Biopesticides and ecotox risk assessment

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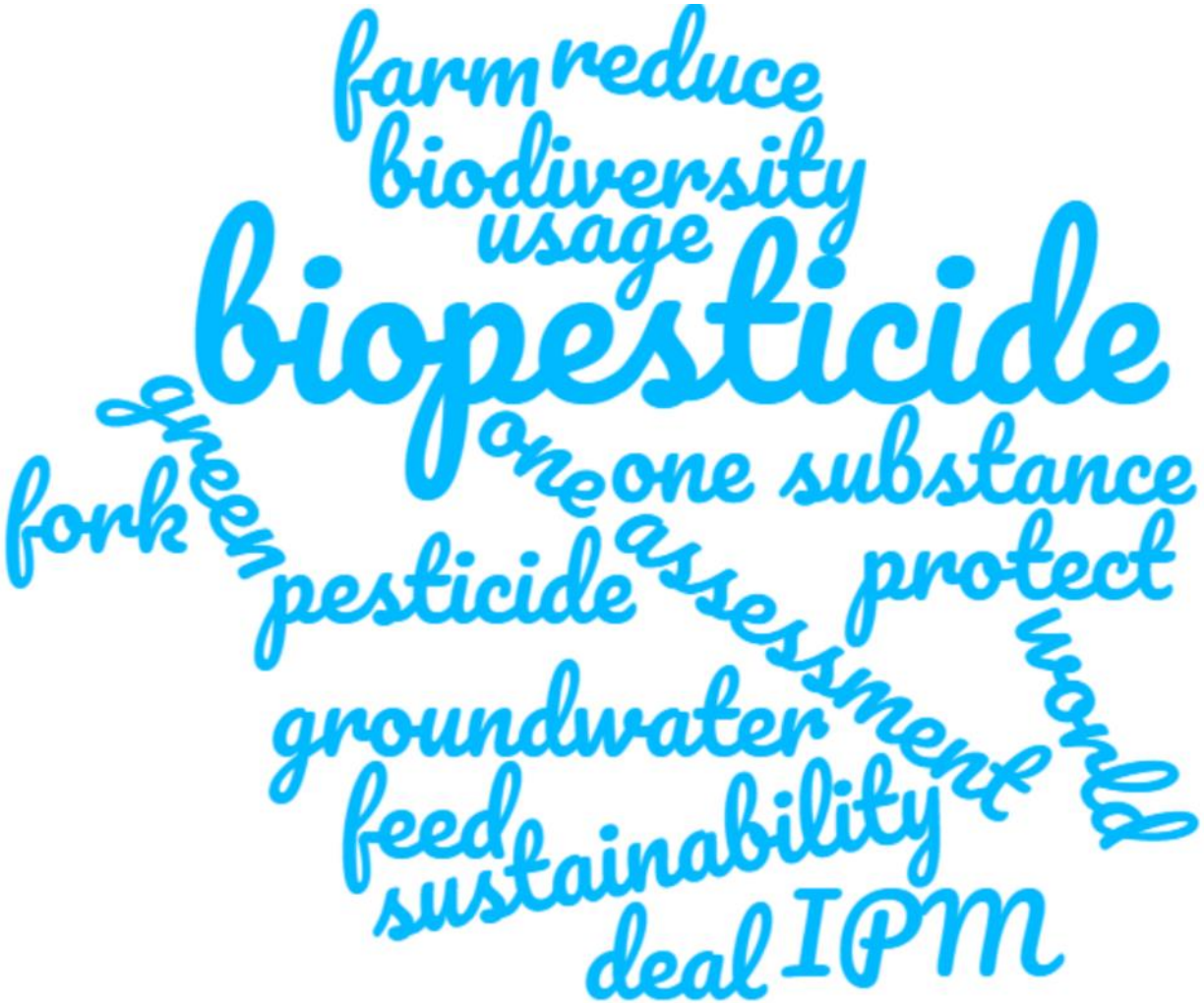
7 November 2023

Introduction



Introduction

Naturally occurring and include:

