



The
Gloucester Project Inc

Workshop #1

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Growing Garlic
towards self sufficiency and commercial cropping

Improving and preparing soil for growing garlic
in Gloucester and surrounding areas

Presenters

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Demonstration - Making Compost Tea
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Garlic

Ideal soil conditions: well-drained, fertile, humusy soil; pH 6.0 -7.0

In sandy conditions, it may be worth planting garlic above a layer of well made compost, mainly to improve moisture retention. In heavier soils, don't just rely on cultivation, make sure you do everything you can to maintain strong soil structure.

The requirements for growing garlic are more like those for potatoes than onions. This means garlic will need a fair bit of Nitrogen - but only in the early leaf-growing stage - so don't overdo the fertilizer.

Phosphorus will be essential for good root development and potassium for leaf growth and bulb quality.

Also, the compounds that give garlic its health benefits are mostly Sulphur compounds, so this nutrient will also be important.

In general, it is best to use an organic fertilizer based on either Poultry or Cow Manure, as these will give the best balance of nutrients.

For Sulphur, sprinkle a little Gypsum *over the bed* after the plants begin to emerge.

Do not plant where garlic or its relatives, such as onions and shallots, have been planted the previous year

Sources and further reading

Books

Lothian Vegetables : Successful Organic Growing

French Jackie The Organic Garden Problem Solver

Bennett, Peter., Organic Gardening, Australian & NZ Book Co Pty Ltd, 1979

La Motte Chemical Products Company, La Motte Soil Handbook, 1930, reprinted 1985

Handreck, Kevin., When Should I Water?, Discovering Soils No.8, CSIRO Division Of Soils, 1979

Coleman, Eliot., The New Organic Grower, Chelsea Green Publishing

Internet

<http://en.wikipedia.org/wiki/Greensand>

www.food-from-the-garden.com

www.terraxis.bees.unsw.edu.au

www.bokashiaustralia.com.au



The
Gloucester Project

For more information please visit
www.tuckergardenpatch.com
www.thegloucesterproject.org.au

Soil

When talking about all the factors in soil, we tend to think of each as a separate chemical or influence. In reality they all exist as an interacting system, each affected by the other factors. Therefore the best way to think about soil condition is to work out how to make it reach a good balance of multiple factors that work together to sustain the ideal conditions for plant growth. We don't want to throw particular factors at a poor soil, we want to establish the soil as a proper system to support our crops. See comments on making a good soil.

The four major components of soil are:

- Rocks and minerals (the solid portion)
- Organic matter, which includes microorganisms and plants (living or dead)
- Water
- Air -- yes, your soil does contain air. The amount varies by type of soil. Sand is highly aerated with clay being the exact opposite.

Amounts of each of these components determine soil quality and whether or not your plants will grow and thrive. Ideal garden soil consists of 25% air, 25% water, 40% mineral matter and 10% organic matter. It is dark-colored, smells kind of sweet, compresses into a loose lump in your hand when moist, and is chock-full of earthworms.

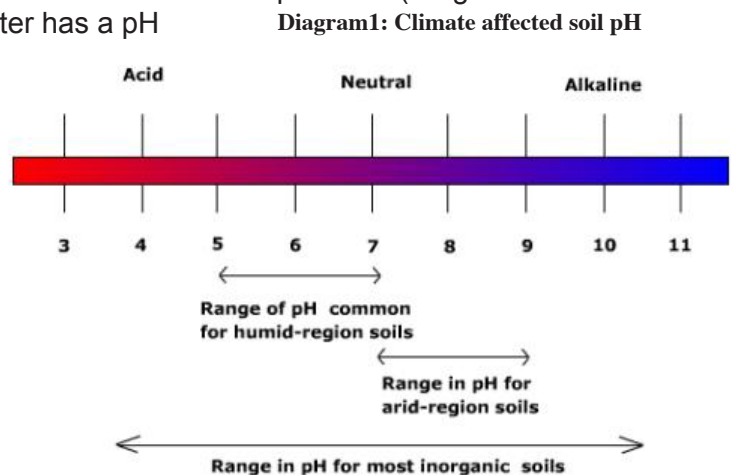
Soil Reaction (pH)

