

Aerobic high temperature composting

(Rapid Method)

1. Chinese rural composting – high temperature method

This form of compost is prepared mainly from night soil, urine, sewage, animal dung, and chopped plant residues at a ratio of 1:4. The materials are heaped in alternate layers starting with chopped plant stalks and followed by human and animal wastes; water is added to an optimal amount. At the time of making the heap, a number of bamboo poles are inserted for aeration purposes. Once the heap formation is complete, it is sealed with 3 cm of mud plaster. The bamboo poles are withdrawn on the second day of composting, leaving the holes to provide aeration. Within four to five days, the temperature rises to 60–70 °C and the holes are then sealed. The first turning is usually done after two weeks and the moisture is made up with water or animal or human excreta; the turned heap is again sealed with mud. The compost is ready for use within two months.

In some locations, a modified method of high temperature composting is used. The raw materials, crop stalks (30 percent), night soil (30 percent) and silt (30 percent), are mixed with superphosphate at the rate of 20 kg of superphosphate per tonne of organic material. The compost heaps have aerating holes made by inserting bundles of maize stalks instead of bamboo poles.

Ecuador on-farm composting

Under this method, the raw materials utilized for compost making are:

- Animal manure: from cows, pigs, poultry, horses, donkeys, ducks, etc.
- Crop residues and weeds: maize, bean, broad bean, groundnut, coffee and weeds
- Agro-industrial wastes, ash and phosphate rock
- Wood cuttings

- Topsoil from the forest or from an uncultivated or sparingly cultivated area
- Freshwater

The raw materials are put in layers in the following sequence

- a layer of crop residues (20 cm)
- a layer of topsoil (2 cm)
- a layer of manure (5–10 cm)

Ash or phosphate rock (50 g/m²) is then spread on the surface, and freshwater is sprinkled on the material. The above steps are repeated until a height of about 1–1.2 m is reached. It is recommended to begin the heap by constructing a lattice of old branches, and to place two or three woodcuttings vertically along the lattice in order to facilitate ventilation. The heap should be 2 m × 1–1.2 m × 1–1.2 m. Once a week water should be added to the heap. However, too much water could lead to the leaching of nutrients. After three weeks, the heap must be mixed to ensure that all materials reach the centre. During the process, the temperature rises to 60–70 °C, and most weed seeds and pathogens are killed. While it may take about two to three months to prepare the compost in a warm climate, in cold regions it could take five to six months.

Berkley rapid composting method – shredding and frequent turning

This method corrects some of the problems associated with the earlier methods of composting. The process can produce compost in two to three weeks. Several factors are essential to the rapid composting method:

- Material composts best when it is 1.25–3.75 cm in size. Soft, succulent tissues do not need chopping into very small pieces because they decompose rapidly. The harder or woodier the tissues, the smaller they need to be in order to decompose rapidly. Woody material should be passed through a grinder.

Chopping material with a sharp shovel is effective. When pruning plants, the material should be cut into small pieces using the pruning shears. This requires a little effort but the results are worth it.

- For the composting process to work most effectively, the material to be composted should have a C:N ratio of 30:1. Mixing equal volumes of green plant material with equal volumes of naturally dry plant material yields such a ratio. The green material can be grass clippings, old flowers, green prunings, weeds, fresh garbage and fruit and vegetable wastes. The dried material can be fallen leaves, dried grass, straw and woody materials from prunings.
- Materials that should not be added to a composting pile include: soil, ashes from a stove or fireplace, and manure from carnivorous animals. Manures from herbivorous animals such as rabbits, goats, cattle, horses, elephants and fowl can be used. Once a pile has been started, nothing should be added. This is because it takes a certain length of time for the material to break down and anything added has to start at the beginning, thus lengthening the decomposition time for the whole pile. Excess material should be as dry as possible during storage until a new pile is started. Moist stored materials start to decompose. If this occurs, they will not be effective in the compost pile. Nothing needs to be added to the organic materials to make them decompose. The micro-organisms active in the decomposition process are ubiquitous where plant materials are found and develop rapidly in any compost pile.
- Composting works best where the moisture content of materials in the pile is about 50 percent. Too much moisture creates a soggy mass, and decomposition will then be slow and the pile will smell. Where the organic material is too dry, decomposition is either very slow or does not occur at all.
- Heat, which is very important in rapid composting, is supplied by the respiration of the micro-organisms as they break down the organic materials. To prevent heat loss and to build up the amount of heat necessary, a minimum volume of material is essential. The pile should be at least 90 cm × 90 cm ×

90 cm in size. Where the dimensions are less than 80 cm, the rapid process will not occur.

- Heat retention is better in bins than in open piles, so rapid composting is more effective where bins are used. In addition, the use of bins is much neater. High temperatures favour the micro-organisms that are the most rapid decomposers; these micro-organisms function at about 71 °C and a good pile maintains itself at about that temperature.
- The compost pile needs to be turned to prevent it from overheating. If the temperature in the pile rises much above 71 °C, the micro-organisms will be killed, the pile will cool, and the whole process will have to start again from the beginning. Turning the pile prevents overheating and aerates the pile, both necessary conditions for keeping the most active decomposers functioning. The pile should be turned in a manner that the material is moved from the outside to the centre. In this way, all the material reaches optimal temperatures at various times. Owing to heat loss around the margins, only the central portion of the pile is at the optimal temperature. Because of the need for turning, it is desirable to have two bins so that the material can be turned from one into another. Bins with removable slats in the front facilitate the turning process. Bins with covers retain the heat better than those without. Once the decomposition process starts, the pile becomes smaller and, because the bin is no longer full, some heat will be lost at the top. This can be prevented by using a piece of polyethylene plastic slightly larger than the top area of the bin. After the compost has been turned, the plastic is placed directly on the top of the compost and is tucked in around the edges. If the material in the pile is turned every day, it will take two weeks or a little longer to compost. If turned every other day, it will take about three weeks. The longer the interval between turnings, the longer it will take for the composting to finish.
- If the procedure is followed properly, a pile heats to a high temperature within 24–48 hours. If it does not do so, this means that the pile is too wet or too dry

or that there is not enough green material (or N) present. If too wet, the material should be spread out to dry. If too dry, moisture should be added. If neither of these, then the N is low (a high C:N ratio), and this can be corrected by adding materials high in N (such as ammonium sulphate, grass clippings, fresh chicken manure or urine diluted 1 to 5).

- Where the C:N ratio is less than 30:1, the organic matter decomposes very rapidly but there is a loss of N. This is given off as ammonia, and where this odour is present in or around a composting pile, it means that valuable N is being lost in the air. This can be counteracted by adding sawdust to that part of the pile where there is an ammonia odour (sawdust is very high in C and low in N). Some covering for the pile may be necessary in order to keep the composting materials from becoming too wet during the rainy season.
- The rapid decomposition can be detected by a pleasant odour, by the heat produced (visible in the form of water vapour given off during the turning of the pile), by the growth of white fungi on the decomposing organic material, by a reduction of volume, and by the materials changing colour to dark brown. As composting nears completion, the temperature drops and, finally, little or no heat is produced. The compost is then ready to use. If the material was not chopped into small pieces during the preparation phase, screening the material through 2.5-cm-mesh chicken wire will hold back the large pieces. These can be added to the next pile and eventually they will decompose