Composting 101: Waste to wonders

6 May 2023

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Why compost?

- Soil microbe inoculant (habitat & food for microbes)
- Source of humic acid (nutrient & water storage & transport)
- Mulch to protect soil
- Weed management
- Fertility

Can be done at different scales

- At home - multiple methods
  Compost bin/pot/box/pit, bokashi, worm farm
- In your neighbourhood
  e.g. community garden
- Local medium-scale facility
  e.g. Easy Earth Whanganui, Community Compost Nelson
- Regional large-scale facility
  Living Earth (CHCH)

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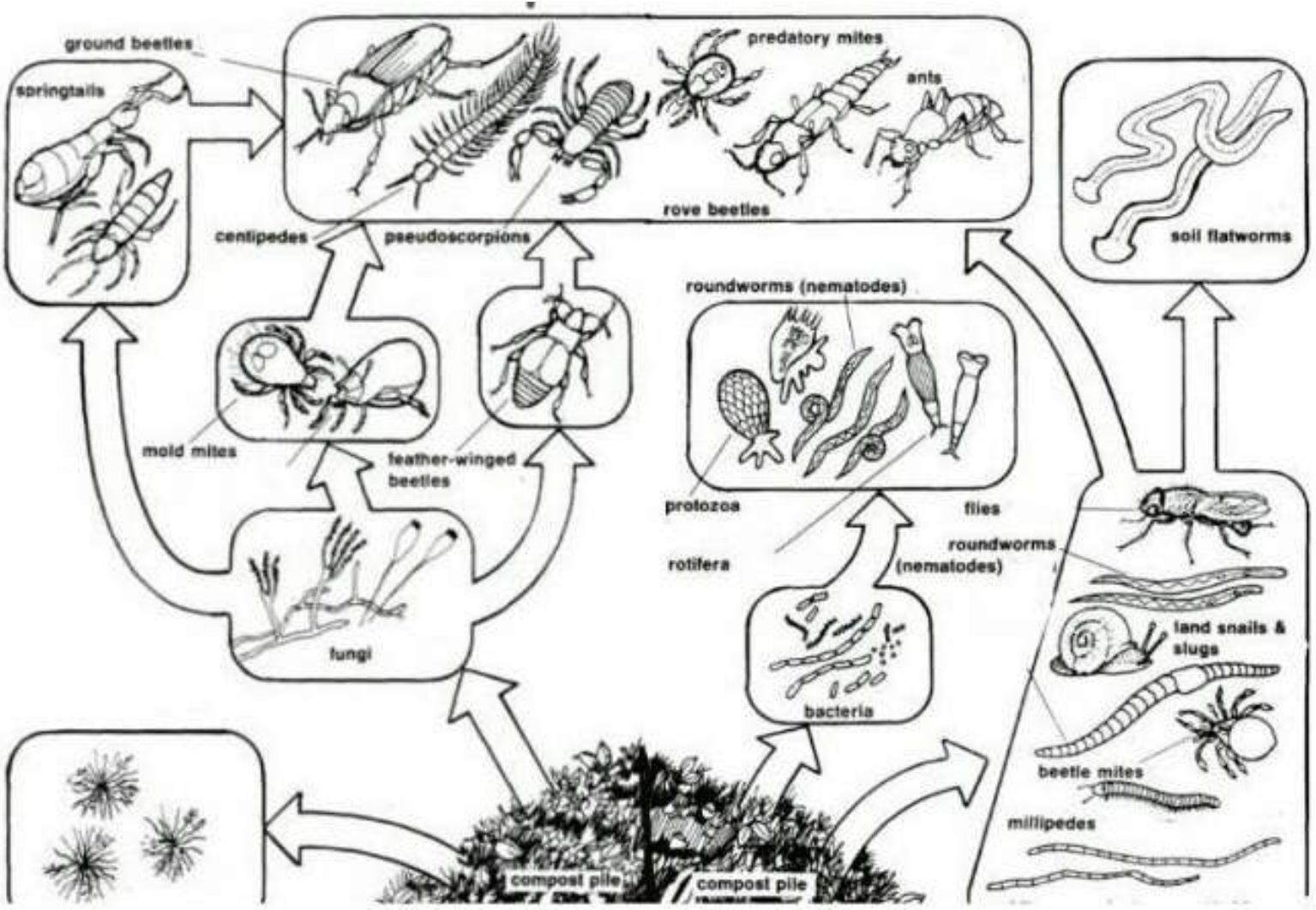
Compost food web