From an agricultural standpoint pH is important because it strongly affects plant growth, nutrient availability, toxicity and microbial activity. In an agricultural sense, soil pH indirectly affects plant growth. This is because various mineral nutrients are readily available in varying concentrations depending on the pH of soil. At certain pH levels, certain mineral nutrients remain with other minerals and are unavailable to the plant.

As plant material dies and decays it adds organic matter in the form of humus to the soil. Humus improves soil moisture retention while affecting soil chemistry. Cations (*An ion or group of ions having a positive charge and characteristically moving toward the negative*) such as calcium, magnesium, sodium, and potassium are attracted and held to humus. These cations are rather weakly held to the humus and can be replaced by metallic ions like iron and aluminum, releasing them into the soil for plants to use. Soils with the ability to absorb and retain exchangeable cations have a high cation-exchange capacity. Soils with a high cation-exchange capacity are more fertile than those with a low exchange capacity.

Hydrogen ion concentration in the soil is measured in terms of the pH scale (Diagram1 -acid alkaline scale). Soil pH ranges from 3 to 10. Pure water has a pH

of 7 which is considered neutral, pH values greater than seven are considered basic or alkaline, below seven acidic. Most good agricultural soils have a pH between 5 and 7. Though acidic soils pose a problem for agriculture due to their lack of nutrients, alkaline soils can pose a problem as well. Alkaline soils may contain appreciable amounts of sodium that exceed the tolerances of plants, contribute to high bulk density and poor soil structure. Alkaline soils are common in semiarid regions.



For example in relation to garlic which prefers a pH range of

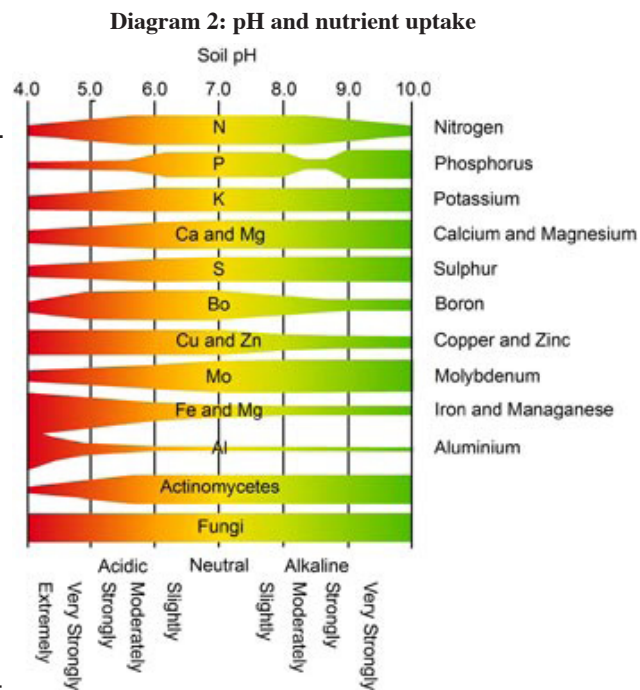
Source: www.terragis.bees.unsw.edu.au

6.0-7.0. If the pH is greater than 8, the availability of some nutrients such as Phosphorous can be limited (diagram2). This may be the case in arid and semi-arid growing areas where the soil is moderately- (i.e. pH 7-8.5) to strongly-alkaline (i.e. > 8.5).

if pH is less than 5, the availability of some nutrients such as phosphorus, calcium, magnesium and molybdenum is very low and so plant uptake is limited.

In addition, some generally insoluble cations (e.g. iron and aluminium) may be released into the soil solution. The result will be reduced plant vigour owing to the sensitivity of many plant roots to aluminium toxicity.

