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Biology of composting

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Biology of composting

- What can be composted or treated by anaerobic fermentation?
- Basis of the biology of composting
  - The microorganisms serving the compost producer
  - The parameters of composting process

What can be composted or treated by anaerobic fermentation?

What can be composted or treated by anaerobic fermentation?

- Waste of horticulture

  - Composting: OK
  - Anaerobic fermentation: depending on the woody fraction

What can be composted or treated by anaerobic fermentation?

- Animal manure

  - Composting: OK
  - Anaerobic fermentation: OK

What can be composted or treated by anaerobic fermentation?

- Woody organic waste

  - Composting: OK
  - Anaerobic fermentation: inappropriate

What can be composted or treated by anaerobic fermentation?

- Waste of fruits and vegetables

  - Composting: OK (in small quantity)
  - Anaerobic fermentation: OK

What can be composted or treated by anaerobic fermentation?

- Waste from vegetables processing

  - Composting: OK (in small quantity)
  - Anaerobic fermentation: OK

What can be composted or treated by anaerobic fermentation?

- Egg shells

  - Composting: inappropriate
  - Anaerobic fermentation: OK (thermophilic or after sanitation treatment)

What can be composted or treated by anaerobic fermentation?

- Waste from agro-industry

  - Composting: inappropriate
  - Anaerobic digestion: OK

What can be composted or treated by anaerobic fermentation?

- Waste of fish / meat

  - Composting: inappropriate
  - Anaerobic fermentation : OK (after sanitation treatment)

What can be composted or treated by anaerobic fermentation?

- Waste of restaurant

  - Composting: inappropriate
  - Anaerobic fermentation: OK (thermophilic or after sanitation treatment)

What can be composted or treated by anaerobic fermentation?

› In theory, all organic residues can be composted or digested.

› However, not all are easy to handle, biodegradable, and free from toxic and pathogenic germs.

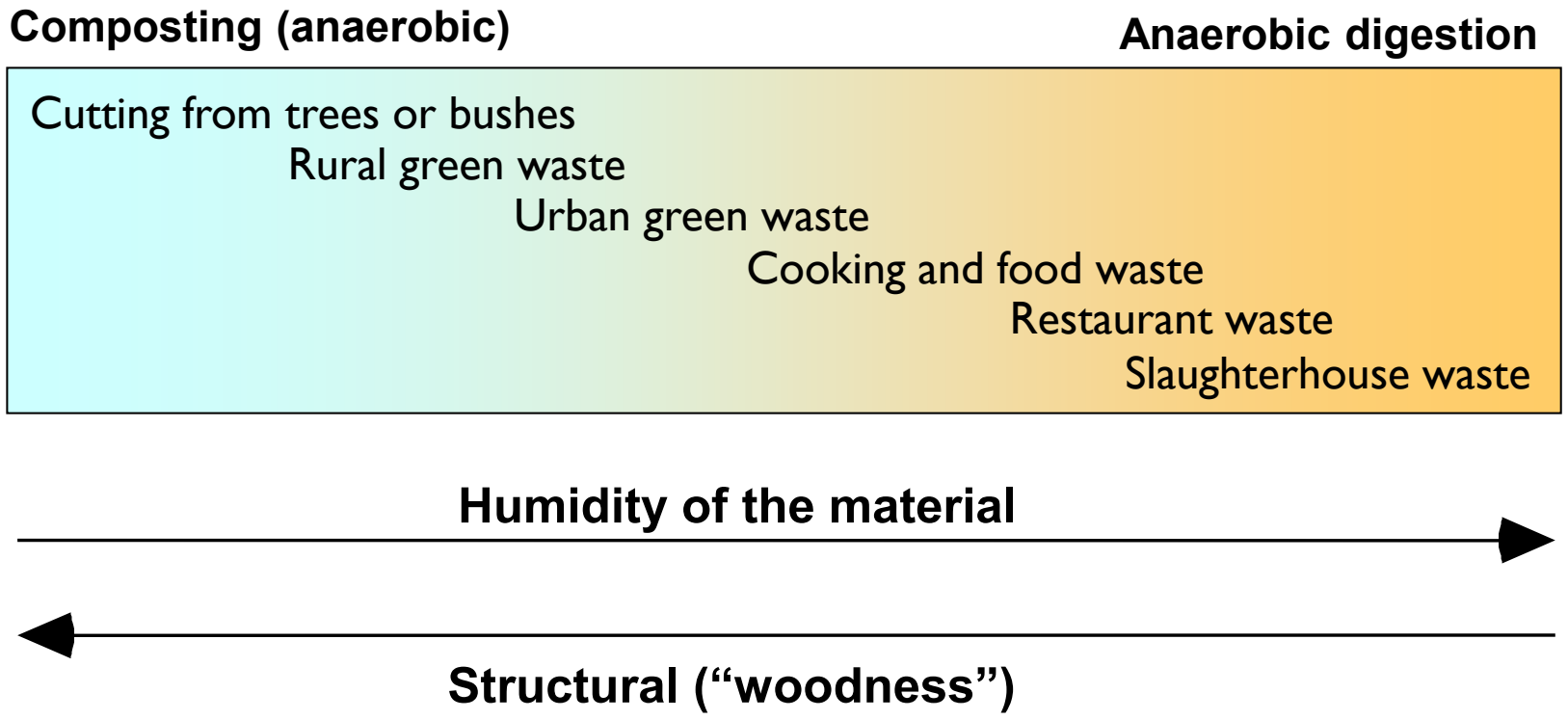
› Depending of the system used, some residues are more or less easy to be treated.