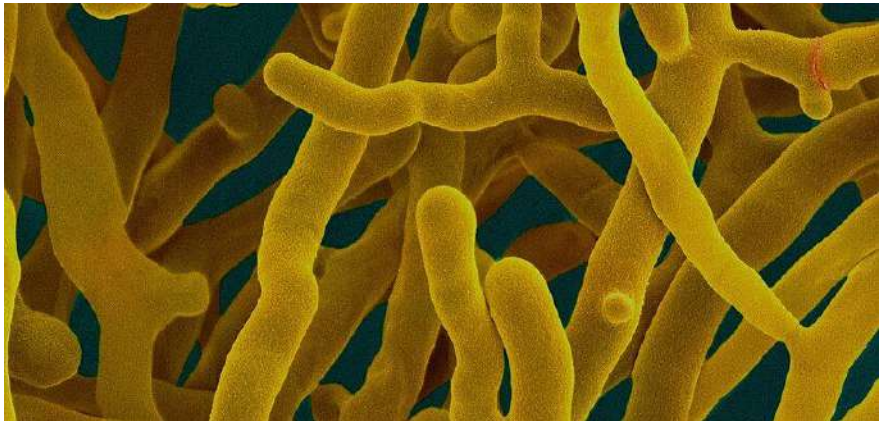


Three groups of bacteria- which do we want?

Aerobes need oxygen. Output from digestion is carbon dioxide and ammonia.

Facultative anaerobes thrive without oxygen but are still active with oxygen present. Do not produce methane.

Obligate anaerobes die/goes dormant when oxygen is present. Output from digestion is carbon dioxide and methane.



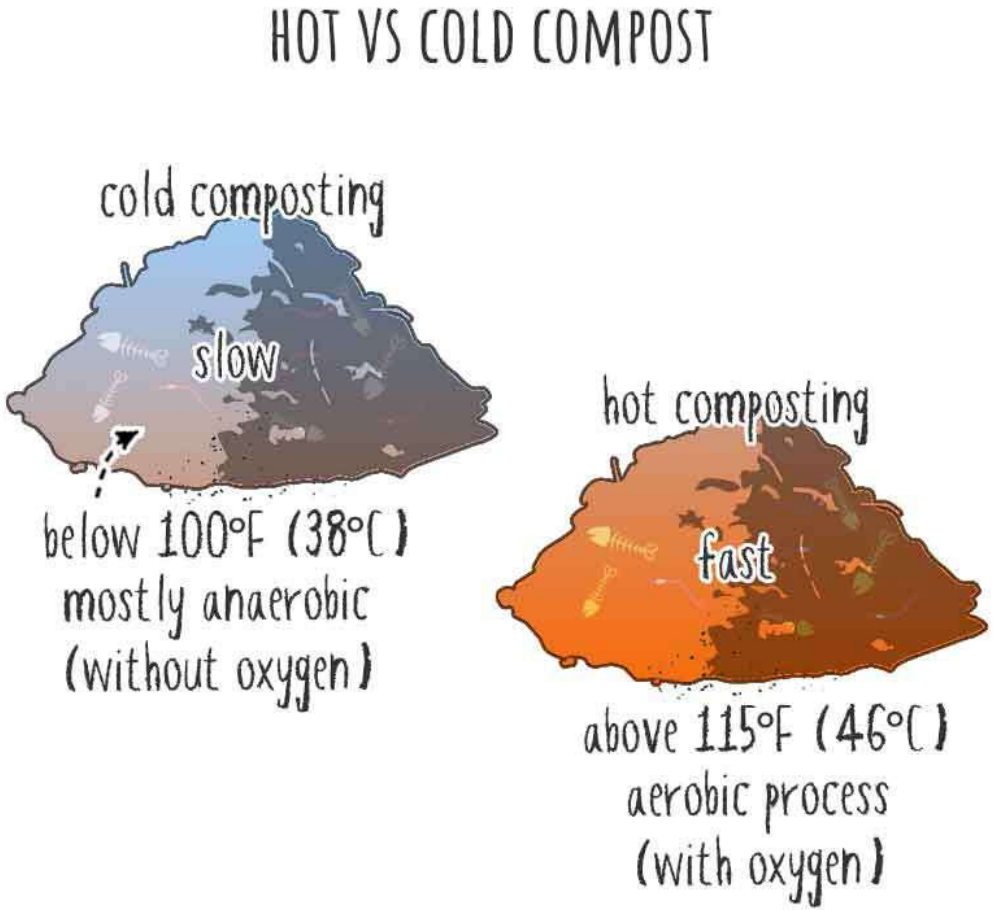
Streptomyces, fights pathogenic microbes in soil.

