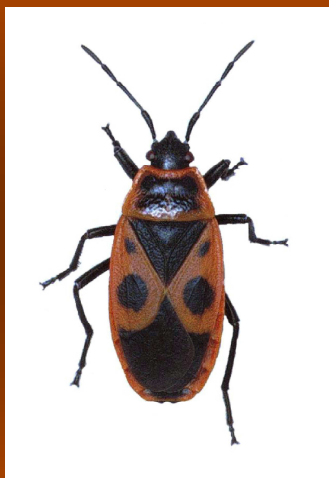


Adipokinetic peptides increase effectivity of insecticides



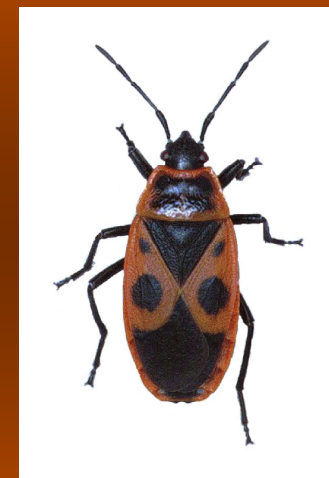
Dalibor Kodrík

Mirna Velki

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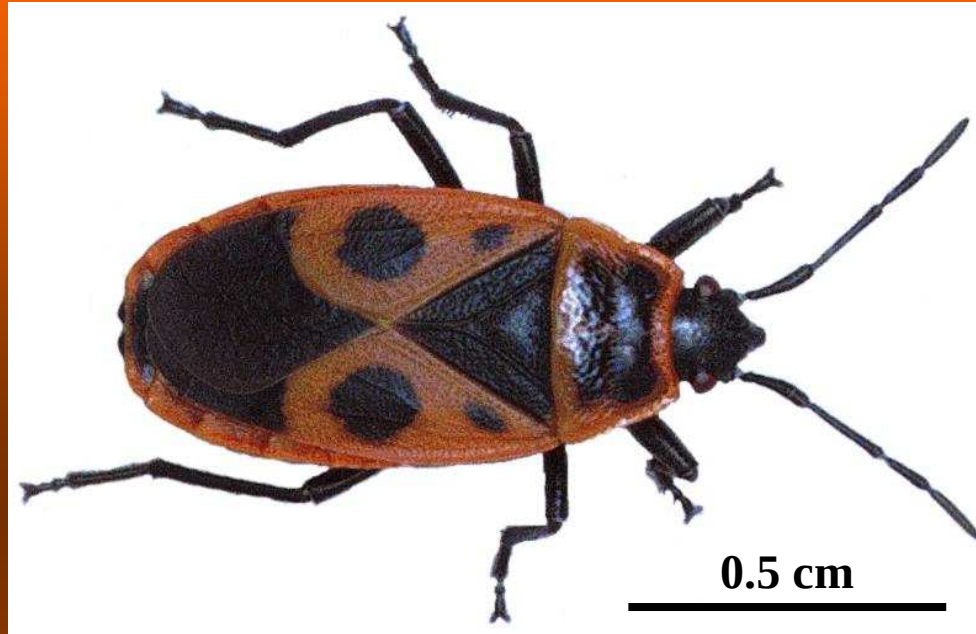
Adipokinetic hormones (AKH)

Functions:

AKHs are **STRESS HORMONES** stimulating catabolic reactions making energy more available, while inhibiting synthetic reactions – **“INSECT GLUCAGON”**

Apart from the role in energy metabolism they control a number of accompanying processes

Model insect species: firebug *Pyrrhocoris apterus*



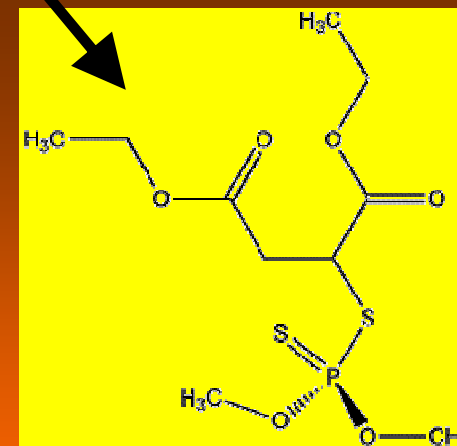
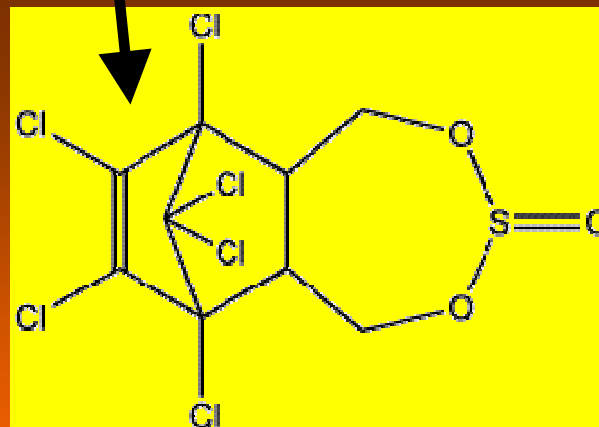
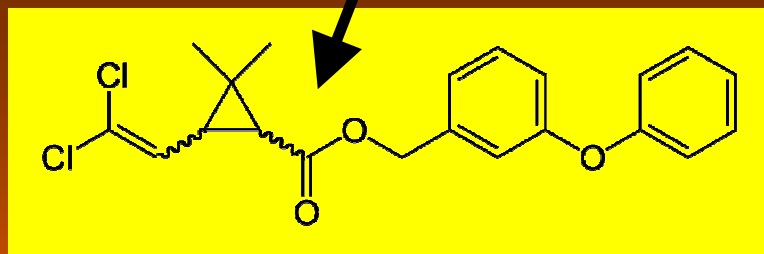
Advantageous:

- interesting biology
- easy breeding and handling
- known AKHs: Pyrap-AKH, Peram-CAH-II
- plenty of literature data

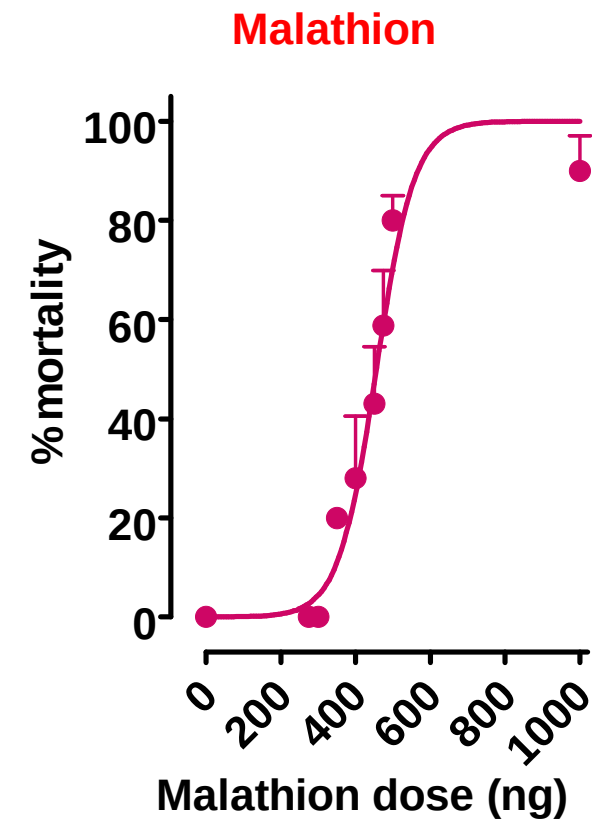
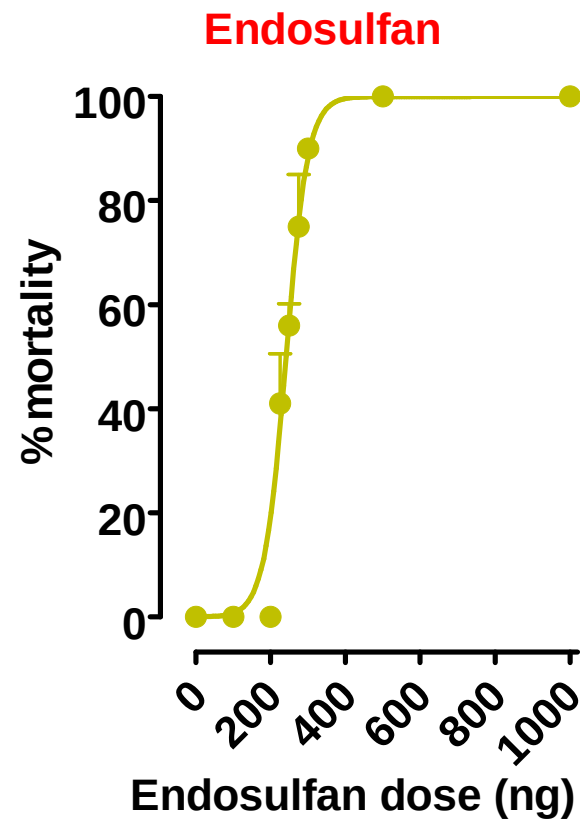
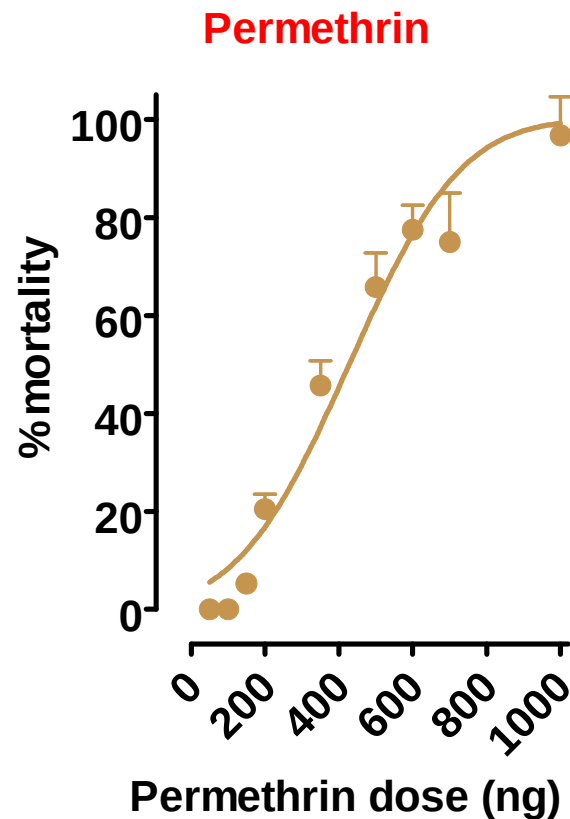
Used agents:

1. Pyrap-AKH: 10 or 80 pmol
pGlu-Leu-Asn-Phe-Thr-Pro-Asn-Trp-NH₂

2. Insecticides:
permethrin, endosulfan, malathion



Effect of the insecticides on the mortality 24 h after treatment



Permethrin:

LD15: 50 ng,

LD50: 100 ng

Endosulfan:

LD15: 200 ng,

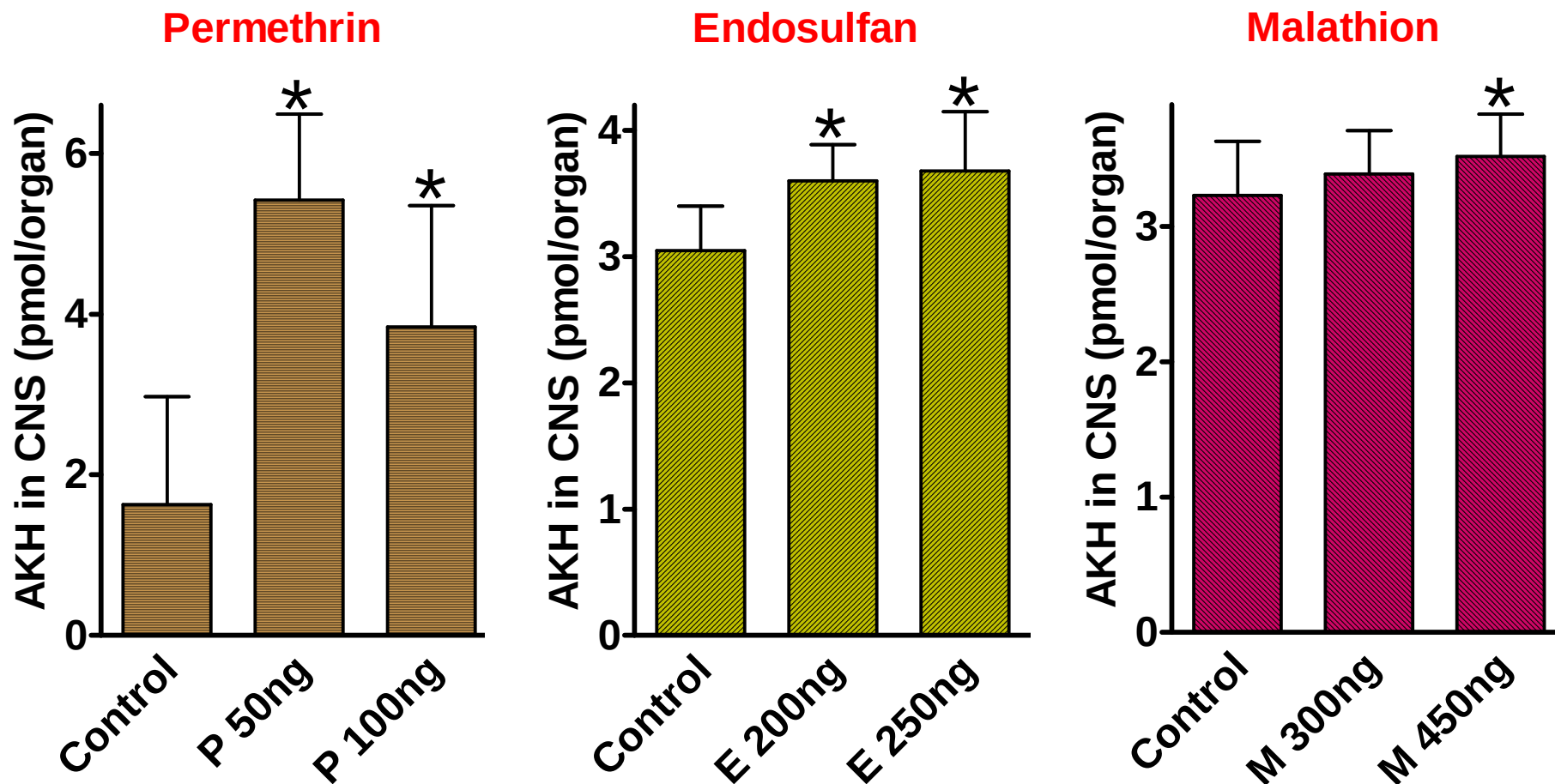
LD50: 250 ng

Malathion:

LD15: 300 ng,

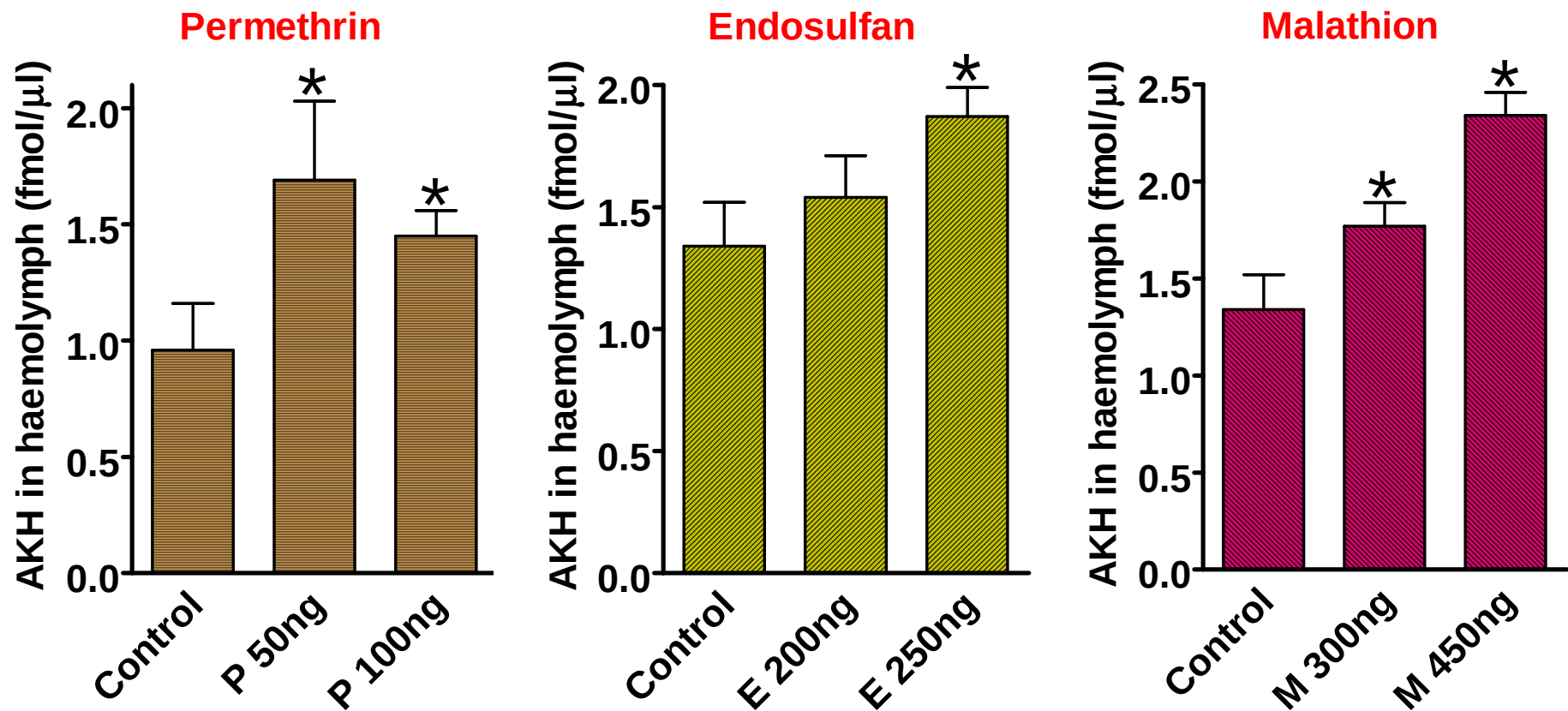
LD50: 450 ng

Effect of insecticides on AKH level in CNS 24 h after treatment



Statistics: * - insecticide vs. control (Ringer saline) $p < 0.05$

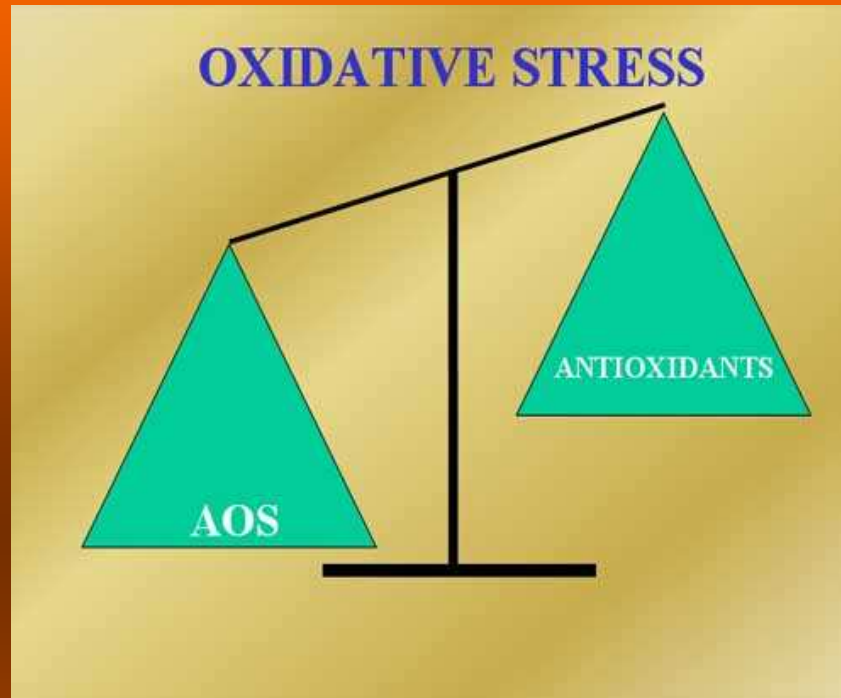
Effect of insecticides on AKH level in haemolymph 24 h after treatment



Statistics: *- insecticide vs. control (Ringer saline) $p < 0.05$

**Endosulfan and malathion cause
oxidative stress in insect body!**

What is it OXIDATIVE STRESS? Increase of (RE)ACTIVE OXYGEN SPECIES (ROS or AOS) and decrease of ANTIOXIDANTS!



