



Advanced Composting

Kimbriki Eco House & Garden

'Learn how to build healthy soils, healthy plants & healthy people'

This advanced composting workshop will deepen your knowledge and skills in relation to living soils & clarify what soil is made of. The ongoing success of organic gardening & farming depends on beneficial microbes, which act as drivers for our entire soil and plant systems. The following notes are for your reference.

This advanced course will cover the following:

1. What is soil made of?
2. Testing & understanding pH
3. Microbial nature of soil
4. Creating bacterial or fungal dominance to suit different types of plants
5. Learning to apply the 3 'Keys' to your garden: 1. Compost 2. Mulches 3. Aerated Compost Teas

1. WHAT IS SOIL MADE OF?

Soil is made of two types of 'ingredients' – Organic Matter (OM) & Rocks (Mineral Matter). Understanding this in a practical sense will give you the skills & confidence to grow plants anywhere in the world.

"The soil is virtually a living organism. It is not just a collection of mineral particles with bugs walking through them. It is a mass of organic, living material in an inorganic matrix. It is dynamic. It is full of life. And it does not produce anything (healthy and vital) for human beings unless it is sustained in that living condition." EO Wilson (1993)

Minerals

These begin as rocks which gradually break down into smaller and smaller particles (i.e. sand to silt to clay). Clay particles are defined as mineral particles having a diameter of <math><0.002\text{mm}</math>. These minute particles are given the name 'Clay Colloids'. Clay colloids have a very symmetrical, crystal-like shape with a fairly flat, small surface area, and they are electrically charged.

Organic Matter (any plant or animal tissue)

All plant and animal tissue (other than when burnt) is decomposed (i.e., broken down) by soil microbes and macrobes into smaller and smaller particles. These decomposing particles of organic matter eventually become HUMUS. Humus particles are defined as organic particles having a diameter of <math><0.002\text{mm}</math>. These minute particles are given the name 'Humus Colloids'. Humus colloids have a very irregular, anemone like shape with a very large surface area, and they are also electrically charged.

Colloids

Both the clay and humus colloids have special qualities. They have an electric charge (mostly negative) all over their surface. This mostly negative charge allows these colloids to attract and hold large numbers of positively

4. CREATING BACTERIAL OR FUNGAL DOMINANCE TO SUIT DIFFERENT TYPES OF PLANTS

Bacteria & Fungi are the two main bodies of microbes in soil. Annual plants are happier and healthier with **bacterial** dominance in their root zone, perennial plants prefer a **fungal** dominance in their root zone. We will learn how to manage this in our gardens.

The softer ANNUALS - i.e. vegies and herbs, prefer a more **bacterial dominated soil or a reasonable balance of bacteria and fungi**. These plants prefer their **Nitrogen as NITRATE (NO₃)**.

Most PERENNIALS – i.e. woody shrubs and trees, prefer a **fungal dominated soil**. These plants prefer their **Nitrogen as AMMONIUM (NH₄)**.

Bacteria are concentrated forms of Nitrogen (N). No other living creature has a higher concentration of N in its body than bacteria.

Bacteria have a C:N ratio of approx. 4:1 (4 parts Carbon to 1 part Nitrogen)

Fungi are concentrated forms of Carbon.

Fungi have a C:N ratio of approx. 15:1 (15 parts Carbon to 1 part Nitrogen)

So, we begin to learn that bacteria will begin to ‘dominate’ in the soil food web if we INCREASE the amount of Nitrogen (Protein). **Fungi** will begin to ‘dominate’ as we increase the amount of Carbon into the soil.

It is now for us to learn how to get a **‘feel’ for this balance and then learn to shift this balance, in the direction preferred by the plants that we are growing.**

5. LEARNING TO APPLY THE 3 ‘KEYS’ TO YOUR GARDEN

To manage pH, water, microbial balance, general plant production & plant health, we have the following 3 ‘tools’ to learn to use.

1. Compost – we refer here to the ‘black’ Humus material from decomposition

2. Mulches – we refer here to any materials added to the surface of your soil

3. Aerated Compost Teas – we refer here to ‘brown’ liquids made from stirring mature composts in water using special recipes for spraying onto both the soil and the plants themselves. ‘Worm Juice’ from a worm farm is also technically a ‘Compost Tea’.

1 & 2. Composts & Mulches

Bacterial Domination

Knowing that **soft annual plants (vegies & non woody herbs)** prefer Bacterial domination in their root zone, then, they will prefer composts & mulches with higher protein/nitrogen. More Protein encourages bacterial activity and will have more Nitrogen available in the Nitrate form. (NO₃) Compost ingredients higher in Nitrogen are the fresh soft green materials, especially **legumes, and also animal manures**. Mulches higher in Nitrogen are the fresh soft green materials, especially legumes, e.g. **lucerne hay & chaff, and chick pea mulch**.