› Depending of the system, some input materials have to be treated before processing (e.g. pasteurization of kitchen waste before mesophilic anaerobic digestion).

› The starting mixture is important for the success of the process.

What can be composted or treated by anaerobic fermentation?

› Composting or anaerobic fermentation ?



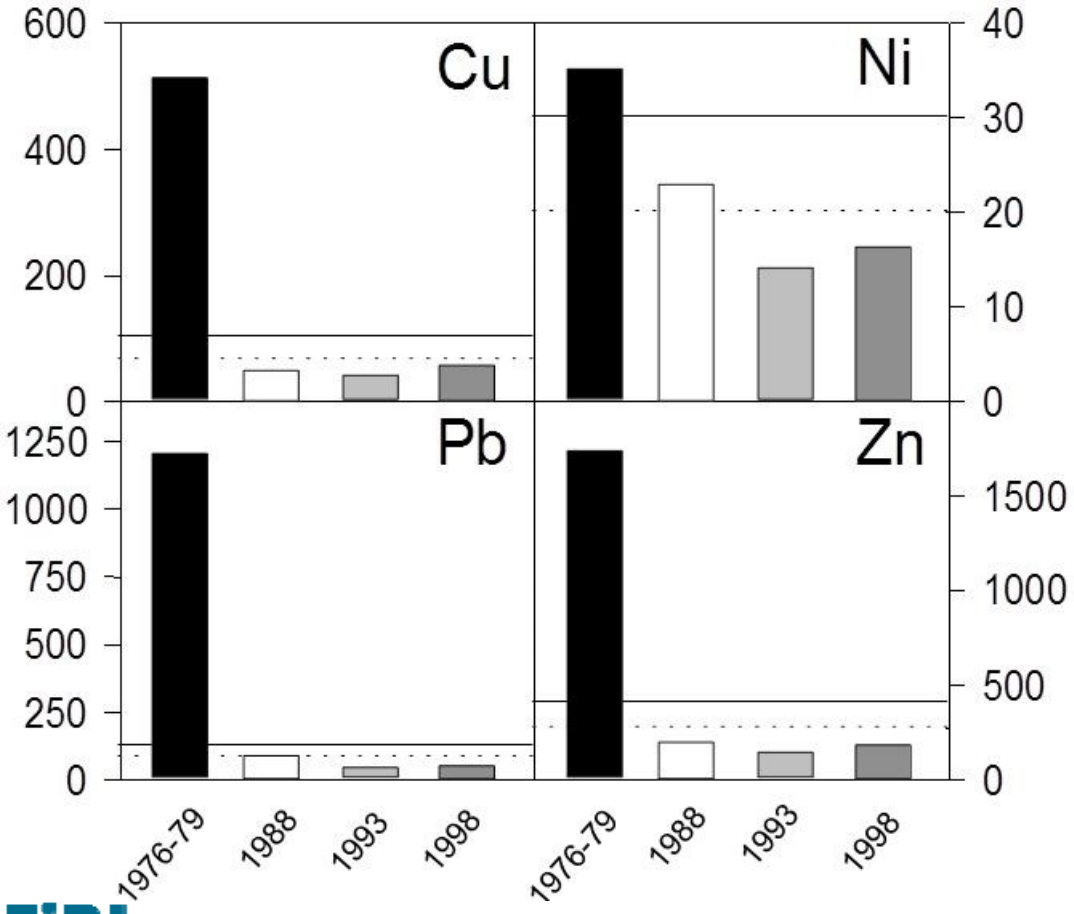
What can be composted or treated by anaerobic fermentation?

- Quality of input materials (levels of undesirables)

  - Source-separated organic waste
  - Each undesirable that does not enter the process does not need to be taken out at the end of it!

What can be composted or treated by anaerobic fermentation?

› Quality of input materials (levels of undesirables)



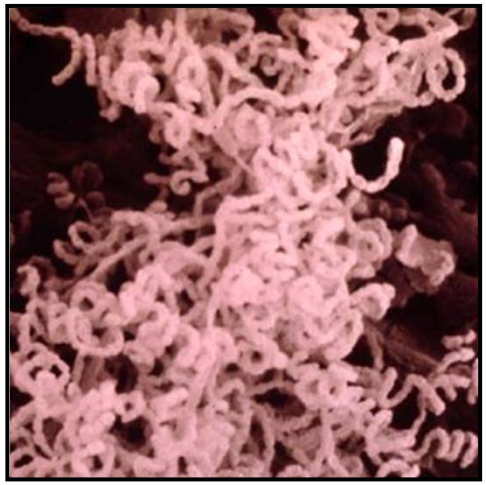
› Begin of the 1980s: only source-separated organic waste can be composted / treated by anaerobic fermentation. Mechanical biological treatment (MBT) no more allowed.