Lactobacillus, in bokashi and human gut

Many ways to compost...

Vermicompost

Bokashi
(fermented food)



Compost ingredients

Nitrogen/ “green”

- Food scraps (organic?)
- Coffee grounds
- Fresh garden residues (spray-free, beware of weed seeds)
- Grass clippings (spray-free)
- Manure (herbivores best, beware medication/ treatments)
- Seaweed (beware of contaminants)

- ~~Dog/cat poo~~

Carbon /“brown”

- Dry leaves
- Dried cut grass
- Paper/cardboard (ink free)
- Wood chips
- Straw/stalks
- Pampas grass

- ~~Packaging~~
- ~~Noxious weeds~~
- ~~Human poo~~

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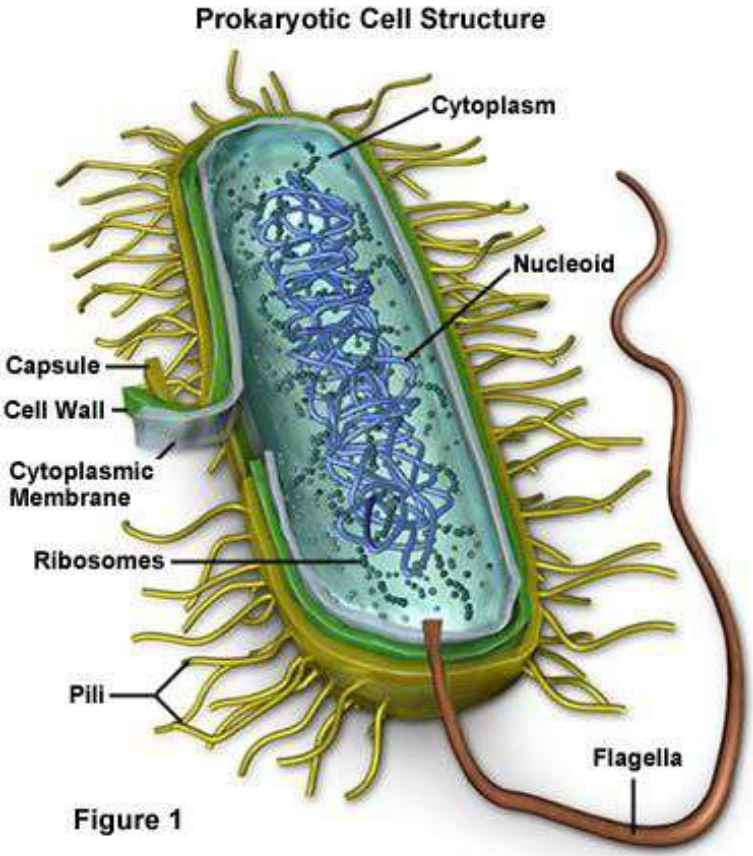
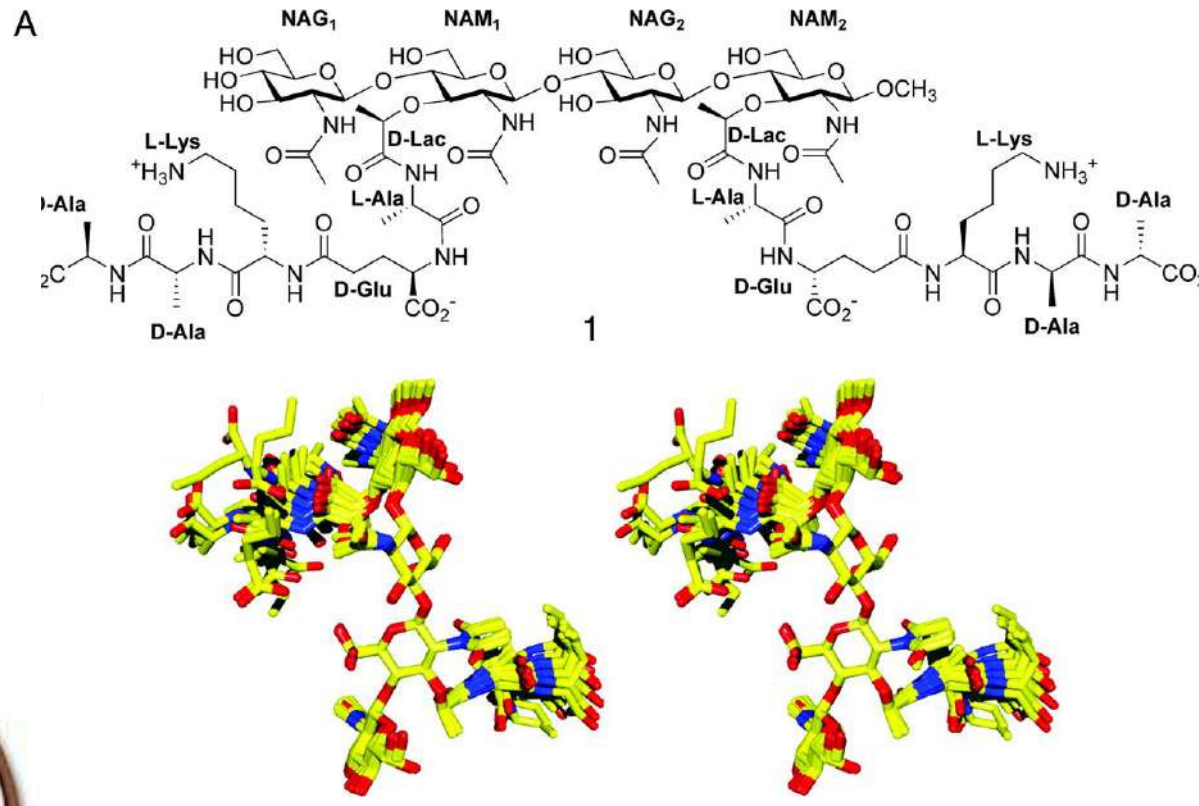
Carbon:nitrogen ratio

- Every living thing contains C & N
- Carbon=energy source and the basic building block making up ~50% of the mass of microbial cells.
- Nitrogen=crucial component of proteins, nucleic acids, amino acids, enzymes and co-enzymes necessary for cell growth and function.