- Semiochemicals
- Microbials
- Botanicals

- Considered safer for the environment than synthesised molecules
- Some (particularly botanicals) are used in feed additives
- Often target specific

Introduction

Registration process:

- Registration for biopesticides falls under Regulation (EC) No 1107/2009 for active substances and plant protection products (PPP)
- Applicants must provide evidence that biopesticides are safe and effective
- Risk assessment based on that for chemical pesticide
  - Comparing predicted exposure with effect values
- Data requirements for active substance and PPP follow:

Semiochemicals and plant extracts:

- Reg 283/2013 – data requirements for active substances Part A
- Reg 284/2013 – data requirements for plant protection products Part A

Microbials:

- Reg 283/2013 – data requirements for active substances Part B
- Reg 284/2013 – data requirements for plant protection products Part B

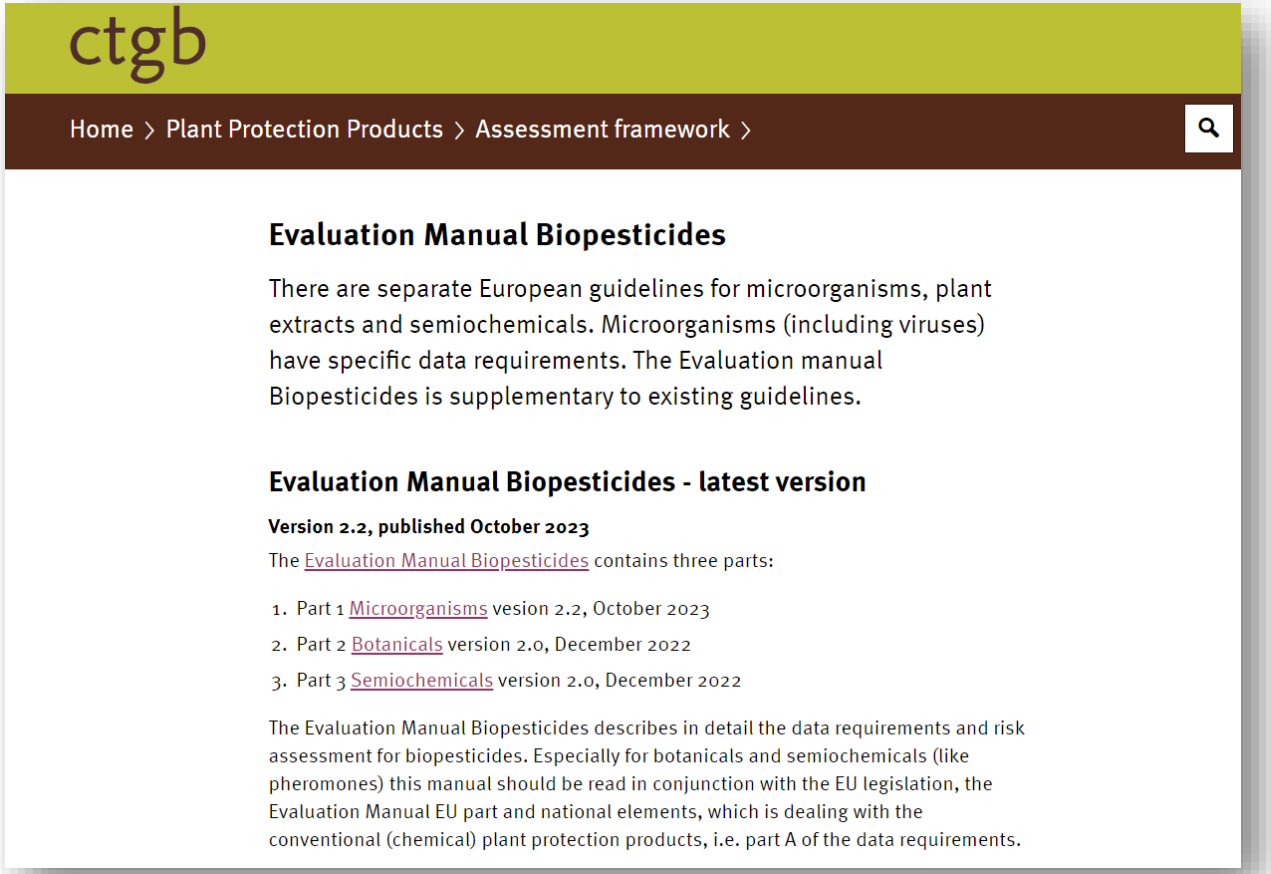
Introduction

Limitations:

- Regulation process can be laborious and slow due to a general lack of knowledge in this area
- Particularly as in general they are considered as low risk
- Recognised by request to fast track biopesticides considered as low risk
- General lack of understanding
- Ctgb have provided evaluation manuals for semiochemicals, microbials and botanicals

  Evaluation Manual Biopesticides | Plant Protection Products | Board for the Authorisation of Plant Protection Products and Biocides (ctgb.nl)

- Risk that bureaucratic process could stifle innovation in this area



Semiochemicals

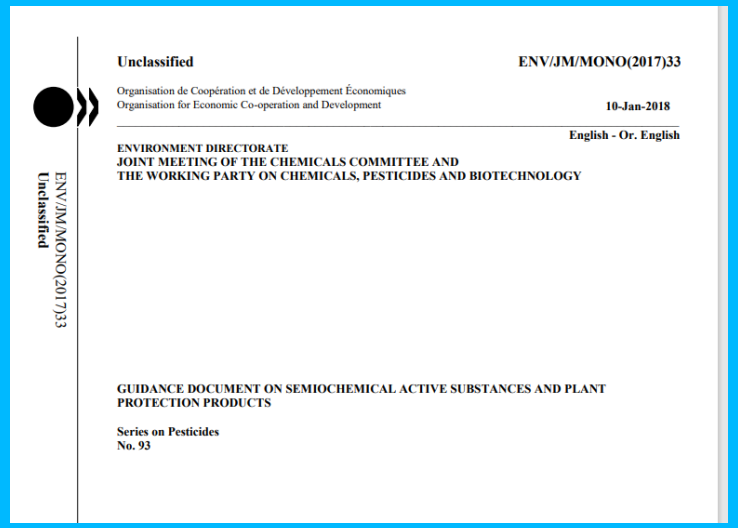
Guidance available: OECD (2018), Guidance Document on Semiochemical Active Substances and Plant Protection Products, Series on Pesticides and Biocides, No. 93

Defined as:

Substances or mixtures of substances emitted by plants, animals and other organisms that evoke a behavioural or physiological response in individuals of the same or other species.

Includes:

- Allelochemicals: produced by individuals of one species that modify the behaviour of individuals of a different species
- Pheromone: produced by individuals of a species that modify the behaviour of other individuals of the same species
- Straight-chained lepidopteran pheromones (SCLPs)
- Volatile and low persistence generally
- Non-toxic, target specific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GUIDANCE DOCUMENT ON SEMIOCHEMICAL ACTIVE SUBSTANCES AND PLANT PROTECTION PRODUCTS

Series on Pesticides
No. 93

Semiochemicals

Use:

- Need to cause an effect such as mating disruption
- Can be used as lures for population monitoring or to attract pest species to treated areas
- Classification based on retrievability, mode of controlled release and /or formulation type
  - ¬ Retrievable and non-retrievable
    - Passive or continuous release
    - Active release
    - Spray applications
    - Granules
    - Seed treatments

Semiochemicals

Data requirements:

- Regulation 283/2013 – data requirements for active substances Part A
- Regulation 284/2013 – data requirements for plant protection products Part A

Active substance:

- May be scope to waive data, most likely the non-target plants due to lack of herbicidal effects
- Chronic exposure unlikely there for bioaccumulation and chronic studies not necessary

Product:

- Consider potential route of exposure
- Spray / passive or active dispensers
  - ¬ Oral / contact exposure via spray
- Field or glasshouse use

Semiochemicals

Key things to include:

- Target organism and modifying behaviour
- Nature and specificity of communication with target organism
- What would happen in the absence
- Natural exposure levels compared with expected exposure levels

Challenges:

- Volatile
- Measuring exposure concentrations
- Consider using inhalation as an exposure route for NTAs including bees

Semiochemicals

Risk assessment:

- Compare naturally occurring levels with anticipated exposure levels
- If risk within one order of magnitude of natural levels, no further action required
- If greater than one order or magnitude, then exposure routes for the environment and non-target species should be taken into account
- Guidance from Ctgb website

Table 3.5-01 Compartment for which exposure is expected

	Retrievable dispensers		Non-retrievable application techniques				
	Passive	Active	Passive dispensers	Dosable matrix	Capsule suspension	Granular application	Seed treatment
	1A	1B	2A	2B	2C	2D	2E
Soil	N	N	N	N	Y	Y	Y
Groundwater	N	N	N	N	Y	Y	Y
Surface water	Y*	Y*	Y*	Y*	Y	Y	Y
Sediment	Y*	Y*	Y*	Y*	Y*	Y*	N
Air	Y	Y	Y	Y	Y	Y	Y
Birds and mammals	Y	Y	Y	Y	Y	Y	Y
Aquatic organisms	Y*	Y*	Y*	Y*	Y	Y	Y
Reptiles and amphibians	Y*	Y*	Y*	Y*	Y	Y	Y
Non target athropods (above ground)	Y	Y	Y	Y	Y	Y	Y**
Soil invertebrates	N	N	N	N	Y	Y	Y
Pollinators	Y	Y	Y	Y	Y	Y	Y

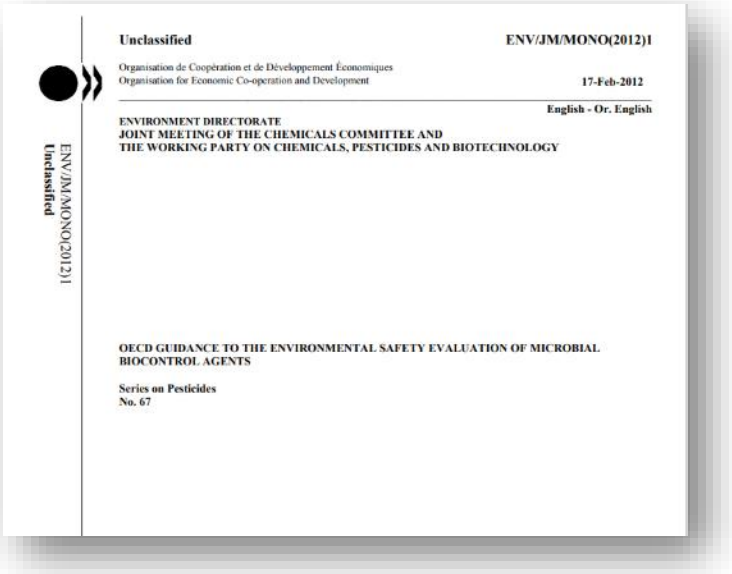
Y = Yes; N = No

* FOCUS (2008) air guidance regarding short range deposition estimations to surface water bodies should be followed.

** Unless information is provided that the active substance is not systemic so not taken up by the roots (e.g. use of the Briggs equation to calculate transpiration stream concentration factor on the transpiration stream concentration).

Microbials

Guidance available: OECD 2012 Guidance to the environmental safety evaluation of microbial biocontrol agents Series 67
ENV/JM/MONO(2012)1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OECD GUIDANCE TO THE ENVIRONMENTAL SAFETY EVALUATION OF MICROBIAL BIOCONTROL AGENTS

Series on Pesticides
No. 67

Defined as: Microbials are living things that are used to promote plant health.

- Incorporated into the target organism to illicit an effect that could be:
  - Antibiosis, toxicity or pathogenicity
  - Induce plant resistance to disease
  - Interfere with the virulence of a pathogenic target organism
  - Growth stimulants
  - Competition for ecological niche
  - Parasitisation

Infection:
Something that can enter a host and reproduce and does not need to cause an effect.

Pathogen:
Something that inflicts an “injury” and damage to a host on infection.