Basis of the biology of composting

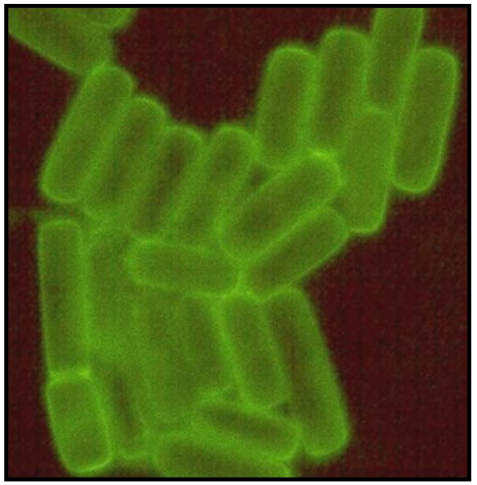
Basis of the biology of composting

› The microorganisms of composting

› fungi



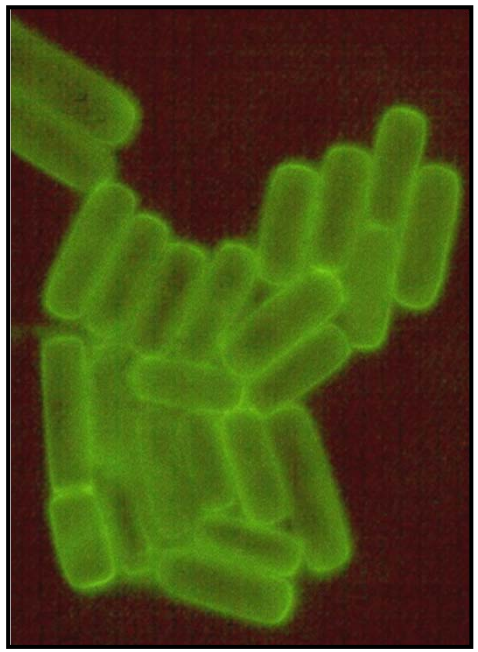
› actinomycetes



› bacteria

Basis of the biology of composting

- The microorganisms of composting
  - Bacteria



- aerobic / anaerobic
- very active at the beginning of the process
- responsible for the hot phase
- can not degrade wood efficiently

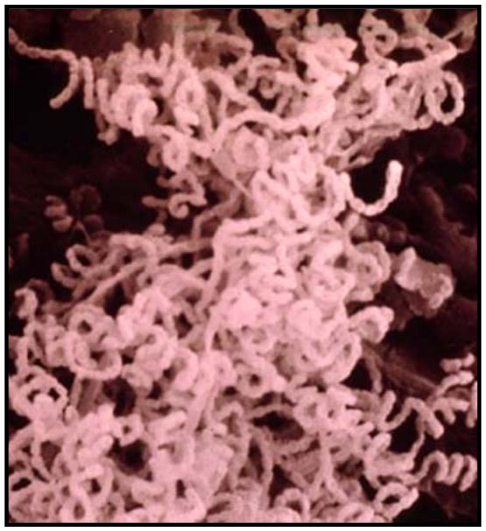
Basis of the biology of composting

- The microorganisms of composting
  - Fungi

- aerobic
- degrade wood
- creation of stabilized crumbs
- important during maturation stage

Basis of the biology of composting

- The microorganisms of composting
  - Actinomycetes (ray fungus)



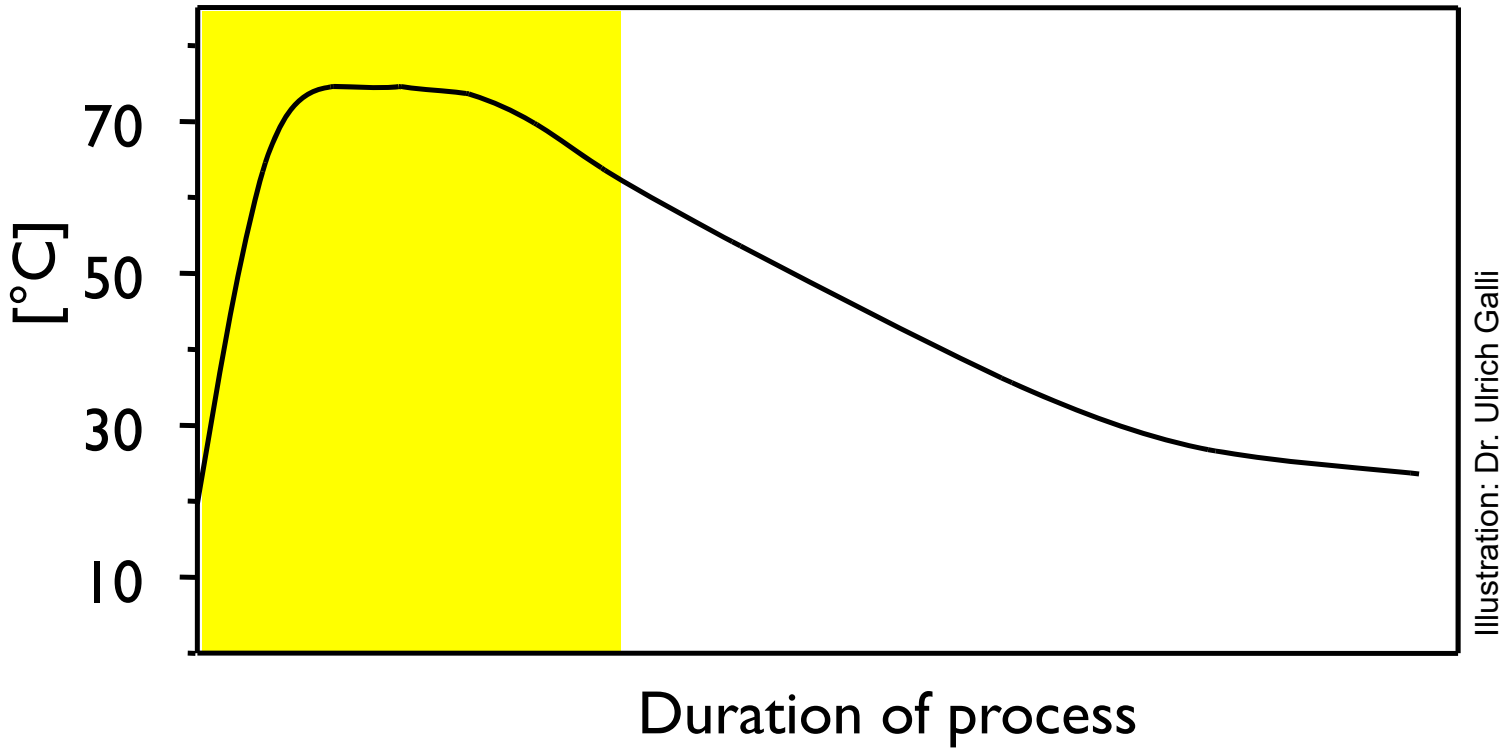
  - can degrade substances, which can not be degraded with bacteria or fungi e.g. chitin
  - responsible for decomposition of difficult materials

