



Sveučilište u Zagrebu
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Climate impacts on pests

IPPC Webinar Series: Climate change and
phytosanitary measures

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Food and Agriculture
Organization of the
United Nations



International
Plant Protection
Convention

Climate Change Overview



A Global Warming Projection

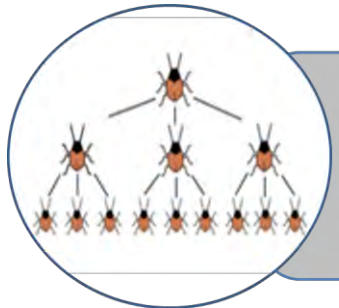
- According to the latest IPCC report, projected impacts of a **1.5°C temperature rise** by **2050** include:
 - I. More frequent and intense **heatwaves**
 - II. Stronger and more frequent **heavy rainfall** and **floods**
 - III. Increased occurrence of simultaneous extreme events (heatwaves, **droughts**, floods)
- These shifts are altering entire ecosystems, disrupting agricultural systems, and creating new challenges for crop production.

Climate Change and Food Production

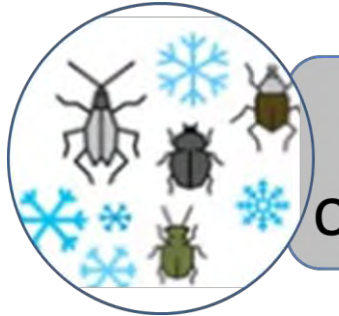


- Climate change disrupts **food availability**, reduces access to food, and impacts its quality.
- **Rising temperatures**, altered **precipitation patterns**, **extreme weather events**, and **reduced water availability** are leading to **lower agricultural productivity**.
- 4 key factors influencing crop yields are:
 1. Soil fertility
 2. Water availability
 3. Climate conditions
 4. Pests

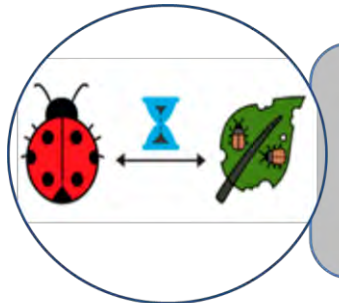
Impact of Temperature Increase on Pest Behavior



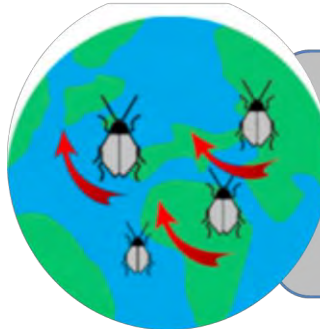
increased number of generations



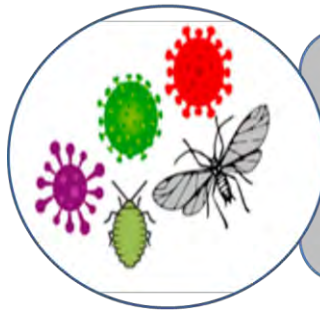
increased overwintering survival



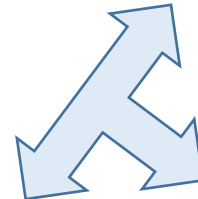
desynchronisation of insect pests and their natural enemies




expansion of geographic range



outbreak of plant diseases transmitted by insect vectors



increased crop damage and greater economic losses!



Yield losses of the most important food crops will significantly increase with global warming, as rising temperatures accelerate the metabolism and population growth of harmful insects.

Increased overwintering survival

Response of
pests to
climate change

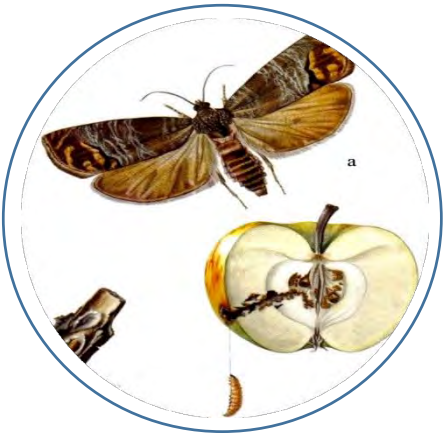
- ✓ The sugar beet weevil (*Bothynoderes punctiventris*)
- ✓ Flea beetles (*Chaetocnema tibialis*, *Phyllotreta* sp.)



