# CADIMA:
# An open-access online tool and database increasing the transparency and facilitating the synthesis of (GMO) impact data

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# The Julius Kühn-Institut…

→ … is the **Federal Research Centre for Cultivated Plants** in Germany

→ … is both a research institute and a higher federal authority.



Major research areas are:

- plant genetics, breeding research
- plant nutrition, agronomy and soil science
- plant protection and plant health

# Organization

**17** specialized institutes

**Institute for Biosafety in Plant Biotechnology**

Impact assessment (risks and benefits) of plant biotechnology – including genetic engineering and new plant breeding techniques

**CADIMA**

Developed in the course of the EU-funded project GRACE
Two major areas:

- Information hub for impact assessment of crop genetic improvement technologies

- Open access online tool supporting the conduct and reporting of systematic reviews
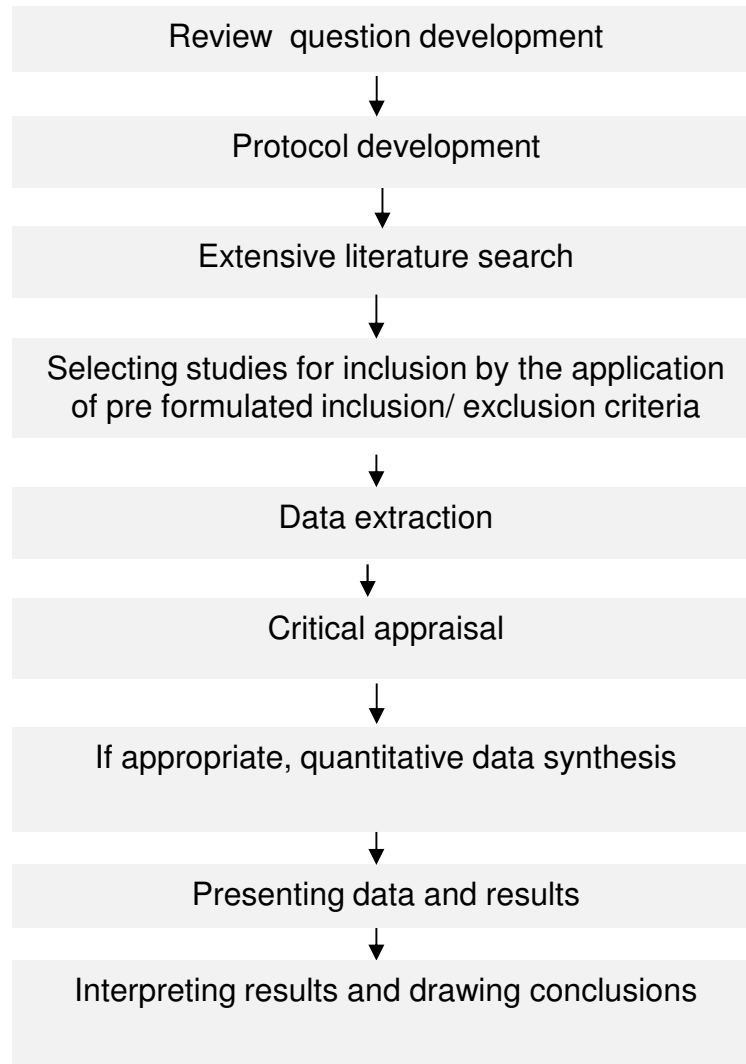
Permanently maintained and further developed by JKI

# The systematic review concept

- Systematic review is a structured, reproducible, and rigorous approach for answering a specific question

- Provides a defensible answer to a specific question by:
    - Increasing precision by the performance of a quantitative data synthesis (if feasible)

    - Minimizing bias by following a standardized procedure comprising so called "core" steps

# Core steps of a systematic review

Review  question development

↓

Protocol development

↓

Extensive literature search

↓

Selecting studies for inclusion by the application
of pre formulated inclusion/ exclusion criteria

↓

Data extraction

↓

Critical appraisal

↓

If appropriate, quantitative data synthesis

↓

Presenting data and results

↓

Interpreting results and drawing conclusions

**Document what you
did and why you did it!**

# Review question development

**?** Does the growing of Bt maize change populations or ecological functions of non-target arthropods compared to the growing of conventional non-GM maize?