Adjustment of soil pH will often result in the re-adsorption (*the accumulation of molecules of a gas to form a thin film on the surface of a solid*) or release of the nutrient back into soil solution. It is therefore argued that pH is the single most important diagnostic chemical measurement of soil.



Source: www.terragis.bees.unsw.edu.au

Acidic soil is most common where rainfall is high and free drainage allows leaching and biological production of acid (Gloucester). This is because most of the exchangeable cations of calcium, magnesium, potassium and sodium are leached. This process occurs because of the introduction of a weak (i.e. carbonic acid) into a soil profile in one of two ways.

When soil pH is very low to moderate, lime is commonly added since it will dissolve to form acid-neutralizing constituents (i.e. Ca^{2+}) and also provide a source of Ca.

However, in neutral and alkaline soils, lime is very stable and will not rapidly dissolve. Adding lime in these conditions will do very little to improve nutrient availability and may even further reduce the solubility of phosphorus (P) and some micronutrients.

Increasing Soil pH. To correct acid soil, you add alkaline material. Doing this is called liming, probably because the most common solution is to add limestone. The finer the lime particles, the more rapidly it becomes effective. Different soils will require a different amount of lime to adjust the pH value. The texture of the soil, organic content, and the plants to be grown are all factors to consider when adjusting the pH value. Wood ashes will also raise soil pH. However, they break down very quickly, so use with caution. Over applying can cause serious soil imbalances.

Decreasing Soil pH. To correct alkaline soil, a source of acid is needed. Elemental sulfur is most commonly used by organic gardeners. However, sulfur requires some time before it is converted to sulfuric acid with the aid of soil bacteria. This conversion rate is dependent on the particle size of the sulfur, the amount of soil moisture, soil temperature and the presence of the bacteria. As a result, it can take several months to decrease the pH value so more soil preparation time is needed.

Nutrients

The three primary nutrients used by plants are nitrogen, phosphorus and potassium.

Nitrogen is largely responsible for healthy leaf and stem growth. In the soil, nitrogen is made available to plants by nitrogen fixing bacteria which convert nitrogen into nitrates, a form plants can use. Nitrogen does not remain in the soil for long. It gets used up by your plants and by decaying matter in the soil. It is also water soluble and can wash out of the soil rather quickly. Even so, an excess of nitrogen will cause a lot of foliage growth at the expense of flowers and fruit.

Texture

Soil texture is a little trickier to amend than soil fertility. Texture refers to the size of the soil particles. Sandy soils have very large particles (very coarse), silt and clay (very fine). Water, air and plant roots can move freely in sandy soils, sometimes too much so. At the other end of the spectrum is clay. Clay particles are so small they pack together tightly and leave little room for water, air or roots. If you've ever tried to garden in baked clay you know it also leaves little room for a shovel blade.

An easy test for soil texture is to make a ball of damp garden soil. If it breaks apart when you tap it, it's sandy. If you can press it between your thumb and finger and make a ribbon, it's clay.

Most soils are somewhere in-between. What you are ideally going for is called a sandy loam. It should be light and allow for air and water movement, but have some tilth, a kind of fine bread crumb like texture, which usually occurs when there is plenty of organic matter in the soil.

Don't try to change your soil texture by adding sand to clay or vice versa. That is a recipe for cement. Some amendment recommendations for clay do include a portion of very fine sand, but there are better ways to change your soil texture (see making good soil).

How Do I Know if I Have Bad Soil?

The only definitive way to know for sure is to have it tested.

A quick guesstimate of your soils health can be made by looking at your plants health. If they are thriving, don't fix what isn't broken. If your plants are languishing, yellowing or otherwise looking sickly or you feel like you are forever feeding them, it would be worth testing your soil.