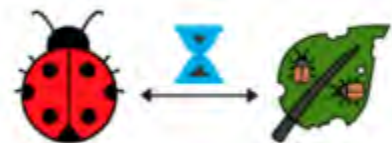
Increased number of generations

Response of
pests to
increased
temperature

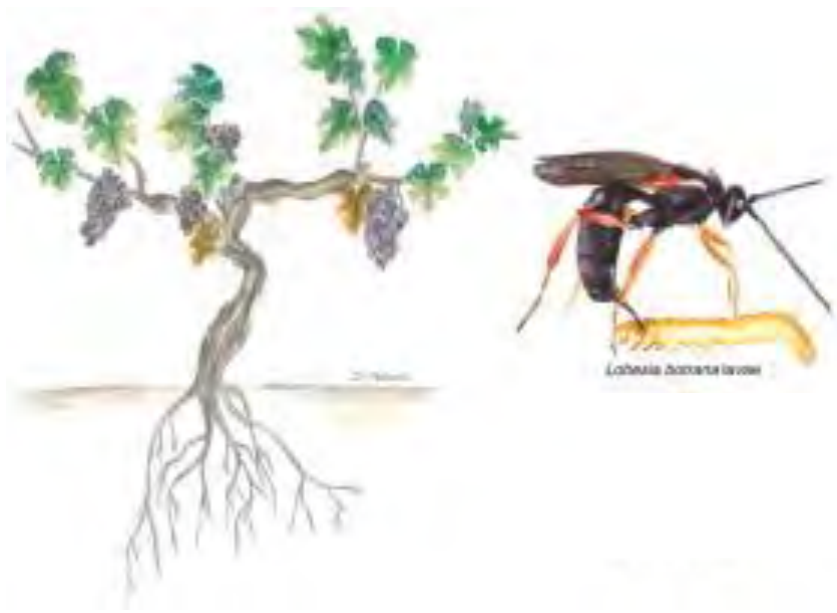
- ✓ Aphids
- ✓ Coddling moth (*Cydia pomonella*)
- ✓ Mediterranean Fruit Fly (*Ceratitis capitata*)
- ✓ European grapevine moth (*Lobesia botrana*)



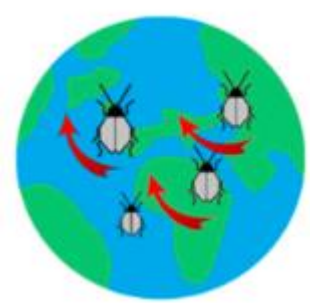
Desynchronisation of insect pests and natural enemies



- European Grapevine Moth (*Lobesia botrana*) and Parasitoid Wasps
- Codling Moth (*Cydia pomonella*) and *Trichogramma* Wasps



Expansion of geographic range



- European Corn Borer (*Ostrinia nubilalis*)
- Spotted Wing Drosophila (*Drosophila suzukii*)



Increased risk of invasive insects

Expansion of alien species

Oak Lace Bug (*Corythucha arcuata*)

- First observed in Europe in 2000.
- Now widespread across all continental oak forests.
- Feeds by sucking sap, causing discoloration of leaves, leading to oak forests having bronze-brown leaves in August (mid-vegetation period).
- Molestant species



Increased risk of invasive insects

Expansion of alien species

- A serious invasive pest in Europe
- Spread throughout the country, destroying box tree plants



Box tree moth (*Cydalima perspectalis*)



Increased risk of invasive insects

Expansion of alien species

Brown marmorated stink bug (*Halyomorpha halys*)