P = population
I = intervention
C = comparator
O = outcome

# Protocol development
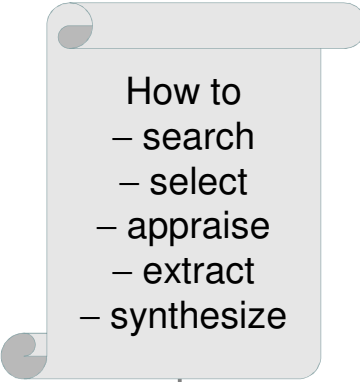
How to
– search
– select
– appraise
– extract
– synthesize

- It reduces bias by preventing deviation from planned methods

- It ensures transparency and repeatability of the methods

- Allows for active stakeholder involvement

- Should be peer reviewed

# Literature search

How to
– search
– select
– appraise
– extract
– synthesize

(maize OR corn OR "Zea mays") AND (transgenic OR Bt OR "Bacillus thuringiensis" OR GM OR "genetically modified" OR "genetically engineered" OR "Cry*" OR "Vip*") AND ("non-target" or "nontarget" or "natural enemy"or predator or parasitoid or decomposer or pollinator)

Identification of the entire evidence base

- Comprehensive
  – Should include an adequate range of relevant information sources

- Grey literature
  – Organizational websites
  – Stakeholder contacts
  – Databases of theses
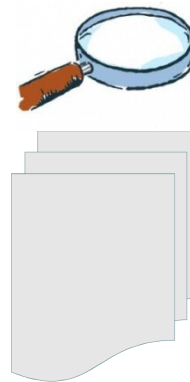
# Study selection

Pool of possibly eligible reports

Pool of eligible reports

| | Yes | No | Unclear |
|---|---|---|---|
| **P** | | | |
| **I** | | | |
| **C** | | | |
| **O** | | | |