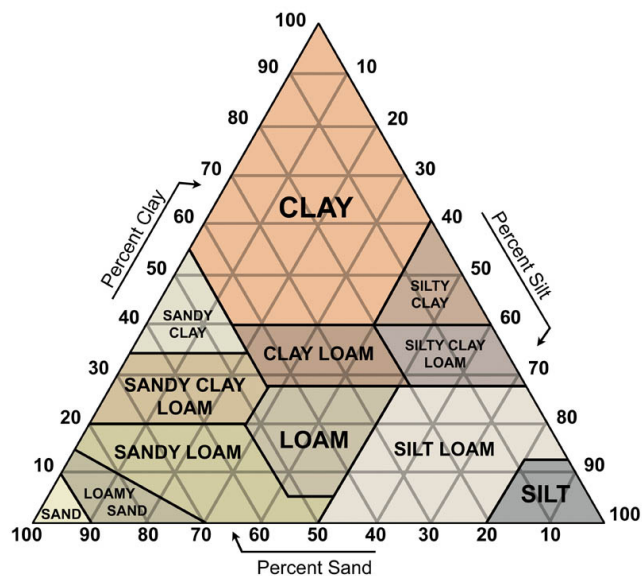
Organic Matter

Organic matter is dead plant or animal material. There is always some organic matter in your soil, but usually not enough for a plant's needs. Decaying organic matter, or humus, will help give your soil tilth. It helps sandy soil by retaining water that would otherwise wash away and it corrects clay soil by making it looser, so that air, water and roots can penetrate. In all soils, it encourages beneficial microbial activity and it provides some nutritional benefits. Humus is nature's way of feeding the circle of life (see Beneficial Microorganisms).

Phosphorus is very important for root growth. Flowering bulbs and root crops can always use some phosphorus. That's why blood and bone (bone meal) is often recommended for bulb planting. It is also crucial for producing flowers and you will sometimes see fertilizers with a high phosphorus content advertised as flower boosters.

Potassium is needed for overall plant health. It keeps the plants growing and aids their immune systems. Like nitrogen, potassium is also water soluble and needs to be replenished from time to time.

Besides the three primary nutrients, there are several trace elements that are necessary for good plant health like: calcium, magnesium, zinc, molybdenum, etc.



A soil texture triangle is used to classify the texture class of a soil. The sides of the soil texture triangle are scaled for the percentages of sand, silt, and clay. Clay percentages are read from left to right across the triangle (dashed lines). Silt is read from the upper right to lower left (light, dotted lines). Sand from lower right towards the upper left portion of the triangle (bold, solid lines). The boundaries of the soil texture classes are highlighted in blue. The intersection of the three sides on the triangle give the texture class. For instance, if you have a soil with 20% clay, 60% silt, and 20% sand it falls in the "silt loam" class.

Making Good Soil

If your pH is off, you can add either lime, to raise the alkalinity, or sulfur, to lower the pH. This is easy enough to do and should be done in stages, so as not to shock the plants. Generally it is recommended that you not add more than 5 pounds of lime or sulfur per 100 sq. ft. of existing garden. If you were wise enough to test your soil before putting in a garden or lawn, go ahead and dump in the whole recommended amount.

Adding Nutrients

If you find you need to add nutrients to your soil, you'll have the choice of organic or inorganic. Inorganic fertilizer has some pluses in its favor. It is usually cheaper than organic fertilizer and it acts more quickly. However, it does nothing for the soil and in some cases actually damages the soil with its higher salt content. In some cases it can also affect the chelation process of plants (*the process how plants convert minerals and vitamins in the soil, into a form that animals and humans can absorb*). So inorganic fertilizers don't actually amend the soil, they simply feed the plant. It is kind of like a human being trying to survive on vitamin supplements and no substantial food. There have also been some recent studies that claim plants build up a resistance to inorganic fertilizers and require more and more of them to get the same results.