- Compost needs a good balance of C:N
  - too much nitrogen = wet & slimy, smelly, too hot, methane
  - Too much carbon = dry, inactive, slow
- A good ratio is around 25:1 to 30:1 -

Carbon:nitrogen ratio of compost ingredients			
NITROGEN	**C:N**	**CARBON**	**C:N**
Alfalfa	12:1	Ashes, wood	25:1
Clover	23:1	Cardboard, shredded	350:1
Coffee grounds	20:1	Corn stalks	75:1
Food waste	20:1	Leaves	60:1
Garden waste	30:1	Newspaper, shredded	175:1
Grass clippings	20:1	Pine needles	80:1
Hay	25:1	Sawdust	325:1
Manure	15:1	Straw	75:1
Seaweed	19:1	Wood chips	400:1
Veggie scraps	25:1		





Peptidoglycan- major part of the cell wall of a bacteria

Moisture management

- Water the pile between each layer
- Alternatively, pre-soak materials before hand
- Aim for enough moisture to be able to squeeze out drops in a handful at all times
- Covering pile helps retain moisture
- Place dip in top of pile for moisture that condenses on underside of cover to collect and re-enter in centre of pile

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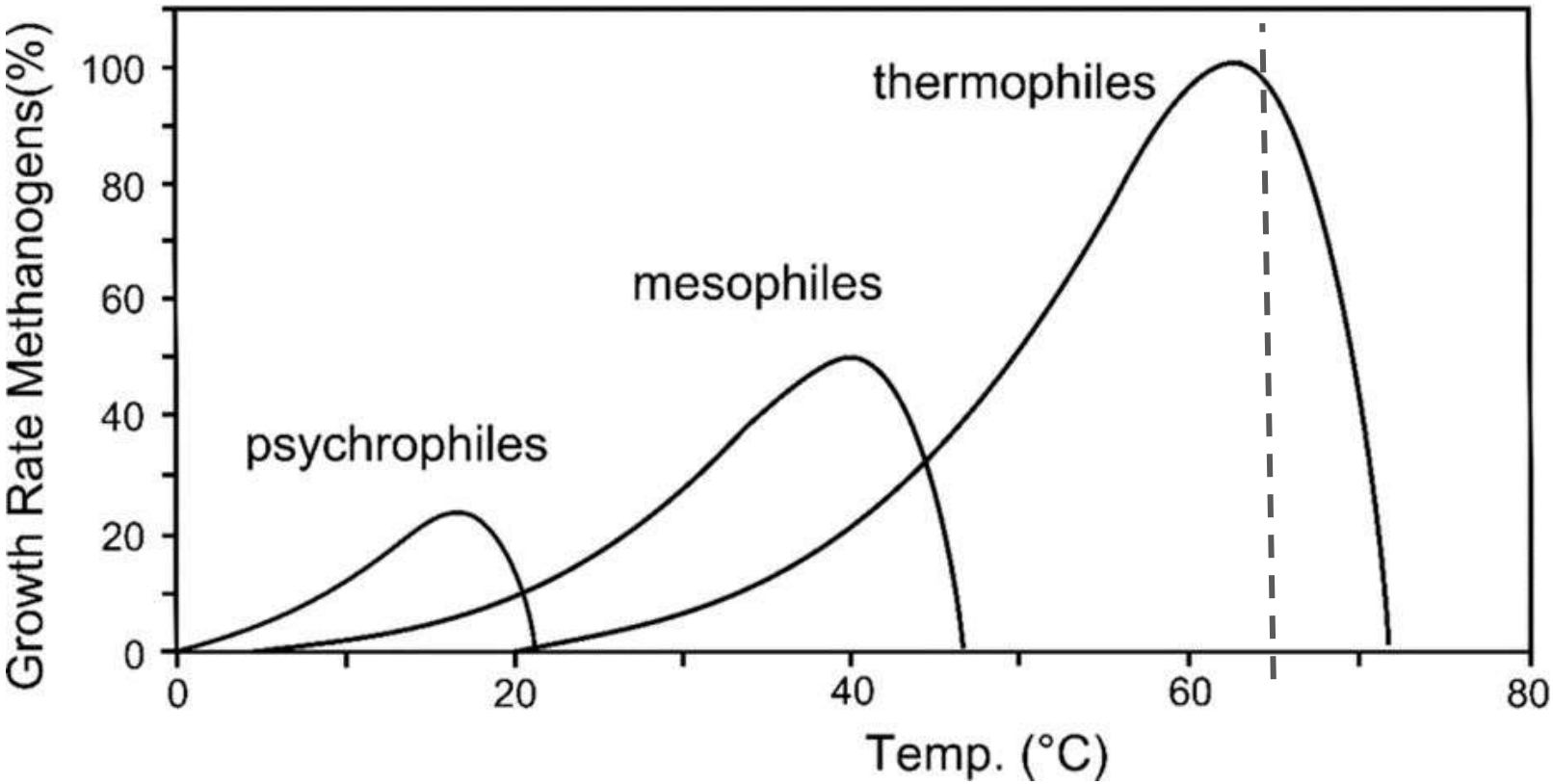
Temperature