# Study selection

# Data extraction



Pool of relevant studies

Data

# Critical appraisal

Pool of relevant studies
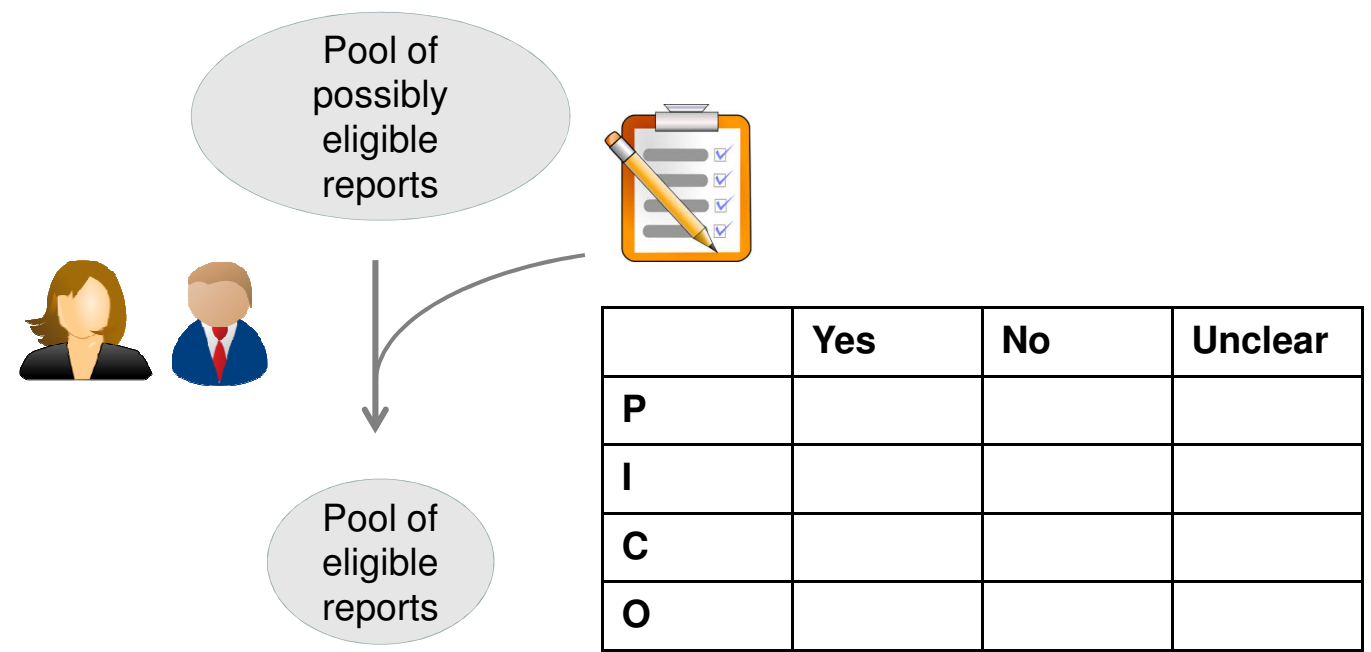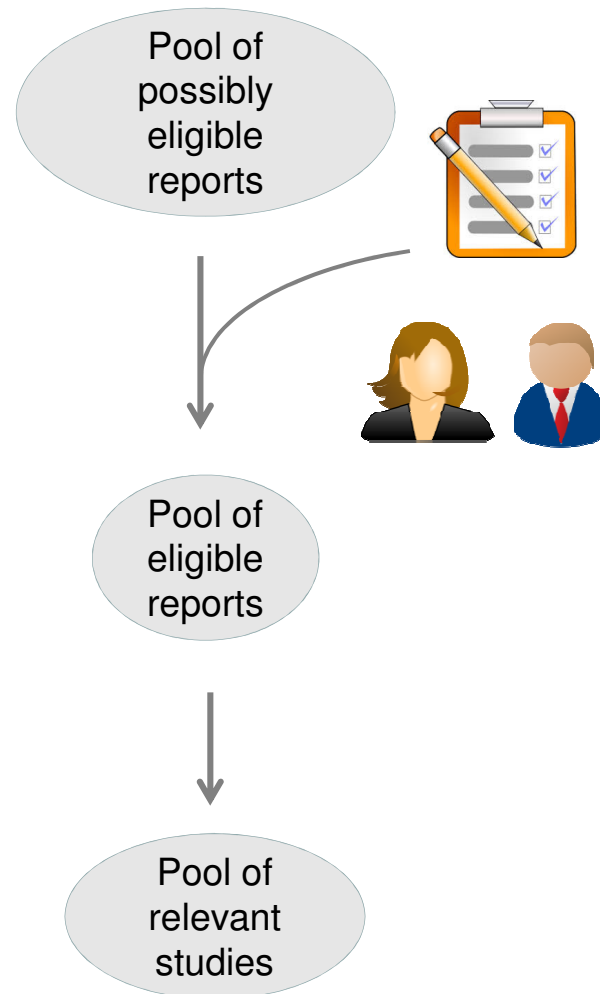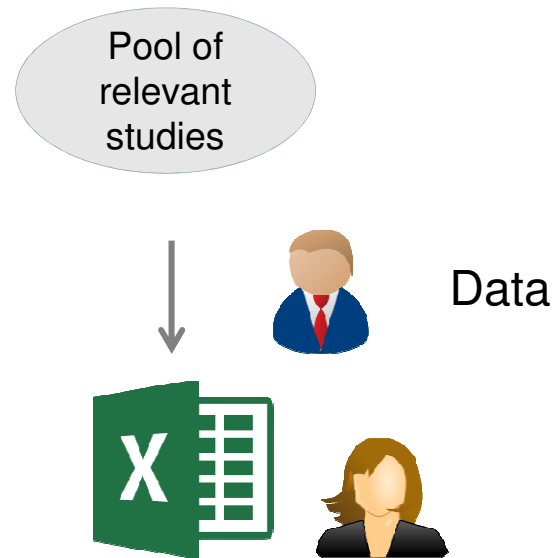
Data