That organic fertilizers are slower acting is actually a good thing. They release their nutrients over a period of time. There are many good complete organic fertilizers on the market. A complete fertilizer is one that contains all three primary nutrients, nitrogen, phosphorus and potassium. You can also get supplemental nutrition from products like manure and fish emulsion for nitrogen, bone meal for phosphorus and wood ashes for potassium. If you've had your soil tested, you'll know what you need to add.

Macronutrients

Nitrogen (N)

- * Nitrogen is a part of all living cells and is a necessary part of all proteins, enzymes and metabolic processes involved in the synthesis and transfer of energy.

- * Nitrogen is a part of chlorophyll, the green pigment of the plant that is responsible for photosynthesis.

- * Helps plants with rapid growth, increasing seed and fruit production and improving the quality of leaf and forage crops.

- * Nitrogen often comes from fertilizer application and from the air (legumes get their N from the atmosphere, water or rainfall contributes very little nitrogen)

Phosphorus (P)

- * Like nitrogen, phosphorus (P) is an essential part of the process of photosynthesis.

- * Involved in the formation of all oils, sugars, starches, etc.

- * Helps with the transformation of solar energy into chemical energy; proper plant maturation; withstanding stress.

- * Effects rapid growth.

- * Encourages blooming and root growth.

- * Phosphorus often comes from fertilizer, bone meal, and superphosphate.

Potassium (K)

- * Potassium is absorbed by plants in larger amounts than any other mineral element except nitrogen and, in some cases, calcium.

- * Helps in the building of protein, photosynthesis, fruit quality and reduction of diseases.

- * Potassium is supplied to plants by soil minerals, organic materials, and fertilizer.

Calcium (Ca)

- * Calcium, an essential part of plant cell wall structure, provides for normal transport and retention of other elements as well as strength in the plant. It is also thought to counteract the effect of alkali salts

and organic acids within a plant.

- * Sources of calcium are dolomitic lime, gypsum, and superphosphate.

Magnesium (Mg)

* Magnesium is part of the chlorophyll in all green plants and essential for photosynthesis. It also helps activate many plant enzymes needed for growth.

* Soil minerals, organic material, fertilizers, and dolomitic limestone are sources of magnesium for plants.

Sulfur (S)

* Essential plant food for production of protein.

* Promotes activity and development of enzymes and vitamins.

* Helps in chlorophyll formation.

* Improves root growth and seed production.

* Helps with vigorous plant growth and resistance to cold.

* Sulfur may be supplied to the soil from rainwater. It is also added in some fertilizers as an impurity, especially the lower grade fertilizers. The use of gypsum also increases soil sulfur levels

Micronutrients

Boron (B)

* Helps in the use of nutrients and regulates other nutrients.

* Aids production of sugar and carbohydrates.

* Essential for seed and fruit development.

* Sources of boron are organic matter and borax

Copper (Cu)

* Important for reproductive growth.

* Aids in root metabolism and helps in the utilization of proteins.

Chloride (Cl)

* Aids plant metabolism.

* Chloride is found in the soil.

Iron (Fe)

* Essential for formation of chlorophyll.

* Sources of iron are the soil, iron sulfate, iron chelate.

Manganese (Mn)

* Functions with enzyme systems involved in breakdown of carbohydrates, and nitrogen metabolism.

* Soil is a source of manganese.

Molybdenum (Mo)

* Helps in the use of nitrogen

* Soil is a source of molybdenum.

Zinc (Zn)

* Essential for the transformation of carbohydrates.

* Regulates consumption of sugars.

* Part of the enzyme systems which regulate plant growth.

- * Sources of zinc are soil, zinc oxide, zinc sulfate, zinc chelate

Organic sources of nutrients

Manure

Manure feeds the soil's microorganisms which break down the manure into humus and other products which can be absorbed by the plant roots. It supplies various macro and micro nutrients necessary for proper plant growth. Manure also feeds the earthworms which are important for soil aeration. While it does not have a particularly high nitrogen content, the organic matter feeds soil microorganisms that release nitrogen and thus it's also effective when applied as a fertilizer. Rabbit manure is harder to come by but has the highest nitrogen content of all manures.