Fungal Domination

Woody shrubs and trees prefer Fungal domination in their root zone. Composts & Mulches with higher Carbon encourage Fungal activity and will have more Nitrogen available in the Ammonium form (NH₄). Mulches which are higher in Carbon include the more woody brown materials such as **dry leaves, and ‘woody’ mulches**.

‘Forest Fines’ from Australian Native Landscapes, is an excellent fine woody mulch with high diversity of ingredients. Forest Fines is also an excellent ingredient into your home compost bin.

NB: Sugar cane mulch has average levels of Nitrogen and Carbon.

Good Compost Making¹

Nutrients are best introduced through composting. Compost heaps provide a controlled environment in which microbial activity occurs much more rapidly than it does in soil. In these heaps, soil organisms break down plant and vegetable matter into a dark brown material called humus. **Composting turns garden and household waste into a valuable conditioner which improves the physical qualities and fertility of soil, resulting in greater vitality and better yields.**

A.D.A.M. Principles - our key soil-based principles

Aliveness

- Creating more microbial life in our garden soils. This living soil is **where the vitality, insect and disease resistance of our plants is created.**
- The process of decomposition, which is nature's natural fertility system, depends on the billions of living microbes present in every handful of healthy soil. **It's all about our soil!**
- Stop using any synthetic pesticides and herbicides. These toxic poisons harm the life in the soil and us!
- Carbon in the soil is the energy source for microscopic organisms – the 'drivers' of the entire soil system. The soil needs more carbon! E.g. dry leaves, woody mulch, and sawdust.

Diversity

- Do whatever we can to increase biodiversity **both above and below the soil surface.**
- Recent research indicates that microbial diversity in the soil is a key **to strengthening plant immunity** to insect and disease attack.
- Mulches and composts made at large garden organics collections sites, such as Kimbriki, are higher in **microbial diversity** because of the **huge variety of plant matter** used to create them.

Aeration

- Soil is alive – it breathes! Above the ground, plants photosynthesise and take in carbon dioxide (CO₂), and then release water (H₂O) and oxygen (O₂), but in the soil, plant roots breathe in O₂ and release CO₂, like humans do – Air is important in your soil.
- Keep gardens, composts and worm farms, as **aerobic** (with oxygen) as possible. The natural system of aeration by living organisms, especially worms must be continually encouraged, and we must aerate our soils using mulches and regularly turning our composts.
- Carbon in the soil in the mature form of '**HUMUS**' (long chain carbon molecules) is the key to soil aeration which **ensures optimum plant growth and optimum plant health** – keep adding diverse organic matter to your gardens.

Moisture

- All life requires moisture to live and flourish.
- Do whatever we can to **achieve more efficient use of whatever moisture is available** by reducing moisture loss by evaporation (add surface mulch); ensuring maximum infiltration (improve soil structure/biological activity), and maximising water holding capacity (increase organic matter and humus/carbon).
- Strongly and enthusiastically encourage the saving of water (tanks, ponds, recycling of water etc).

Hot Composting Method

The principle behind Hot Composting is to get the pile to heat up and this is dependent on the right carbon to nitrogen ratio right from the start. **Anything that was once living can be composted!**

Put simply your pile should be 25-30 parts carbon to 1 part nitrogen, here are some examples of ingredients:

Carbon-Rich Ingredients	Nitrogen-Rich Ingredients
Straw	Fresh Grass Clippings
Dry Corn Stalks	Fruit & Veg Scraps
Shredded Paper	Weeds
Small Twigs	Deadheads/Trimmings from plants
Dry Fallen Leaves	Coffee Grounds & Tea Bags
Fine woody mulches/ Bark	Animal manures

Carbon-Rich Ingredients	Nitrogen-Rich Ingredients
Wood Ash/ Peat	Eggshells
Dry Grass clippings	Seaweed
Dryer Lint/Vacuum Contents	
Wood Shavings	

1. Find a well-drained semi-shaded position close to a water source that gets a few hours sunlight each day minimum. Preferably away from invading tree roots.
2. Create layers of each of each of the materials as in the example below, watering each layer as you construct so that it has the feel of a damp sponge
3. When complete, cover with mulch, hessian sacks or old wool carpet to preserve the moisture.
4. Check for dryness once a week and sprinkle with water regularly.
5. If you notice a smell, aerate by turning the pile with a fork or compost turner to allow more air flow. This will also help it cook faster.
6. The compost is ready when it has a dark brown, crumbly texture, a pleasant, earthy smell and has shrunk by over 50% to nearly 70% and has lots of earthworm activity.
7. Add to your flower and vegetable gardens, add to potting mixes, potted plants and the drip line of trees.