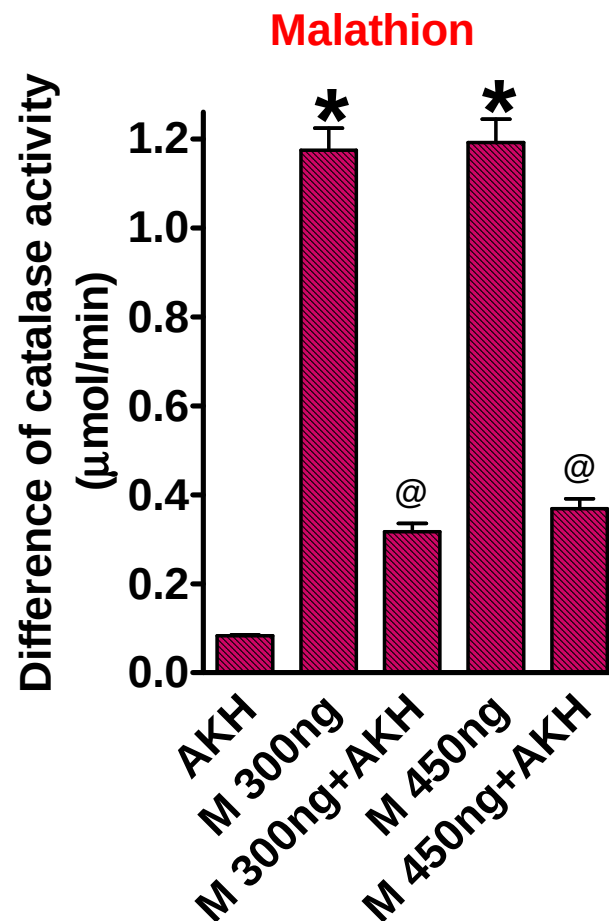
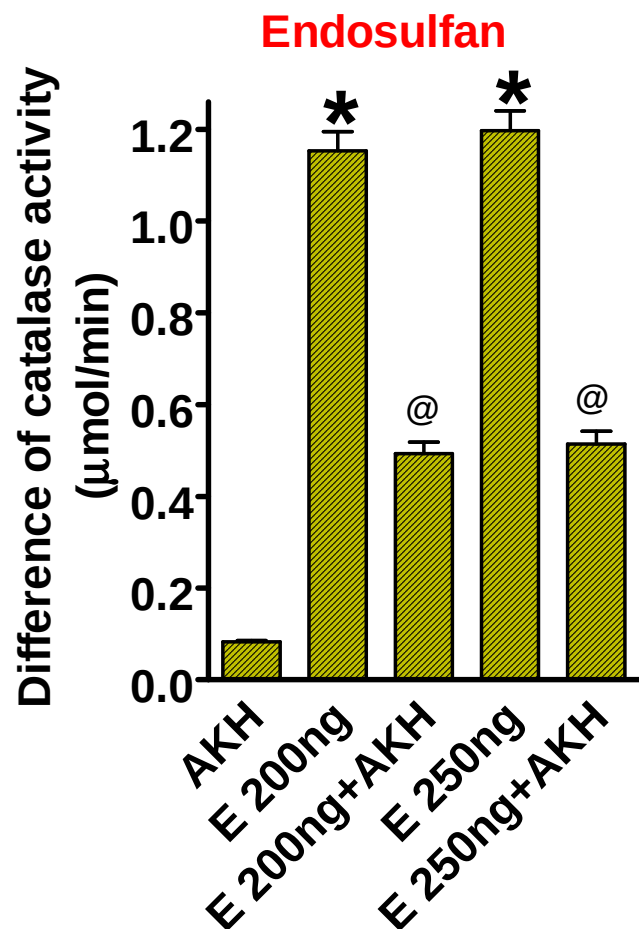
ROS:

O_2^- - superoxide radical
 H_2O_2 - hydrogen peroxide
 OH^- - hydroxyl radical

ROS defence - antioxidants:

Enzymes – superoxide dismutase, catalase, glutathion peroxidase
Molecular scavengers – ascorbic acid, tocopherol, glutathion

Effect of insecticides and Pyrap-AKH (80 pmol) on catalase activity in the whole bug body 3 h after treatment