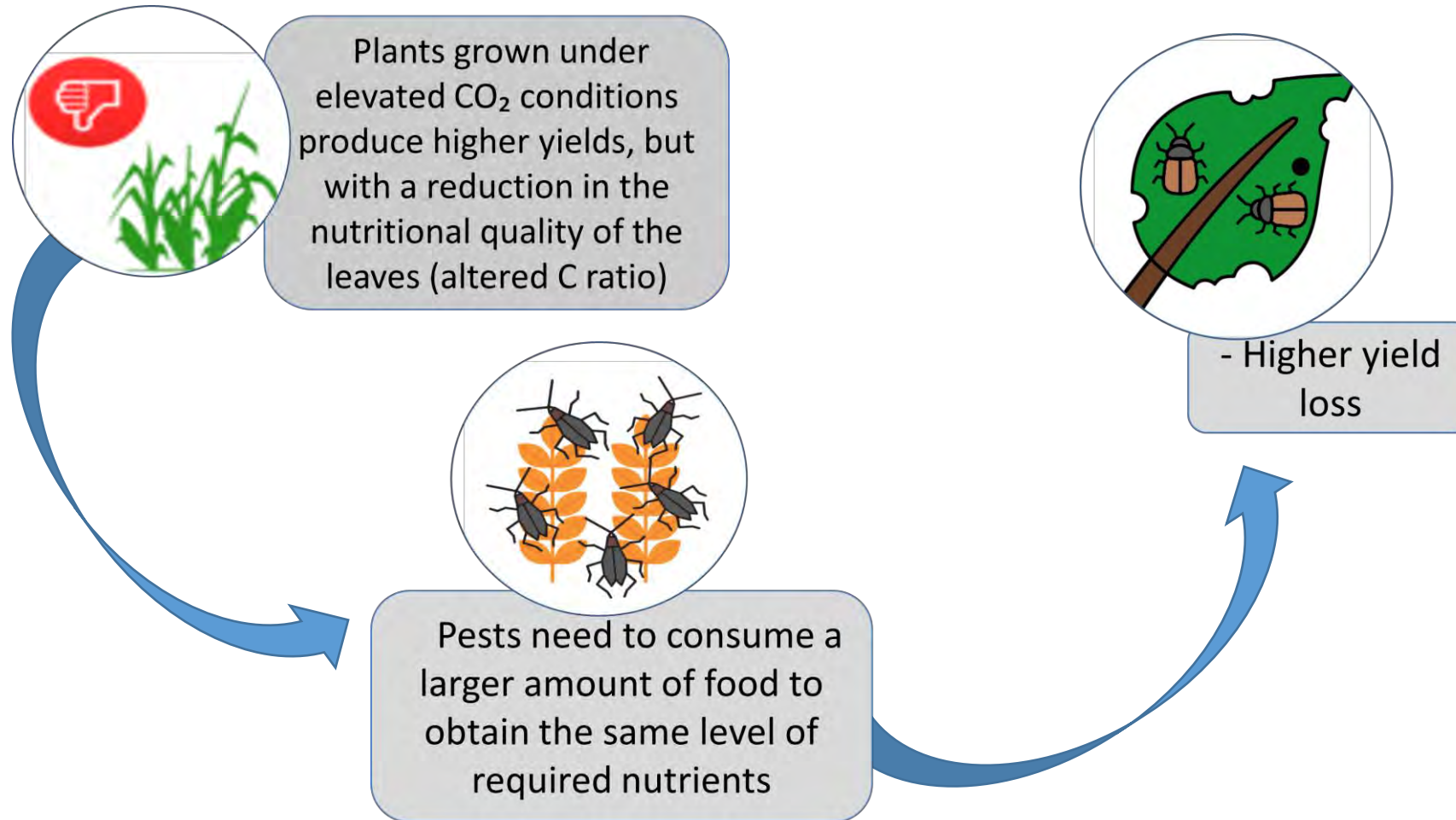
- Highly polyphagous pest
- Soybean, corn, oilseed, apple, cherries, hazelnuts, etc.

Pajač Živković, I., Skendžić, S., & Lemić, D. (2021). Rapid spread and first massive occurrence of *Halyomorpha halys* (Stål, 1855) in agricultural production in Croatia. *Journal of Central European Agriculture*, 22(3), 531-538.

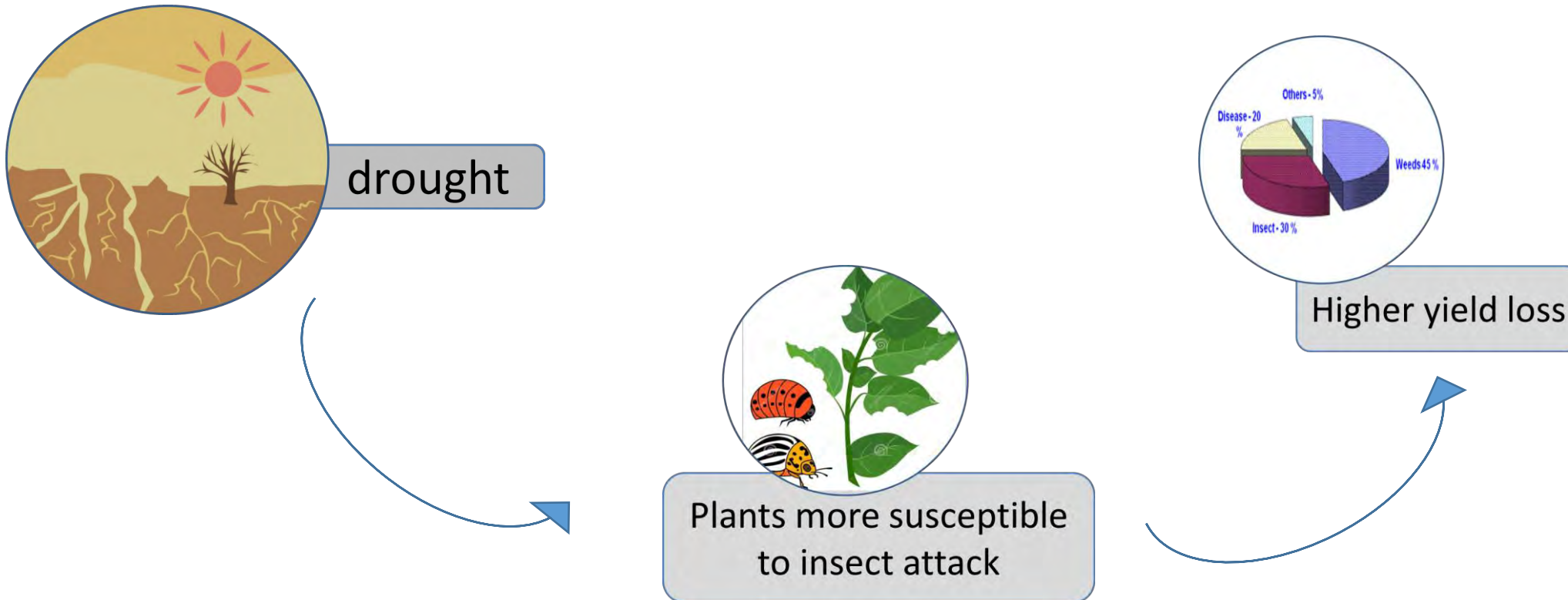
Pajač Beus, M., Lemić, D., Skendžić, S., Čirjak, D., & Pajač Živković, I. (2024). The Brown Marmorated Stink Bug (Hemiptera: Pentatomidae)—A Major Challenge for Global Plant Production. *Agriculture*, 14(8), 1322.