Humic Acid - this substance, called 'liquid compost' by some, is an excellent addition to your garden soil. It is a naturally occurring compound that makes up a significant part of decayed organic matter. Here's a list of the benefits that turned up during a brief web search:

- * adds humus to your soil
- * the most concentrated organic material available
- * increases the efficiency of fertilizers
- * increases nutrient uptake
- * transforms insoluble nutrients into useable ones (especially iron)
- * retards pathogenic fungi build-up
- * stimulates microbial activity
- * increases drought tolerance
- * improves seed germination
- * it's an excellent root stimulator
- * naturally aerates the soil from the inside
- * pH-buffering capacity
- * flushes high levels of salts out of the root zone
- * helps keep fertilizer from leaching through the soil
- * promotes good soil structure
- * Increases root growth
- * capacity to detoxify chemical residues and heavy metals
- * contains an auxin-like growth stimulant capable of enhancing cell division and cell elongation
- * A powerful, natural chelating agent

Organic Sources of macro-nutrients

Nitrogen

- * Bone Meal/Blood & Bone
- * Blood Meal/Blood & Bone
- * Ground Feathers
- * Sewage sludge
- * Cottonseed meal

Phosphorus

- * Manure
- * Ground phosphate rock
- * Bone meal

Potash

- * Manure
- * Wood ashes
- * Granite dust
- * Greensand (Greensand - an organic source of potassium. About 7% potash plus 32 trace elements).

Calcium

- * Natural ground limestone

- * Dolomite
- * Wood ashes
- * Bone meal
- * Ground oyster shell

Magnesium

- * Dolomitic limestone

Sulfur

- * Agricultural Molasses
- * Gypsum (but also contains cadmium so limit use))

Organic Sources of micro-nutrients

Iron

* Usually there is plenty of iron in most soils but it is primarily in the form of insoluble rocks and minerals and therefore unavailable to plants. Adding humus (or humic acid) is the best way to make iron available to the plants.

Manganese

* Shortage of manganese is likely to occur in a high organic soil that is too alkaline. Check soil pH and work acidic organic materials such as oak leaves into the soil.

- * Alfalfa

Copper

- * Sawdust
- * Wood shavings
- * Grass clippings

Zinc

- * Manure

Boron

- * Manure
- * Granite dust

Molybdenum

- * Alfalfa
- * Ground limestone

******Note that for some micro-nutrients, too much is just as bad than not enough so be sure and get your soil tested. Using organic methods to correct your soil's deficiencies is the safest way.*

Adding Organic Matter

Organic matter is the only amendment that aids both the fertility and the texture of the soil. Whether it's animal manure or plant humus, you will be feeding the soil and the whole ecosystem that exists there. The soil in turn will feed your plants.

There are many types of organic matter.

- * Compost makes an excellent addition and if you are composting your garden waste, it's free.

* Manure can often be obtained from local farms and stables. Manure should be composted and decomposed until it turns dark, crumbly and odorless. Fresh manure has too much ammonia in it and can burn your plants and offend your neighbors.

*Coconut coir can work well to loosen the soil. It is also very dusty. Wet it first to make it easier to work with.

* You can even work grass clipping and other debris directly into the garden bed to decompose slowly. Be sure whatever you put down is free of seed.

* Cover crops or green manure are crops grown on unused soil with the intent of tilling them in and letting them decompose in the garden. The roots keep the soil loosened as they grow and the plants suppress weeds. Cover crops from the legume family, like clover and vetch, also add nitrogen to the soil.

Autumn Green Manure Crops

Legumes: (fix nitrogen)*

Broad Beans: Produce a large amount of organic matter. Can be sown late in Autumn.

Will stand some water logging. Sow 35gm/sq m

Field Peas: Similar to above

Lupins: Effective phosphorus gatherers. Contribute lots of organic matter.