Basis of the biology of composting

- Composting: rotting process
  - Phase of decomposition
    - Intensive microbiological activity
    - Increasing temperature
    - Extreme loss in volume
    - Natural hygienization
  - Phase of maturation (curing)
    - Creation of stable humus
    - Development of positive characteristics of compost

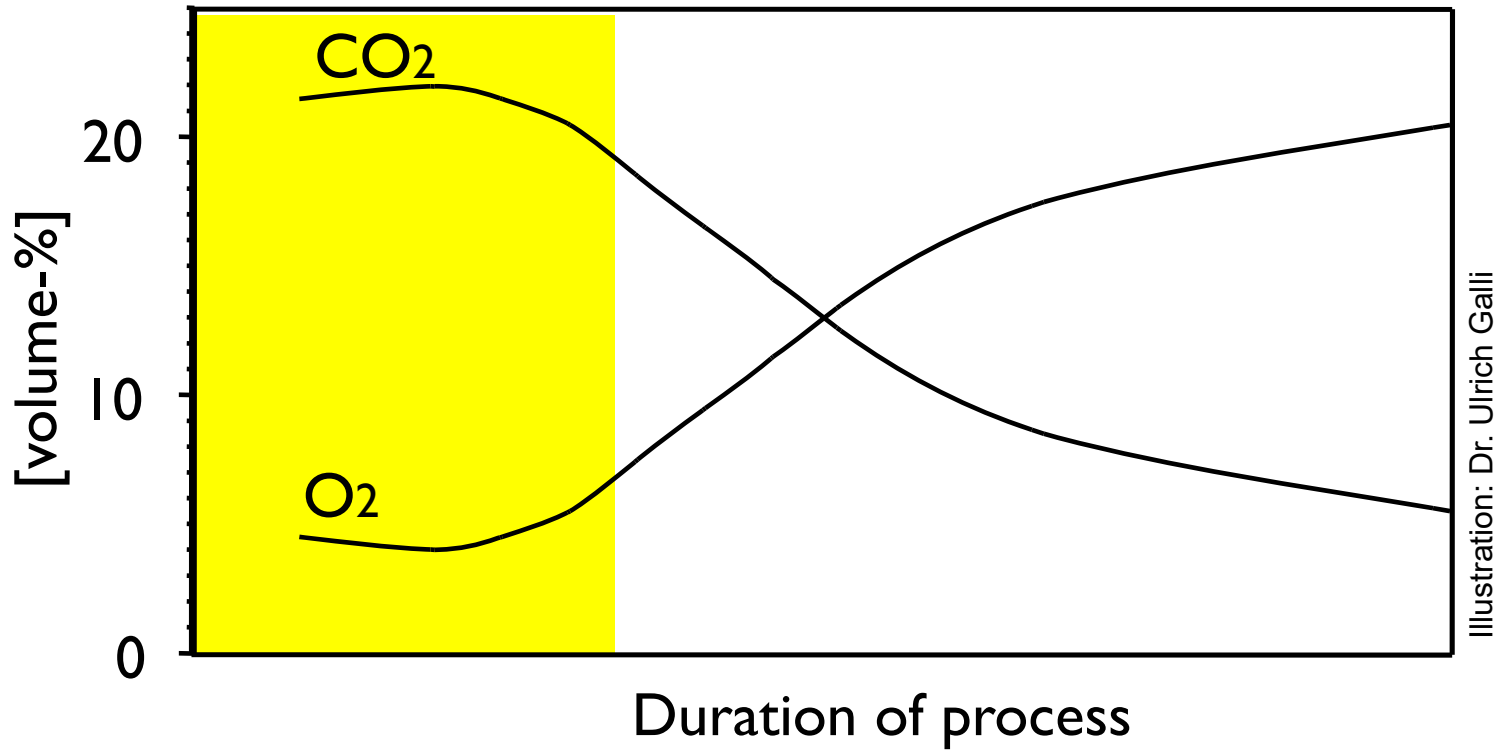
Basis of the biology of composting

› Evolution of temperature during composting



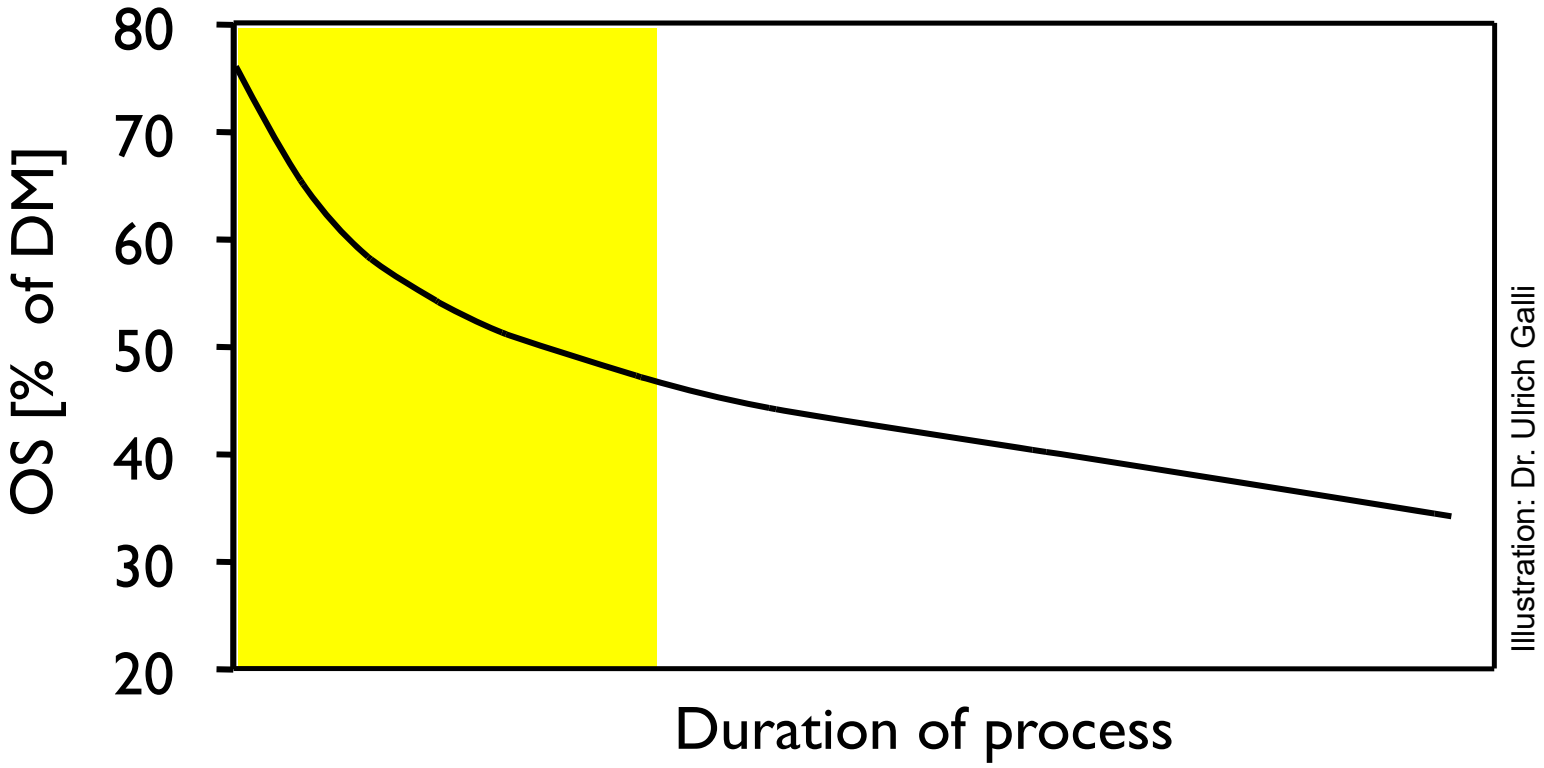
Basis of the biology of composting

› Evolution of gas composition during composting



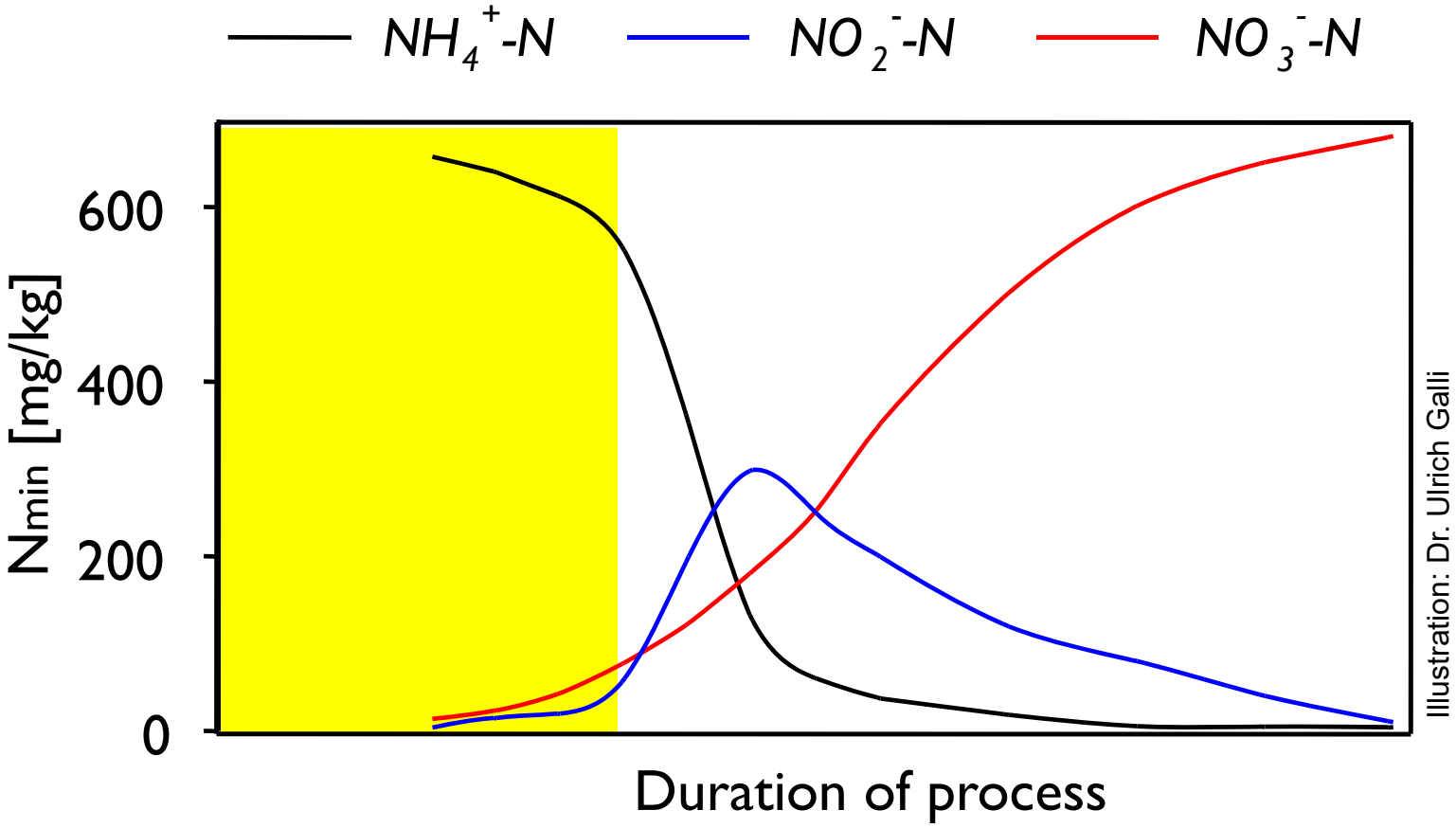
Basis of the biology of composting