Can we trust the results?
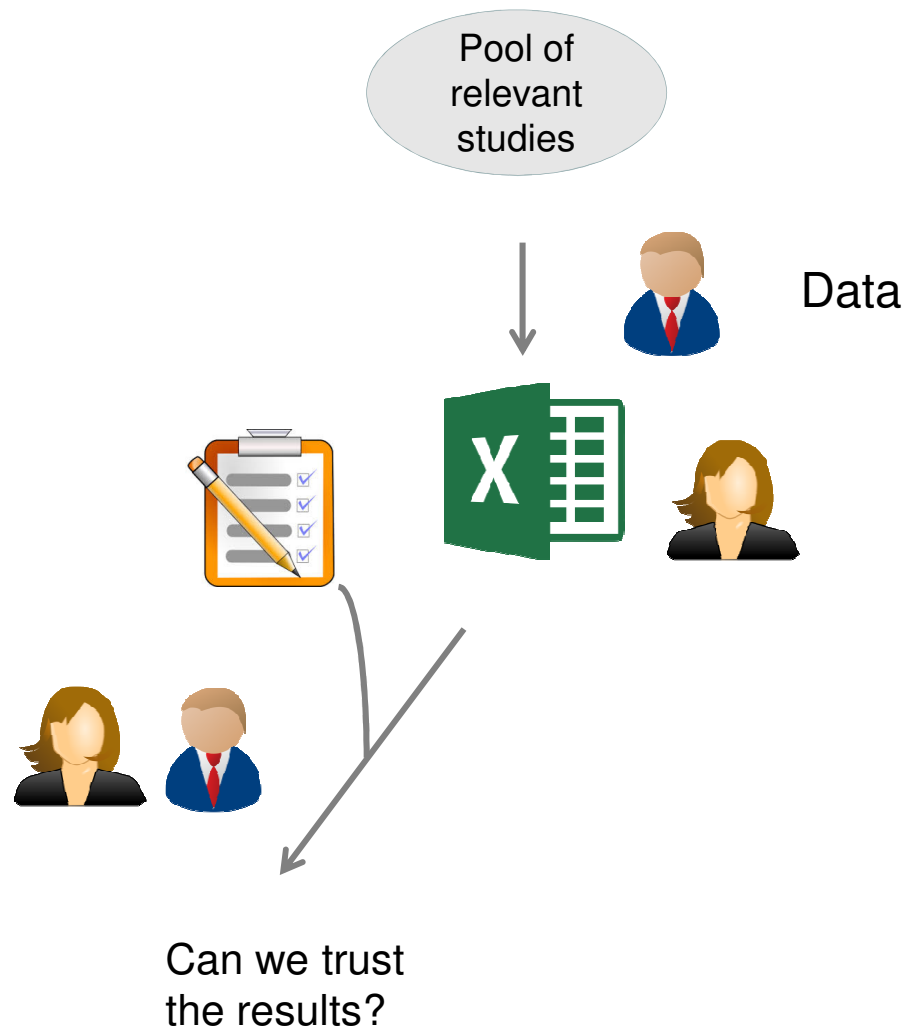
# Critical appraisal

- Including biased studies in the data synthesis step of a systematic review will cause the results of the review to be biased

- How much do I trust the results?

  – Internal validity

- How generalisable are the study results?