Not usually susceptible to fungal diseases which may affect peas and beans. Sow 16gm/sq m.

Sub Clover: Very effective nitrogen fixer. Not large amount of foliage. Sow 1 gm/sq m.

Tic Peas: Cheaper alternative to Broad Beans

Vetch: Large bulk. Competes well with weeds.

* Some lucernes may also be suitable

Non Legumes:

Barley Vigorous grower. Increases uptake of phosphorus in following crop.

Bennett (1979) recommends planting 2 cm deep, 3 cm apart, 15cm between rows.

Oats Grows in wide range of soils. Doesn't mind acidity.

Tolerates very cold weather. Broadcast 10 gm/sq m

Rye Large amount of organic matter. Drought resistant. Sow similar to oats.

NB

* Some legumes need to be inoculated to ensure the right bacteria is present in your soil.

* Flowering crops should be dug just before flowering, cereals before producing head of grain.

* A crop will decompose in 4 to 6 weeks in late October to early November, but may take longer if it is a cold spring.

Adjusting your soils pH, fertility and texture to your plants liking is the final say in making good soil. Your plants will determine what your soil's pH should be. Organic matter will improve the soil in the long run. All soil will benefit from the addition of organic matter. How well your soil incorporates the organic matter will determine how much supplemental feeding will be necessary.

Beneficial Soil Microorganisms

EM (Effective Microorganisms) mainly Yeast, Lactobacillus, Phototrophic Bacteria, Actinomycetes and a range of other beneficial cultures. <http://www.bokashiaustralia.com.au>

Bokashi (pronounced pickaashee) is like a super fast super charged compost. This can be made using the organic materials that are on hand.

Bokashi recipe 1

Bokashi can be made using ten parts of straw, to three parts of any type of animal manure and one part of bran as well as added EM and molasses.)

Firstly soak the straw in the EM solution. (Made of 1:1:100 of EM concentrate, Molasses and water). Then put down a layer of straw, sprinkle on some bran and some animal manure, spread another layer of straw on top and repeat the layers until the heap is about 80 to 100 cm high. Then it is covered with sacks or a polythene sheet to stop the mix drying out too much. After a week the bokashi should have a sweet fermented smell and white fungi will appear throughout it. Then it is ready to use. It can be dug into the garden, spread on the pasture or piled under fruit trees...

Bokashi recipe 2

Ingredients

40kg of wheat bran

12 litres of warm water

240 cc of molasses

240 ml of EM

What you'll need

a tarp, or a large, smooth area protected from the rain

a bucket, or a large spray bottle

a large air-tight container, such as an industrial plastic barrel with the lid

1. Spread wheat bran on a big plastic tarp.

A driveway or any other smooth surface would do fine, but you'll want to make sure that you can protect it from rain. With a tarp, you can wrap the whole batch up as a big bundle if rain threatens.

2. Mix the warm water, molasses and EM in a big container.

3. Spray the liquid mixture over the bran with a water jug or a large spray bottle.

4. Mix the bran and the liquid further by hand, crumbling the chunks down until the bran is evenly wetted.

5. Put the mixture in the air-tight barrel. Press it down as you stuff it in to remove as much air as possible.

6. Leave it for about a month in a warm place. (normal room temperature, or slightly warmer if possible)

7. When the surface of the mixture becomes covered with a whitish, fuzzy mold-like material and has a nice (at least for some of us!) sour fermented smell, it's done.

8. The bokashi can be used right away. For longer-term storage, spread the mixture out on your plastic tarp away from direct exposure to sunlight and moisture until it's completely dry. Break up any lumps; the bokashi should be completely granular. This usually takes a couple of days on the warm summer days of our area; in a hotter, drier climate it would presumably happen quite a bit quicker.

9. The dried bokashi should be good for at least two years.

Compost Tea

How does it work?