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Predator-proofing

Compost ingredients (especially food waste) attracts mice and rats who like the warm secure environment and free food. Predator proofing is essential.

Why rodents are bad

- They eat your compost
- diseases - their droppings and urine can transmit harmful pathogens
- Damage to some plants if you use the compost afterward
- Rats predate native birds and their eggs

What you need to predator proof bins

- Galvanised wire mesh with holes no bigger than 1.25cm
- Pliers/cable ties OR
- hooped nails/hammer/pallet (if raising pile)

Aerobic composting (turning vs no-turn or “static”)

- Rely on aerobic microbes so needs oxygen
- Piles often turned to keep aerobic but turning releases CO_2 and breaks fungal hyphae
- Goal of static composting is to keep pile happy without turning by:

1. Getting pile size, structure, carbon:nitrogen ratio and moisture levels right
2. Cheating, by inoculating with BAM (beneficial anaerobic microbes)
3. Tracking temperature and taking corrective action if needed

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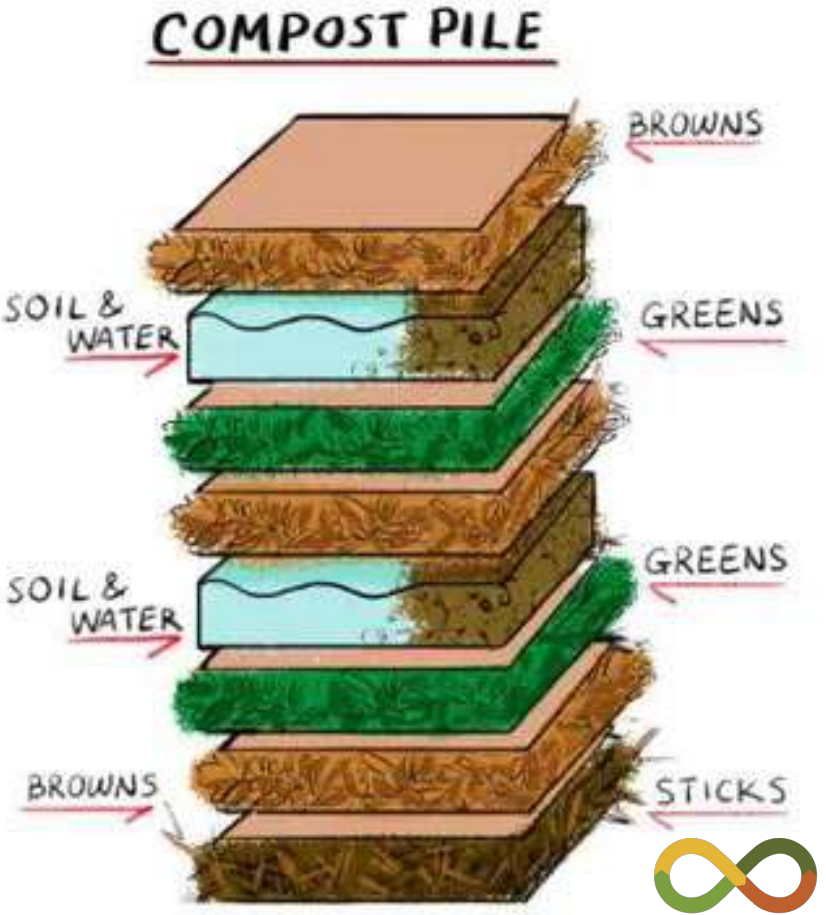
Size & structure (hot compost)