¹ Stefan Mager "Elements of Nature Guide" Published by www.aracariaguides.com

3. Modern 'Aerated' Compost 'Teas'

Recent biological research is showing us a BIG DIFFERENCE between:

1. the old-style manure teas, made simply by soaking some manure or compost in water and getting a brown liquid and
2. the modern 'compost teas' which use more specific recipes and must be 'Actively Aerated'. Old style manure teas are often Anaerobic with low numbers of beneficial microbes and can ferment into alcohol which can be dangerous to some plants. Modern Aerated Compost Teas are very high in beneficial microbes and have no alcohol.

Setting up the Tea Brewer

A simple aerated tea brewer can be made using a 20 litre bucket, an aquarium pump and 2 airstones. Try and get a pump with two air outlets or use two single outlet pumps.

The key test for sufficient aeration is the smell test.

- **Smells good = adequate aeration**
- **Smells bad = inadequate aeration**

NB Keep all components of the system very CLEAN between brews

Basic Compost Tea recipes

Two Types of 'teas'

1. Vegies and other Annuals Tea
2. Trees & Shrubs Tea

Type 1 Tea Recipe (for 20 litres of 'tea') - Vegies and other Annuals Brew

- Use approximately four cups of very mature (non woody) black rich compost with more protein and less carbon (High worm activity indicates bacterial dominance). Worm Castings are also very good for this 'bacterial tea'. (Worm 'juice' tea is a high quality Type 1 tea).
- Mix this compost with 20 litres of nice pure water, i.e. no chlorine or other poisons. The water quality is critical. Rainwater is great.

Extra microbe food for Type 1 Tea

- Add two tablespoons of a simple sugar to feed the microbes during the 'brewing' process. e.g. Molasses (non-sulphured), cane syrup, maple syrup or fruit juice.

Type 2 Tea Recipe - Trees & Shrubs Brew (for 20 litres of 'tea')

- Use approximately four cups of a more woody compost with more carbon & less protein/nitrogen. (e.g. "Greenlife Compost" – made at Kimbriki by ANL).
- Mix this compost with 20 litres of nice pure water, i.e. no chlorine or other poisons. The water quality is critical. Rainwater is great.

Extra microbe food for Type 2 Tea

- Mix 3-4 tablespoons of oatmeal, oat bran or powdered baby oatmeal with a cup of rich compost and moisten. Leave mix in container in a warm (27deg C) dark place for 3 or 4 days.
- A fungal 'beard' will grow. Add all this to your 20 litre bucket of water and woody compost and brew for one to two days.
- Other useful ingredients that encourage fungal populations are Aloe Vera, Kelp, Kiwi Fruit, pulp of Oranges & Apples.

FAQs for both Type 1 & Type 2 'Tea'

How long to aerate the brew?

Minimum 24 to 48 hours of aerated brewing

How much Aerated Tea can I use and when can I use it?

Research shows that you can never use too much aerated tea. It doesn't burn plant leaves or roots. Billions of beneficial microbes will be present. Apply before 10am or after 3pm. Excess heat and ultraviolet light kills microbes until they establish themselves in situ.

- At onset of flowering or fruit set
- At first sign of any stress or disease in plants
- Boost to young plants over two weeks old
- Regularly as a general 'tonic' for plants

How do I use the Aerated Teas?

Directly onto the soil

Always water into the soil at the **drip line** – if possible. Always use fresh, aerated 'tea'.

You can use the 'tea' undiluted around well-established plants. Ensure though that you dilute the 'tea' (to the colour of weak 'tea'), if using around young plants and seedlings!

Spray onto the leaves of your plants as a special plant 'tonic'

Compost 'tea' can help prevent many fungal organisms from damaging your plants and is also a good 'foliar feed' for your plants at flower and fruit set times or just for a 'nice little boost' for your lovely herbs, vegies and fruit trees.

- Filter the 'tea' through a fine strainer or use an old stocking as your strainer. Put the filtered tea into your Spray Bottle.
- Now you can spray this 'tea' just like this OR you can add some Fish Emulsion and also some Seasol or other good seaweed product into the mix – at their recommended rates – and spray your plants with this
- Spray onto plant leaves directly making sure to cover the fronts AND backs of the leaves
- Bigger droplets and lower pressure are best (to not harm the living microbes).

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For more information
visit www.kimbriki.com.au/eco-house-garden
email kimbriki@kimbriki.com
contact phone 02 9486 3512 Monday to Friday 8.30-5.00
Kimbriki Resource Recovery Centre