› Evolution of organic substance during composting



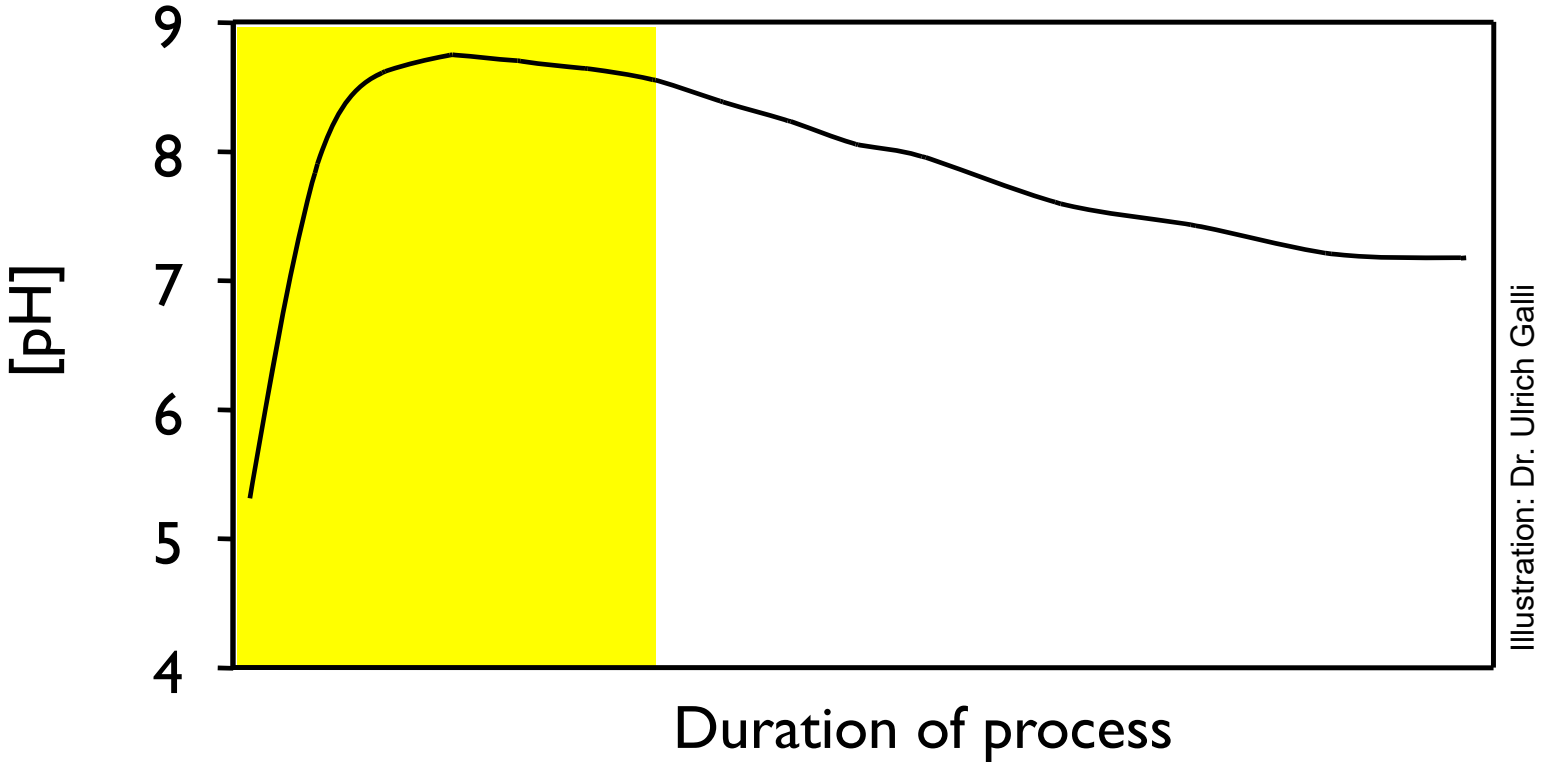
Basis of the biology of composting

› Evolution of N_{min} forms during composting



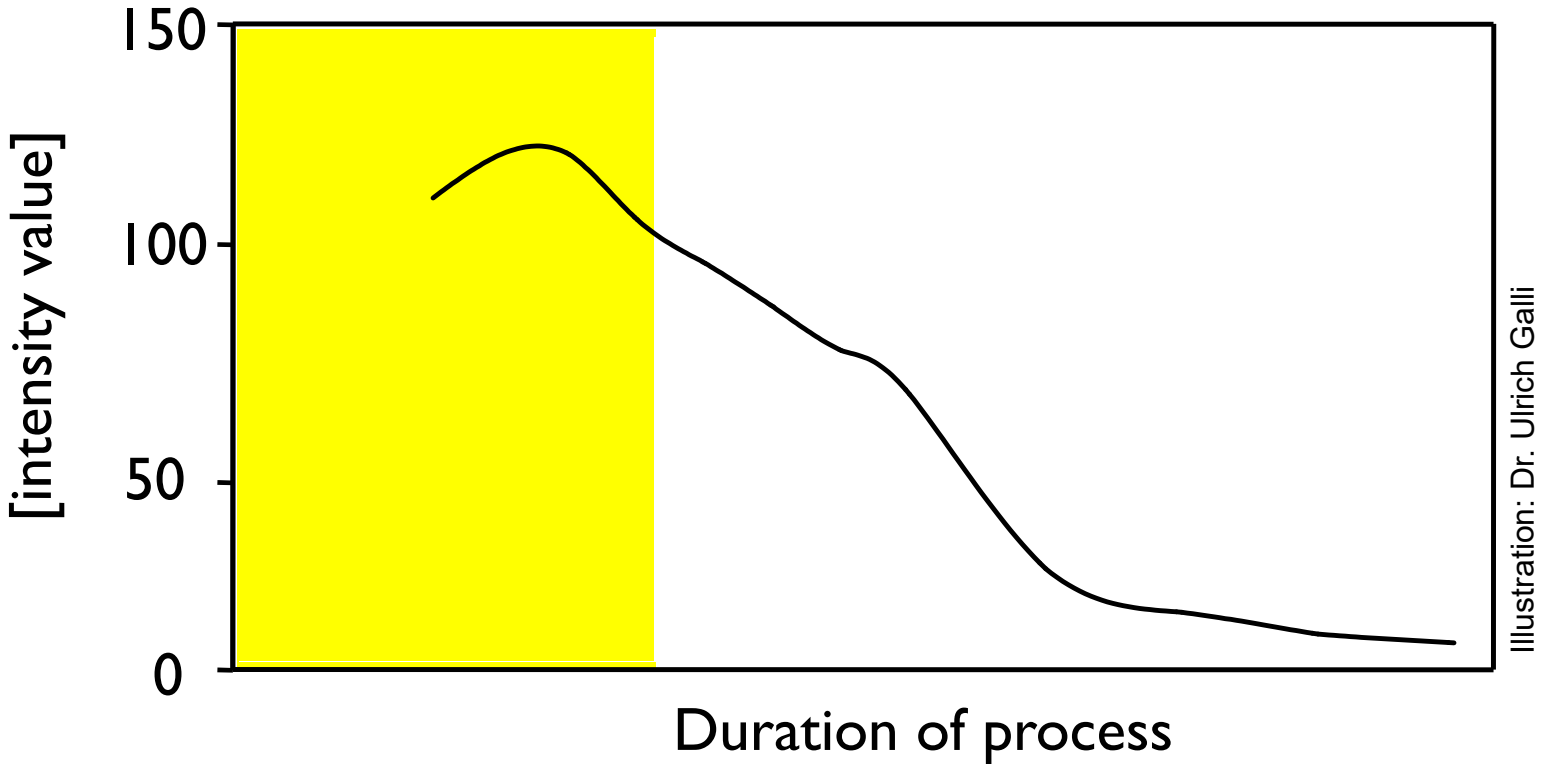
Basis of the biology of composting

› Evolution of pH during composting



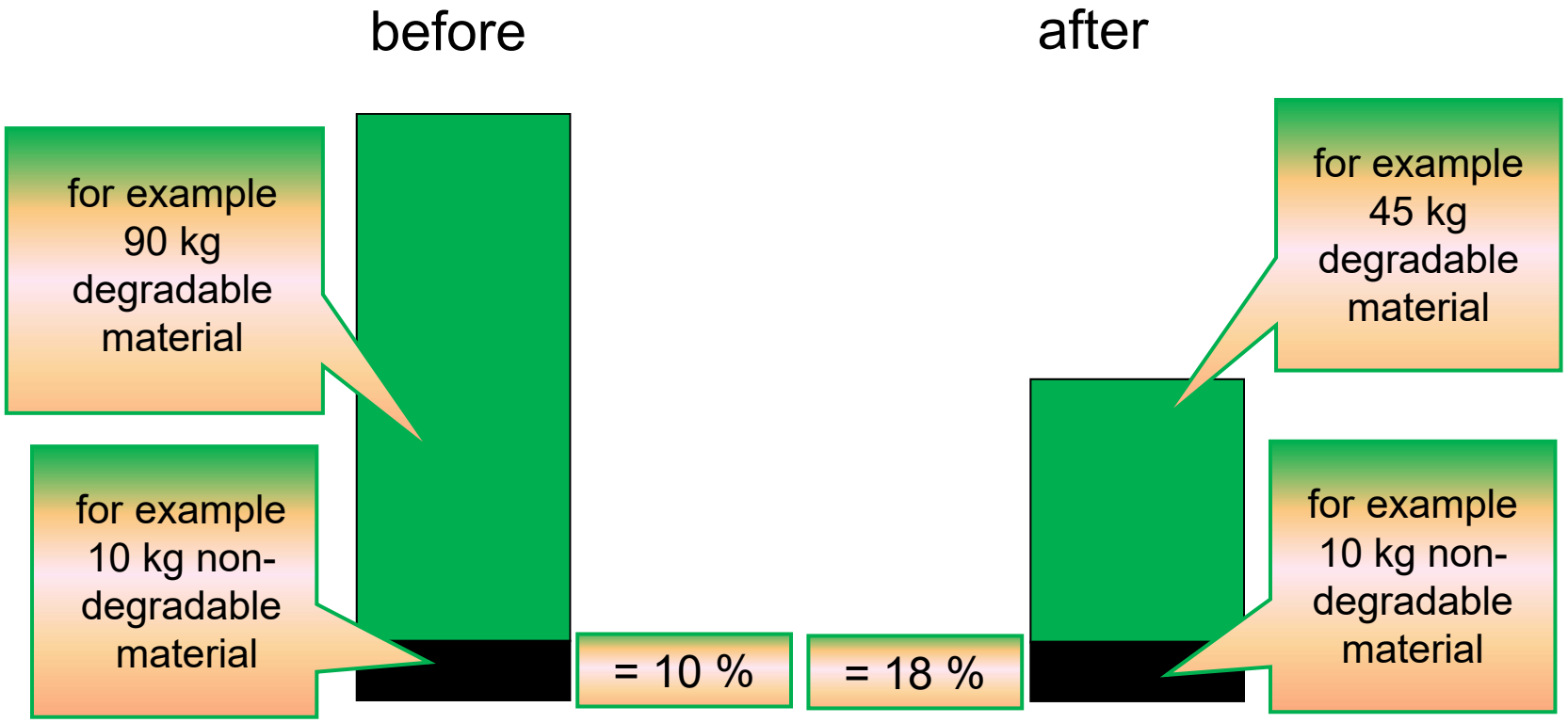
Basis of the biology of composting

› Evolution of compost extract colour during composting



Basis of the biology of composting

- Evolution of undesirable materials during composting
  - metals, earth, plastics, …



Basis of the biology of composting

- Evolution of undesirable materials during composting
  - metals, earth, plastics, … ⇧
  - other chemical compounds ???
  - pathogenic germs and weed seeds ⇩

Basis of the biology of composting

- Final product: compost
  - Organic fertilization
  - Amelioration of soil structure
  - Biological plant protection product

- Compost is not waste !

Questions ? Discussion ?

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