- Chunky sticks at bottom for aeration
- Alternate brown & green layers (~10cm/layer)
- If including soil/compost layer, add on top of green layers
- Brown layers for top and bottom
- 1m3 minimum to get required heat levels
- Keep edge vertical
- Cover with tarp or cap with straw/hay so water runs off



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Beneficial Anaerobic Microbes (BAM)

- contains facultative anaerobes; active in aerobic and anaerobic conditions
- If middle of pile goes anaerobic, decomposition continues but without the smell
- aiming for pile to be soaked in BAM so beneficials can achieve quorum sensing and outcompete pathogenic bacteria
- Dilution: 1:20 BAM:water

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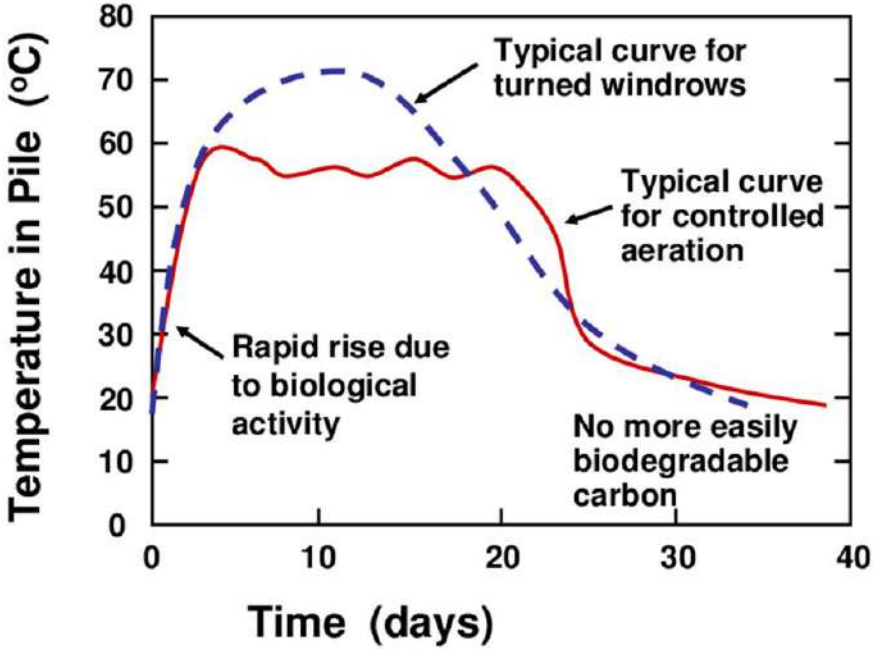
Temperature & Corrective Action

- pile should spike up to 65°C (no hotter) in first day or two after construction.
- After 7-10 days it should drop to constant temp around 40°C until complete



Corrective action:

- Too hot= too much nitrogen. Turn or rebuild with more carbon
- Too cold= too little nitrogen and/or water. Add N and/or H2O
- Smelly= anaerobic, possible too wet. Turn to add more oxygen.

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Anaerobic fermentation - Bokashi

- Bokashi originated from Japan, translating as ‘fermented organic matter’
- A system that ferments food scraps without oxygen using effective microbes (EM)
- Requires a two step process - Anaerobic (1st step), aerobic (2nd step)
- Enables all food scraps to be composted - including cooked and raw food, meat, dairy, bones & shells.

PROS:

- Safe to use
- Method allows for all food scraps to be composted
- Doesn’t require a large garden space, can be stored indoors under the kitchen sink
- No nasty smells or attracting nasty pests
- May emit lower greenhouse gas emissions
- Likely improves soil quality / plant growth by returning high amounts of carbon, nitrogen into the soil

CONS:

- Requires an airtight bucket
- Requires inoculated bran
- Finished ‘pickled’ solid needs to be buried in soil (30-70 cm deep) or composted
- Fermenting smell

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Why compost? (A grower's perspective)

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