Microbials

Data requirements:

- Regulation 283/2013 – data requirements for active substances Part B
- Regulation 284/2013 – data requirements for plant protection products Part B

Waivers:

- Accepted
- Open literature
- Try to avoid vertebrate testing
- Background levels
- Herbicides and plant pathogens
- Sufficient detail
- Product data may not be needed

Microbials

Secondary metabolites:

- Generally produced under stress
- Not required for normal function such as growth, development or reproduction
- Survival mechanism
- Can be excreted (exotoxin) or retained within the organism (endotoxin)
- Can be extremely toxic
- Can be generated in any compartment (soil, aquatic environment)

Antimicrobial resistance:

- Risk of transfer to humans

Microbials

Key things to include:

- Taxonomy – to strain
- Information pertaining to the biology of the organism:
  - ¬ Origin
  - ¬ Mode of action
  - ¬ Host range
  - ¬ Ability to survive in various environments
  - ¬ Niche
  - ¬ Reproduction and dispersal mechanism
- How do you identify it

Microbials

Challenges:

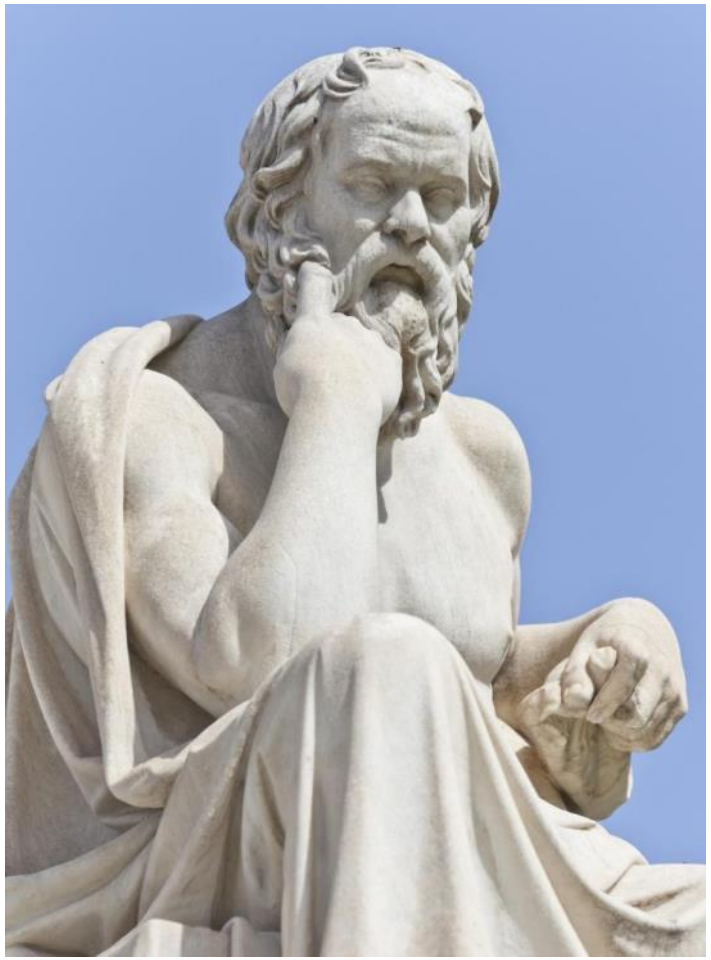
- Standard test species may not be the most appropriate
- Difficult to assess pathogenicity and infectivity
- Include sterile filtrate and attenuated controls
- Aquatic testing may be difficult as test solutions may be turbid
- Antimicrobial properties of royal jelly
- NTAs testing of two arthropod species from different taxonomic groups with test protocols