A healthy soil food web occurs when all the organisms the plant requires are present and functioning within the soil system. Microbiology is responsible for making non-plant available nutrients in the soil plant available. It is one of the functions of a healthy food web is to hold nutrients in non-leachable forms so they remain in soil.

Soil pH, soil structure, and nutrient cycling occur at the correct rates and produce the right forms of nutrients for the plant when the correct ratio of fungi to bacteria is present. Good compost contains thousands of bacterial and fungal species.

When a small amount of specially made compost is added to highly aerated water, held at a desired temperature and supplied with the correct nutrients for the microbiology in the compost to feed on, you

can make a highly cultured 'brew'. This 'brew', brimming with the microbiology needed for healthy soil, can then be distributed over farms, fields, plantations or gardens – adding crucial microbiology to the soil.

Worm Farms

Worm Castings contain a highly active biological mixture of bacteria, enzymes, remnants of plant matter and animal manure, as well as earthworm cocoons (while damp). The castings are rich in water-soluble plant nutrients, and contain more than 50% more humus than what is normally found in topsoil.

Worm Castings are packed with minerals that are essential for plant growth, such as concentrated nitrates, phosphorus, magnesium, potassium and calcium. It also contains manganese, copper, zinc, cobalt, borax, iron, carbon and nitrogen. However, the best of all is that these minerals are immediately available to the plant, without the risk of ever burning the plant. Remember that animal manure and chemical fertilizers have to be broken down in the soil before the plant can absorb them.

The bacteria in the alimentary canal of the earthworm transforms organic waste to natural fertilizer. The chemical changes that the organic wastes undergo include deodorizing and neutralizing. This means that the pH of the castings is 7 (neutral) and the castings are odorless (they smell like a forest after rain). The worm castings also contain the bacteria, so the process is continued in the soil, and microbiological activity is promoted.

Benefits of Worm Castings

1. The humus in the worm castings extracts toxins and harmful fungi and bacteria from the soil. Worm Castings therefore have the ability to fight off plant diseases.
2. The worm castings have the ability to fix heavy metals in organic waste. This prevents plants from absorbing more of these chemical compounds than they need. These compounds can then be released later when the plants need them.
3. Worm Castings act as a barrier to help plants grow in soil where the pH levels are too high or too low. They prevent extreme pH levels from making it impossible for plants to absorb nutrients from the soil.
4. The humic acid in Worm Castings stimulate plant growth, even in very low concentrations. The humic acid is in an ionically distributed state in which it can easily be absorbed by the plant, over and above any normal mineral nutrients. Humic acid also stimulates the development of micro flora populations in the soil.
5. Worm Castings increase the ability of soil to retain water. The worm castings form aggregates, which are mineral clusters that combine in such a way that they can withstand water erosion and compaction, and also increase water retention.
6. Worm Castings reduce the acid-forming carbon in the soil, and increase the nitrogen levels in a state that the plant can easily use. Organic plant wastes usually have a carbon-nitrogen ratio of more than 20 to 1. Because of this ratio, the nitrogen is unavailable to plants, and the soil around the organic waste becomes acidic.

How to use Worm Castings

For Germination

Use 20 to 30% Worm Castings with sand as an excellent germination mixture. It will also ensure continuous and lush growth for about three months, without you having to add any other plant food.

As a Soil Conditioner

If you hoe a layer of barren soil, add a layer of Worm Castings and give it some water, you will be surprised at the growth of your first season's plants.

As a Fertilizer

Sprinkle Worm Castings around the base of plants or lightly dig it in, and then add water. They can also be sprinkled on a large scale with a spreader. Remember: you cannot use too much Worm Castings – it cannot damage your plants.

As a Liquid Fertilizer

Worm Castings can easily be mixed with water. Use 1 cup Worm Castings for every gallon of water and wait 1 week. This liquid mixture can be used as an excellent fertilizer or leaf foliate spray. It also helps to control insects. Many people prefer this method of application.