbejde mellem de store agrokemiske virksomheder.

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IRAC
Insecticide Resistance Action Committee
www.irac-online.org

Method No. 021

IRAC Susceptibility Test Methods Series
Version 3.3

Detail:

Method:	IRAC No. 021
Status:	Approved
Species:	Pollen beetle (<i>Aulacothrix pollinis</i>)
Species Stage:	Adult
Product Class:	Insecticides

Comments:
The method, "Adult Pollen-beetle test for insecticidal resistance", is based on the IRAC Method No. 021 for arthropods, specifically. It can be used for monitoring sensitivity or drug resistance of stored grain to insecticides. Since these insecticides are widely used in Europe and North America, it is important to have a reliable method for testing them and carry out a sensitivity monitoring.

Description:

Materials:
Insecticide, container, fine-painted sand, screen for test-digital, weighing platform for scale, analytical balance, petriplates for meeting diversity, other glassware, wire-wire mesh, microtweezers, small funnel to transfer beetles to the vials, stereomicroscope or hand lens, paper towels, mesh-maylene mesh.

Method:

(A) Control: Approximately 200 adult beetles at different locations across the different field. These beetles, in general, are collected from the same field. Place some dry paper towel at the bottom of the container, and add some oil-coated paper towels plus two or three cage references to the food source [Figure 1]. The beetles should be introduced to the cage reference and the food source.

(B) Physically handling of the beetles should be reduced to a minimum.

(C) The test conditions should be similar to those of the field. The temperature should avoid excessive temperature, humidity or vibration stresses.

(D) A small amount of insecticide is applied to the food source. The beetles are released into a ventilated feeding cage (or equivalent) kept at room temperature.

(E) The test conditions are given with an internet surface area of 20–30 cm². Insect purchase was done from a commercial supplier and the insecticide was obtained from a commercial source, following storage – 10°C freezing winter, rising with acetone and air drying for at least 4 hours before use.

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Resistens situationen i Danmark 2017

- Vi er langt mod Nord; relativt få skadedyr i en kort vækstsæson.
- Relativt lavt behandlingsniveau.
- Glimmerbøsser
- Jordlopper
- Kornbladlus
- Hindbær(jordbær)snudebiller



Resistens hos glimmerbøsser.

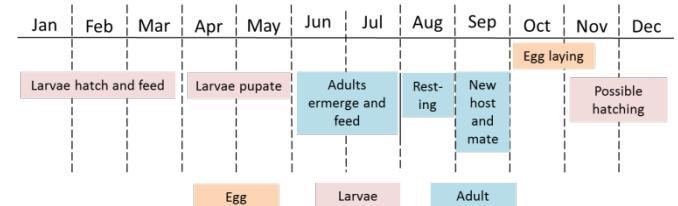
- Udbredt resistens hos glimmerbøsser overfor pyrethroider, men variation mellem produkterne. Resistensen er aftagende.
- Bruges der pyrethroid er der størst chance for at Mavrik (tau-fluvalinate) har god effekt overfor glimmerbøsser.
- Glimmerbøsser er følsomme overfor alle andre midler.
- Skadetærskel er hævet; rotation af midler.





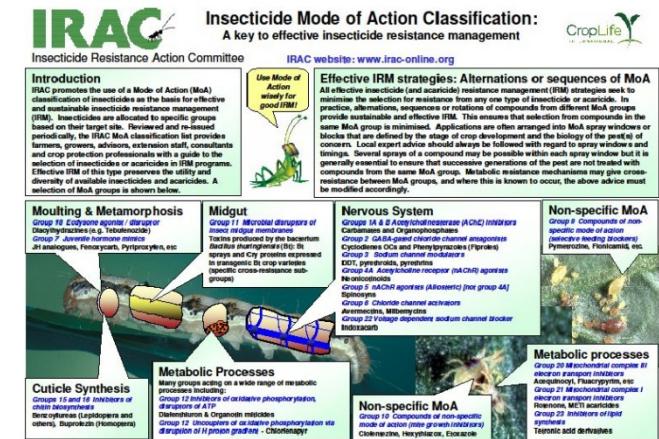
Resistens hos rapsjordlopper?

- Ingen pyrethroid resistens i Danmark; enkelte individer er mere tolerante.
- Resistens gener kan findes; både target site og metabolisk.
- Pyrethroid resistens i det nordlige Tyskland og Baltikum.
- Bejdsning af udsæd med neonikotinoider er en god løsning.



Resistens forebyggelse og management

- Sjældent store problemer
- Behandlingssvigt skyldes oftest forkert anvendelse; der er sjældent tale om resistens.
- Rotation af midler med forskellige virkningsmekanismer.
- Små afgrøder; OFF LABEL anvendelse.
- Fremtiden: klima, nye afgrøder=nye skadedyr.



Mikroevolution af pesticidresistens

SYNAPSE

Promethrin