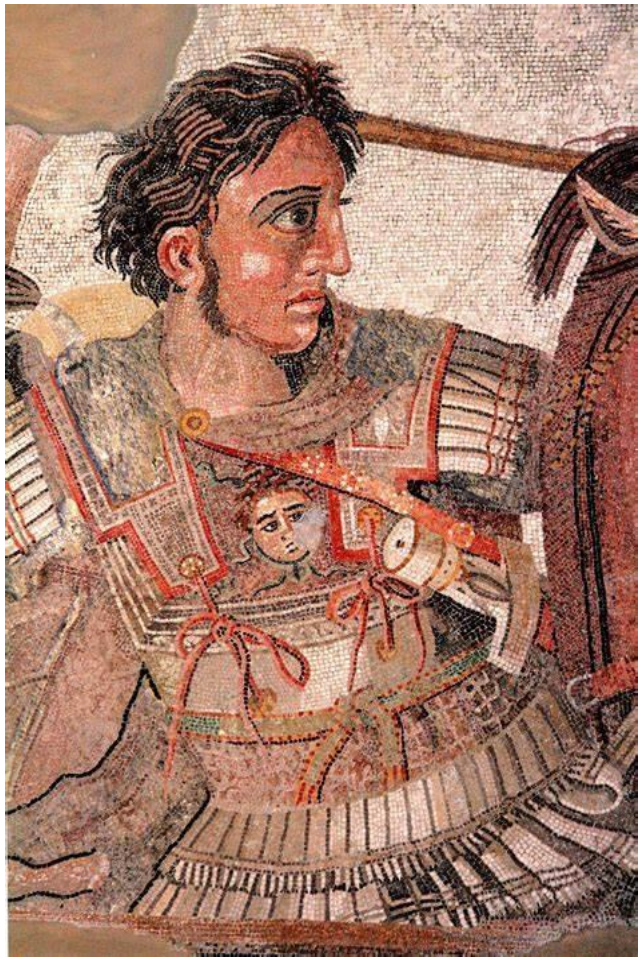
Microbials

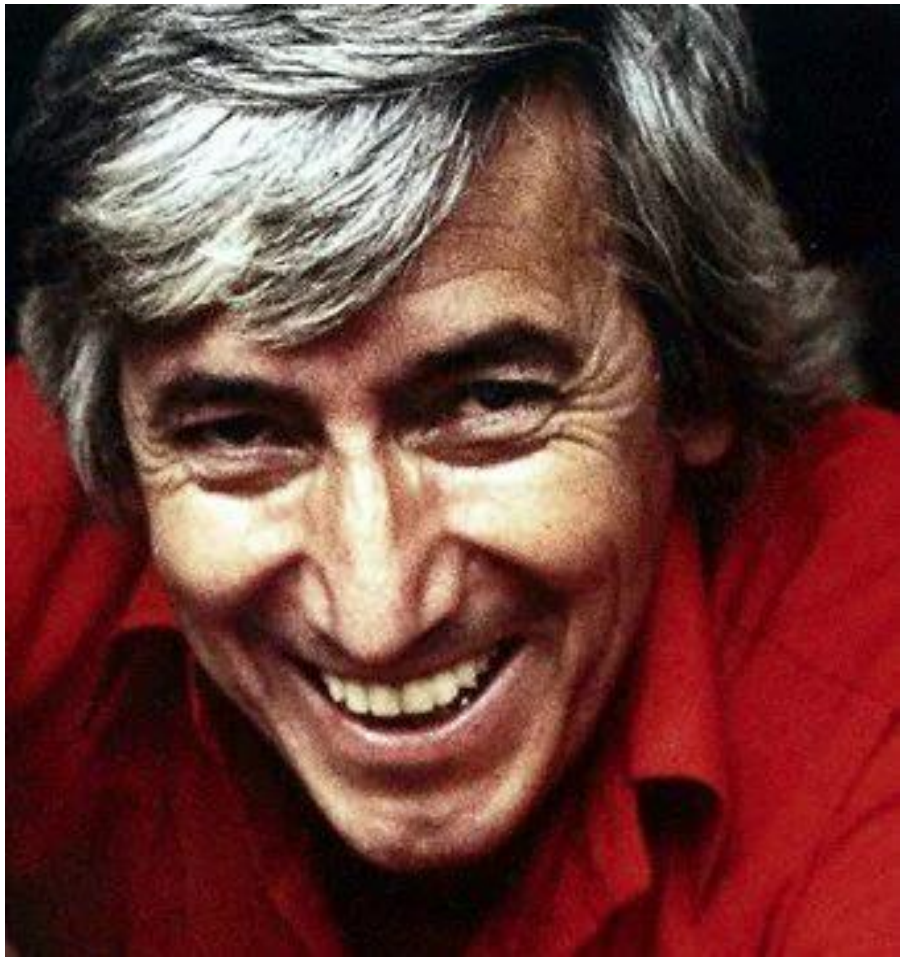
Risk assessment:

- Risk assessment qualitative or semi-qualitative
- Recommend comparing the endpoint with estimated exposure
- Derive a margin of safety
- Present a weight of evidence
  - ¬ Mode of action
  - ¬ Assumptions used for calculating exposure

Botanicals







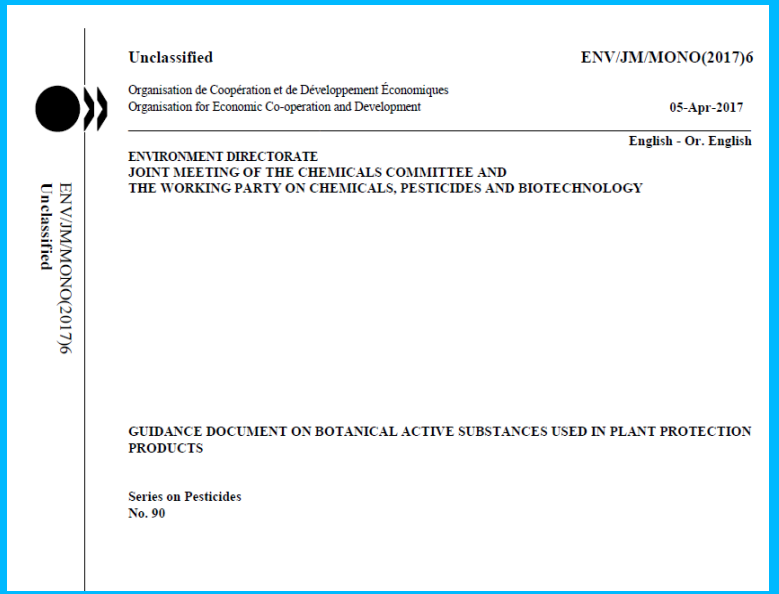
Botanicals

- Plants natural defences developed:
  - ¬ Protection from pathogens, insects and herbivores
  - ¬ Attract pollinators
  - ¬ Communicate with other plants

- Guidance: OECD 2017 Guidance on botanical active substances used in plant protection products Series 90 ENV/JM/MONO(2017)

- **Defined as**: Substances deriving from plant extracts through either crushing, milling, distillation or extraction. Does not include synthesised molecules.

Often also found in feed supplements and natural health products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GUIDANCE DOCUMENT ON BOTANICAL ACTIVE SUBSTANCES USED IN PLANT PROTECTION PRODUCTS

Series on Pesticides
No. 90

Botanicals

Group 1: Known to have no unacceptable effects on humans, animals and the environment and are based on materials with known specifications such as food grade.

Group 2: An established specification for which current knowledge indicates that it may contain components of concern for humans, animals and or the environment. These components should be identified and quantified.

Group 3: No established specification is available, thus complete characterisation and identification is required.

Botanicals

Data requirements:

- Regulation 283/2013 – data requirements for active substances Part A
- Regulation 284/2013 – data requirements for plant protection products Part A

Waivers:

- Group 1 substances waivers likely as considered low risk

Botanicals

Things to consider:

- What is the component of concern?
- How many components of concern are there?
- Can be highly variable due to:
  - ¬ Geographical location, agricultural practice, climate
  - ¬ Extraction techniques used

Information to include:

- Source
- Harvest
- Storage
- Processing

Botanicals

Risk assessment:

- Considered low risk if estimated exposure is lower or similar to natural levels and no unacceptable effects on NTOs
- When exposure is higher than natural exposure then risk must be considered
- Follow that for synthetic pesticides
- Risk mitigation may be necessary

Summary

- Regulation 1107/2009 not designed for biopesticides
- Use Regulatory Authority with prior experience
- Start talks early

Things can only get better

D:Ream 1993

Thank you

Question?