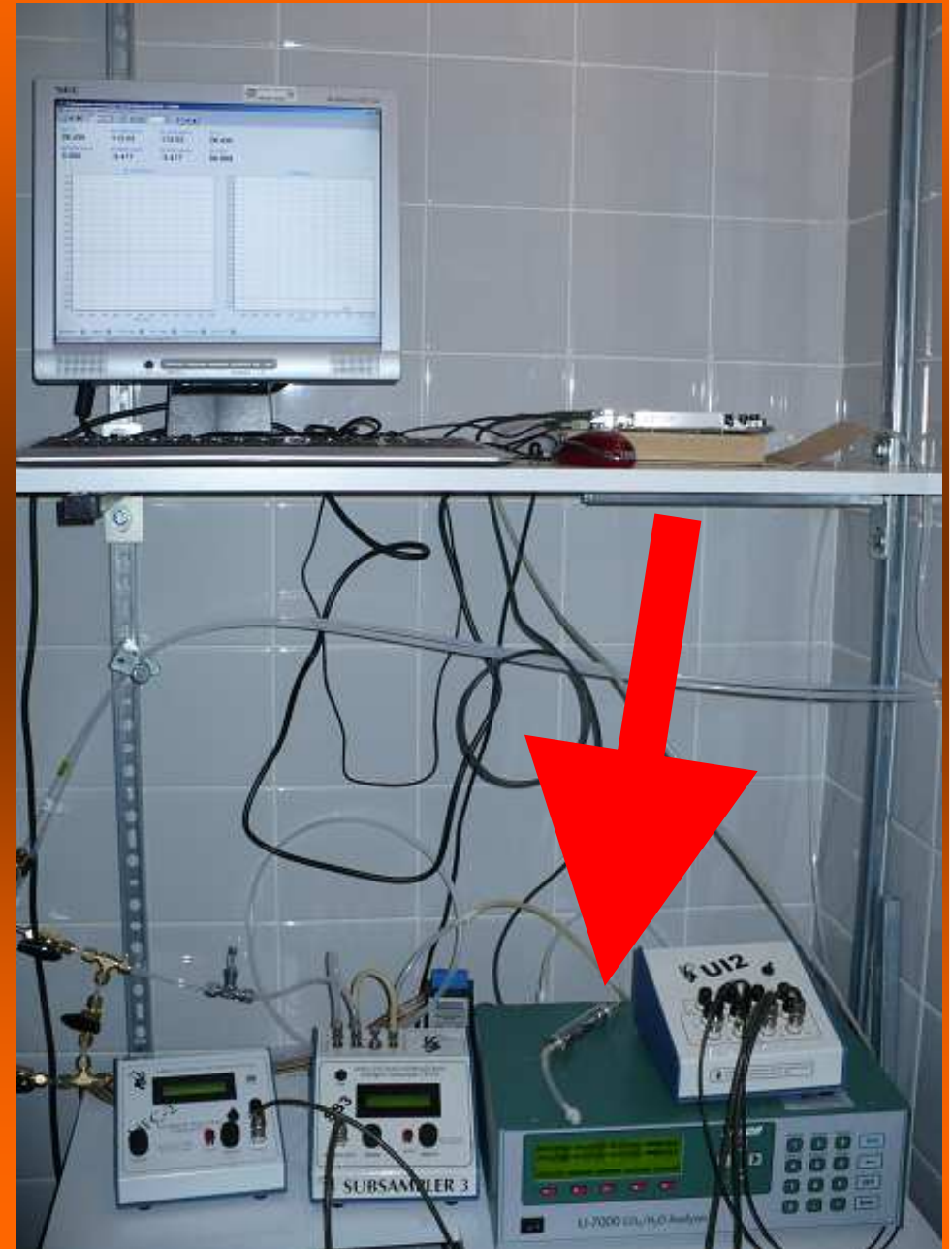
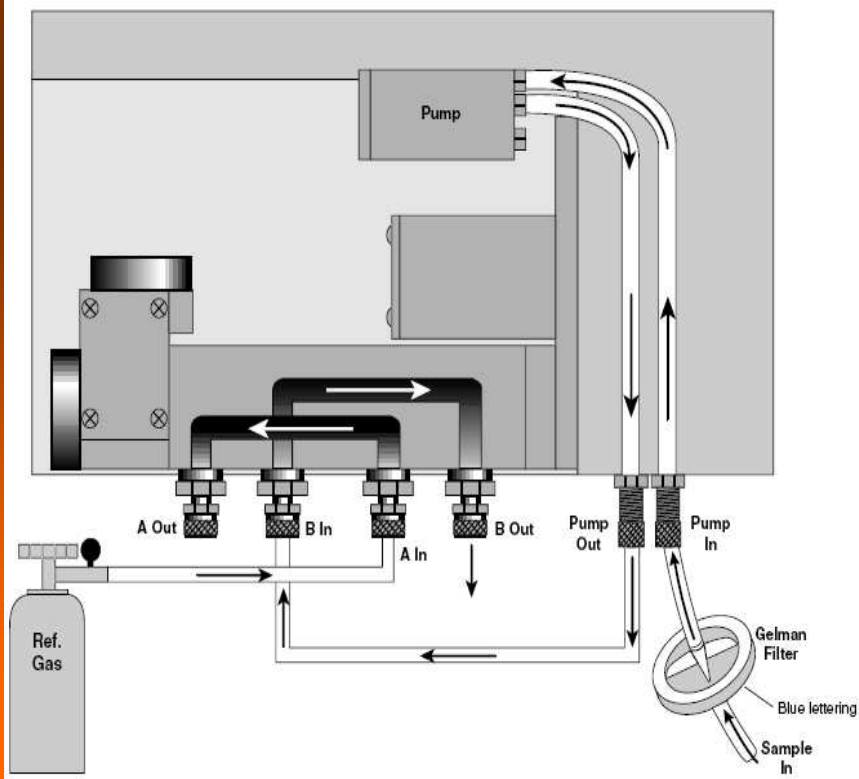