  – External applicability

# Critical appraisal and synthesis
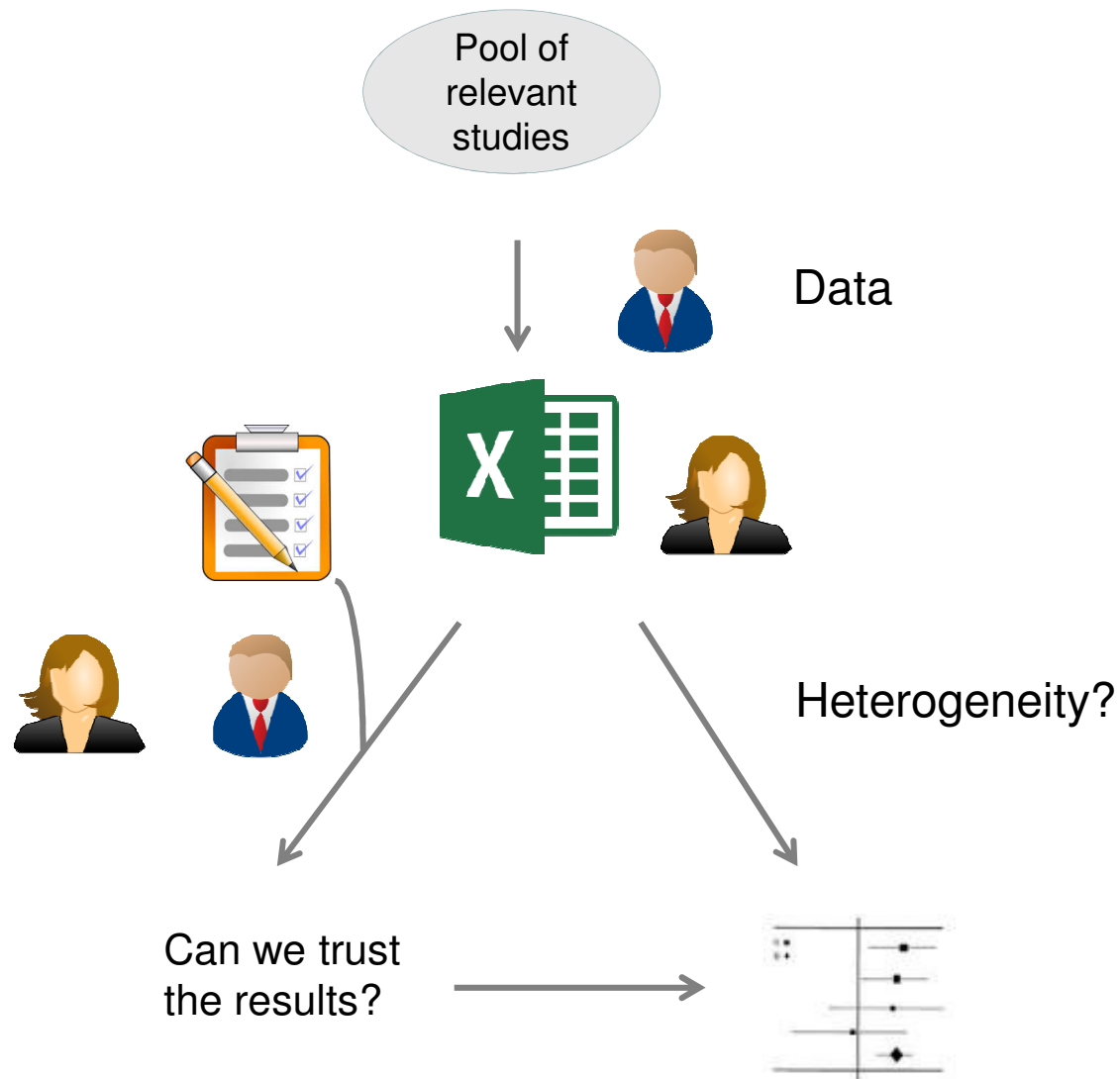
# Limitations

- Sufficient and robust primary research data would have to be available for a systematic review to provide useful information

- Systematic reviews do not provide an immediate answer to a question

- Systematic reviews can be resource intensive and are thus not always feasible
    - Online tools can help to increase the efficiency of the evidence synthesis process
    => CADIMA

# CADIMA

The open-access database CADIMA is a non-profit internet portal provided and maintained by the Julius Kühn-Institut aiming to increase the transparency and traceability of information in agricultural and environmental sciences. To further explore the functions of CADIMA, please check out the area of your interest by clicking on the respective boxes below

<CADIMA search>                                                                    🔍 Search...

## Evidence Synthesis Tool and Database

CADIMA supports the conduct of systematic reviews and evidence/systematic maps by the provision of a freely available online tool that:
1. guides review authors through the evidence synthesis process,
2. facilitates the coordination of cooperating team members,
3. eases steps with considerable workload and
4. guarantees for its thorough documentation

The evidence synthesis tool was established and is further developed in a close collaboration between the Julius Kühn-Institut and the Collaboration for Environmental Evidence

>> click here <<

## Information hub for
## impact assessment of crop genetic improvment technologies

CADIMA offers information services providing
1. a comprehensive overview and links to providers of information regarding the impact assessment of GMOs (Central Access Point)
2. open access to raw data from animal feeding trials with whole GM food/feed and alternative approaches generated during associated research activities (Animal Feeding Trials).
3. services related to specific projects: PreSto GMO-ERA-Net (partly restricted access)

>> click here <<

www.cadima.info

Menu structure mirrors the core steps of a systematic review

Home

Settings

Protocol ⌄

Literature search ⌄

Define search string(s)