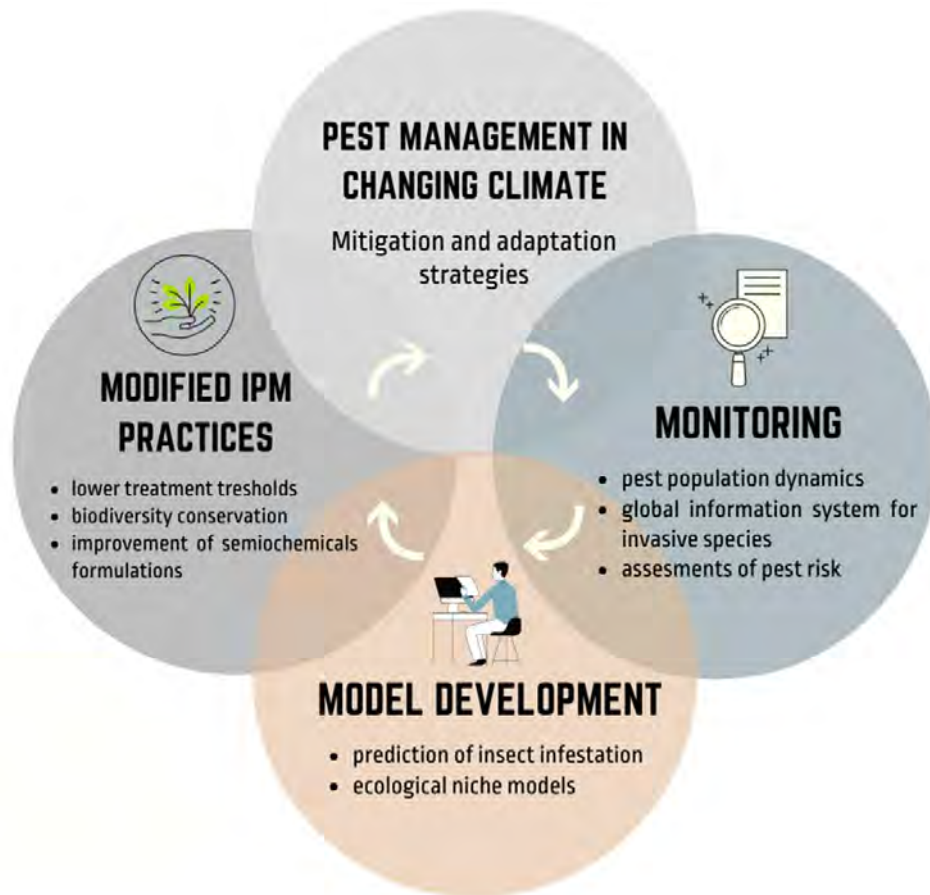
Impact of Elevated Atmospheric CO₂



Impact of Altered Precipitation Regime



Pest management in changing climate



Decisions on the need for **control measures** must be based on the most **up-to-date tools**, such as **forecasting** methods and scientifically validated **economic thresholds** for control, as well as advancements in **modeling, automatic pest monitoring systems**, and **remote sensing technologies** to detect pest stress in crops for timely and precise pest management.

Thank you for your attention!