Statistics: * - AKH vs. insecticide, @ - insecticide vs. insecticide+AKH; $p < 0.05$

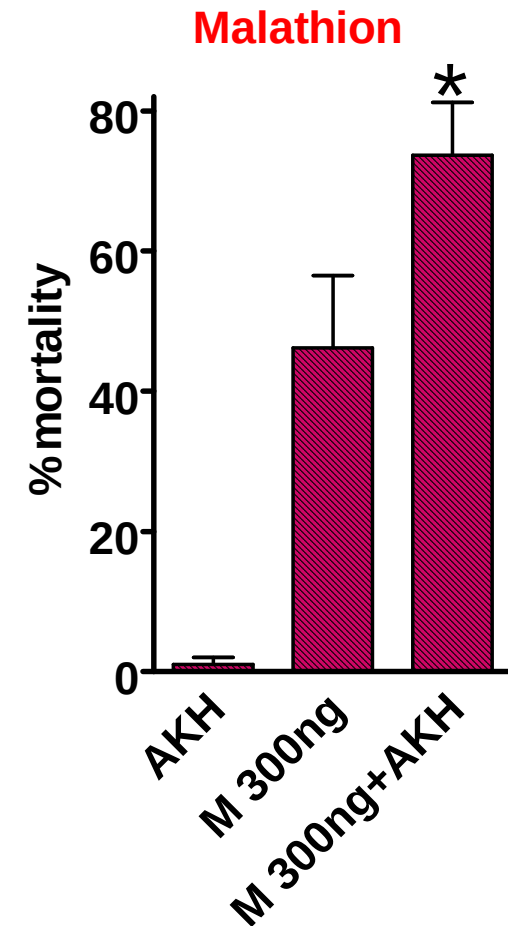
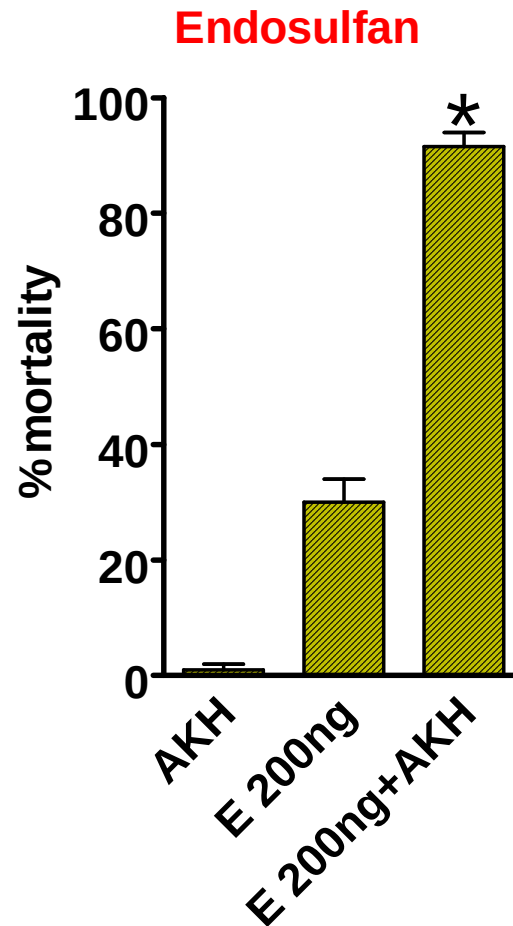
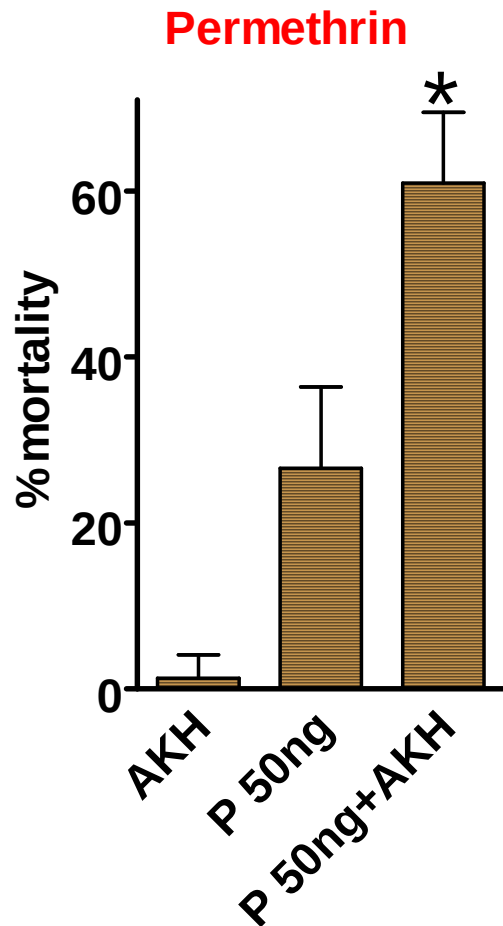
Metabolic rate measuring - the carbon dioxide production