Display merged reference list

Study selection ⌄

Data extraction ⌄

Critical appraisal

Data synthesis

Presenting data/results

**Define search string(s)**
- Please enter the developed search strings and the databases (or further sources) they were applied to by clicking on "create new search string". In a next step, please upload (⬆) for each search string and database the retrieved reference list as RIS file. CADIMA will automatically calculate the number of imported references.
- Please check that all abstracts are entered for each reference by clicking on view reference list (☰), displaying the details for each reference by clicking on ( ✎ ).
- When all database searches are filed in, please proceed with "display merged reference list"

⊕ Create new search string

Total 1 result.

| Select | 🗑 | ✎ | ⬆ | ☰ | ⬇ | ⬇ | ➔ | Search string | Database source | #results (#origin) | Date |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ☐ | 🗑 | ✎ | | ☰ | ⬇(10000) | ⬇(10000) | ➔ | (maize OR corn OR "Zea mays") AND (field* OR plot* OR location* OR trial* OR farm-scale OR scouting OR trap* OR sampl* OR monitor*) AND (transgenic OR Bt OR "Bacillus thuringiensis" OR GM OR "genetically modified" OR "genetically engineered" OR "Cry*" OR "Vip*") AND ("non-target" or "nontarget" or "natural enemy"or predator or parasitoid or decomposer or pollinator) | Scopus | 10000 (10000) | 2017-09-04 |

» Display merged reference list

- No search engine but reference lists can be exchanged e.g. with Endnote as RIS files
  - Upload of 10000 entries ~ 3 min
- Duplicates are recognized but currently no automated duplicate removal possible
  - Included in version 2.0

- Automated calculation and reporting of consistency check results

**Apply criteria** ✕
- Please, determine the mode the criteria should be applied to identified reports (title/abstract and then full text OR first title, then abstract and then full text).
- Furthermore, please decide on the amount of studies that need to be allocated to the respective team members by using the toggle bars displayed below.
- In case the selection process should be performed by multiple reviewers independently from each other, move for every review team member the slider to the very right end.
- For each review team member a maximum of three ranges can be added

**Please select one apply type:**
- ◉ Apply criteria to title AND abstract
- ◯ Apply criteria FIRST to title and SECOND to abstract

**Please specify the number of references for each team member (max value 12228):**

Christian Kohl:    ☐ exclude team member

1 - 12228 (12228)    + add range

Petya Stoykova:    ☐ exclude team member

1 - 12228 (12228)    + add range

» Apply criteria to title and abstract

- The number of studies to be assessed by each reviewer can be customized
- Currently: Same reviewers will be involved at title, abstract and full-text stage
  - Possibility for an allocation of different reviewers at the different stage will be implemented in version 2.0

Online application of selection criteria at title/abstract stage
– Discrepancies will be highlighted

- Online application of selection criteria at full text stage
  – Discrepancies will be highlighted

- Bulk upload of pdfs possible (~500 files per upload)

CADIMA facilitates  the extraction of relevant studies from included records

Home
Settings ✔
Protocol ✔
Literature search ✔
Study selection ✔
Data extraction ✔
Define critical appraisal criteria
Define data extraction colummns
Perform data extraction
★ Critical appraisal
Data synthesis
Presenting data/results

**Perform data extraction**
- Data extraction can be performed on- or offline, or a mixture of both. CADIMA will automatically provide information regarding study/article ID, study authors, publication year, title and data location
- **Online data extraction**
  For online data extraction, please, enter the requested data in the table below. Please be aware that the each review team member can overwrite already entered data without any notification
- **Offline data extraction**
  For offline data extraction, please, press "download excel sheet". All data that were already entered e.g. via using the online data extraction mode, will be automatically displayed as well. Fill in the requested data and upload it again to CADIMA by using "upload excel sheet". When inconsistencies between the uploaded information and the information already entered into CADIMA occur, a notification will pop up.