CO₂ measurement

by LI-7000 (LI-COR Biosciences, USA). The carbon dioxide measurement is based on the difference of infrared radiation passing through two gas cells



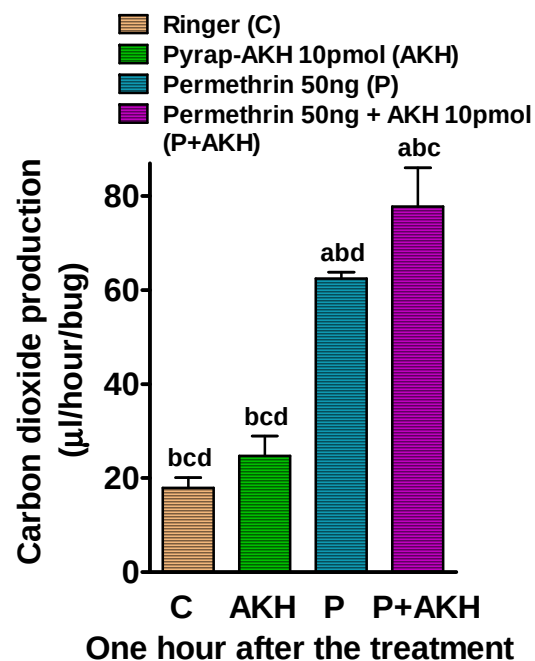
Effect of Pyrap-AKH (80 pmol) on the mortality elicited by the insecticides 24 h after treatment



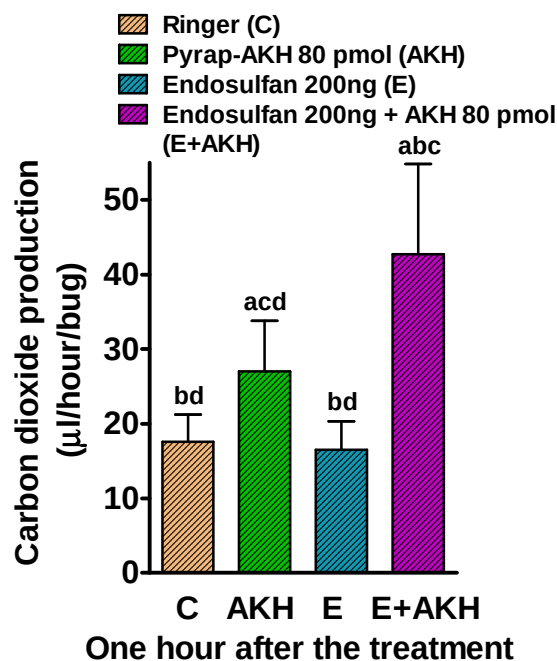
Statistics: *- insecticide vs. insecticide + AKH; $p < 0.05$

Effect of insecticides and Pyrap-AKH on carbon dioxide production 1 h after the treatment

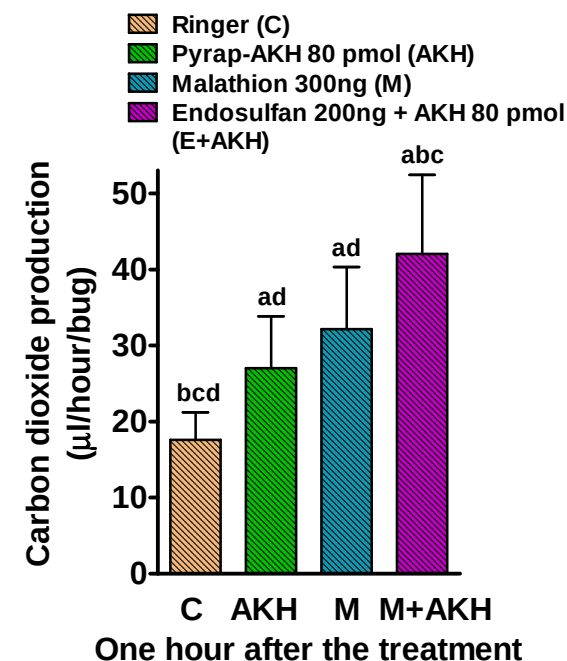
Permethrin



Endosulfan



Malathion



Statistics: a - control vs. any other group, b - AKH vs. any other group, c - insecticide vs. any other group, d - AKH+inseticide vs. any other group; $p < 0.05$

Conclusions:

- Stress caused by application of insecticides increase AKH level in CNS and haemolymph**
- Stress caused by application of insecticides stimulates protective mechanisms against oxidative stress**
- Co-application of insecticides with AKH increases their effectivity probably by stimulation of the whole-body metabolism**

Acknowledgement

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P501/10/1215 from the Czech Science Foundation
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229518)**