⊕ Download excel sheet    ⊕ Upload excel sheet

Displaying 1-3 of 3 results.

page size: 300

| Comment | Article ID | Study ID | Author | Publication Year | Title | Study Name |
|---|---|---|---|---|---|---|
| | 1 | 1 | Al-Deeb, M. A.; Wilde, G. E.; Higgins, R. A. | 2001 | No effect of Bacillus thuringiensis corn and Bacillus thuringiensis on the predator Orius insidiosus (Hemiptera : Anthocoridae) | Orius insidiosus nymphs |
| | 1 | 2 | Al-Deeb, M. A.; Wilde, G. E.; Higgins, R. A. | 2001 | No effect of Bacillus thuringiensis corn and Bacillus thuringiensis on the predator Orius insidiosus (Hemiptera : Anthocoridae) | Orius insidiosus adults |
| | 1 | 3 | Al-Deeb, M. A.; Wilde, G. E.; Higgins, R. A. | 2001 | No effect of Bacillus thuringiensis corn and Bacillus thuringiensis on the predator Orius insidiosus (Hemiptera : Anthocoridae) | Survival rate Orius insidiosu |

▶ Proceed with critical appraisal

- On- and offline data extraction possible

**Article ID:** 14    **Study ID:** 1

**Fulltext:** no PDF available

**Author:**

**Title:**
Review Manager (RevMan) Version 5.3 2014

**Data Location:** Figure 1    **Study Name:** C. elegans

**Comments:**

☐ Data completed

🖫 Save    ☰ Back to list

sample_size    mean    organism

comparator

Will be displayed during critical appraisal

Apply critical appraisal criteria to study
- Rate each criteria to the study
- Use "next" or "back" buttons at the bottom to go on

**Study information**
Title: No effect of Bacillus thuringiensis corn and Bacillus thuringiensis on the predator Orius insidiosus (Hemiptera : Anthocoridae) (2001 )   Authors: Al-Deeb, M. A.; Wilde, G. E.; Higgins, R. A.
Article ID: 1    Study ID: 1
Data location: Table 3    Study name: Orius insidiosus nymphs

[✖ Abort and back to list]  [◀ Previous]  [Next ▶]  [⬇ Save and back to list]

**Critical appraisal criteria**

| criteria | Risk |
|---|---|
| Cultivars used: Low risk if corresponding near-isolines are used for Bt and conventional treatments, high risk if distantly related cultivars are used (1 - 3) | 2 [ Low ] ▾  show / make comment ❤ |
| Sampling methods: High risk if different methods are used to measure animal populations in the different treatments, low risk if the same method was used (1 - 3) | 2 [ Low ] ▾  show / make comment ❤ |

**Data extraction information (Download file)**

| Critical appraisal column | Value of data extraction |
|---|---|
| Control_cultivar_used | near isogenic variety |
| Sampling_method_control | manual counting |
| Sampling_method_experimental | manual counting |

**Home**
**Settings** ✔
**Protocol** ▾
**Literature search** ▾
**Study selection** ▾
**Data extraction** ▾
**Critical appraisal** ▾
   Settings
   Results critical appraisal
**Data synthesis**
**Presenting data/results**

CADIMA support the critical appraisal of included studies

# CADIMA assures for a thorough documentation

**Presenting data and results**
- CADIMA assures for a thorough documentation of the entire review process.
- Under "Flow diagram" the study selection is depicted
- Under "Data files", CADIMA does provide all information allowing for a detailed documentation of the review process. Furthermore, review team members can decide on the information that can/should be made publically available by uploading them to "Data and results" and ticking the "public" box

Home
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Flow diagram | Data files

**Files generated by CADIMA**

| Description | Download (file type) |
|---|---|
| Flow diagram | Flow diagram (docx) |
| Table displaying the results of the literature search per search string and database | Results literature search (docx) |
| Reference lists: database a, database b etc. and the final merged reference list or Final reference list for reference management tools | Reference list (xlsx) or Reference list for reference management tools (RIS) |
| List of selection criteria | Selection criteria (docx) |
| Consistency check evaluation Outcomes study selection at the different stages Included references after title/abstract screening Included references after full text screening | Consistency check evaluation (xlsx) Study selection outcome (xlsx) Included references title/abstract (xlsx) Included references full text XLSX or RIS |
| List of critical appraisal criteria | Critical appraisal criteria (docx) |
| Compiled data extraction sheet | Data extraction sheet (xlsx) |
| Outcomes critical appraisal | Critical appraisal outcome (xlsx) |

# Outlook

- Version 2.0 March 2018
    - Automated duplicate removal
    - Flexibility during screening stage

- Support rapid evidence syntheses
    - Adapt the approach to the synthesis purpose
    - Want to contribute: contact christian.kohl@julius-kuehn.de

- User feedback
    - Test CADIMA
    - Register to online workshops

# Acknowledgement

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