

Composting Kitchen Waste

Basic Questions and Answers

NATIONAL INSTITUTE OF RURAL DEVELOPMENT & PANCHAYATI RAJ
Ministry of Rural Development
Rajendranagar, Hyderabad - 500 030
www.nird.org.in

Preface

Mixed-up wastes always mess up environment. In other words, kitchen waste, cluttered with other types of dry waste, amounts to double work to the sanitation workers. If we could keep the kitchen waste aside from other types of wastes, we are facilitating the beginning of a scientific practice in waste management. Composting is one of the easiest ways to manage kitchen waste. ‘Reduce the creation of wastes in the first place’ is one of the principles of waste management.

This means several different things. For instance, you can reduce kitchen wastes from being handed over to the sanitation workers by adopting one of the ‘home-composting methods’. By doing this, you manage half of the problem at source. It makes the job of your Gram Panchayat or municipality easy. This could also be your way of demonstrating responsible well-being, and contributing to the cause of environmental conservation as a householder – silently unpretentiously. This is such a simple thing that goes a long way in terms of being environment friendly. The compost made out of your kitchen waste goes back to the soil enriching the quality of the soil.

Perhaps, some of us attempted home-composting methods and found it clumsy and ungainly, or simply it’s not as easy as it is said. Possibly, it could be very simple, if we have some basic understanding of composting before we actually get down to composting with kitchen wastes. This tiny book is for the use of those who are desirous of adopting one of the home-composting methods, and those who attempted home-composting earlier but failed. You may have several basic questions on composting. This handbook is arranged in the form of questions and answers. Basically these questions are Frequently Asked Questions by participants who attend our training programmes on solid waste management at NIRD&PR, Hyderabad and NERC, Guwahati. We hope you shall find this tiny book interesting, informative, and practically useful. Our earnest urge is put this tiny book to use. Come back to us with more questions, we shall only feel happy to clarify things and share with you good practices from across.

R Ramesh
P SivaRam

Hyderabad
January 2017

1. What is composting?

We have observed in our daily lives that decomposition of organic materials such as vegetables, fruits, leaves, plants etc. is very natural. Composting is a technique to control and accelerate this natural process. There are many composting methods and techniques available now.

2. What is the basic understanding I need to have while getting down to composting?

We mentioned earlier that through composting we *control and accelerate the natural process of decomposition*. How do we do this? What happens during composting is, microbes (e.g. microscopic living organisms such as *bacteria, fungi* – millions of them) feed on and breakdown organic materials. It is best to *keep their population high* so as to accelerate the composting process because they help faster decomposition.

3. I understand that microbes help faster decomposition. But we need to ‘keep their population high’, means what? How to keep their population high?

For instance, when we make coffee, we refer to a *specific blend of coffee and chicory* to get the best tasting coffee – 70:30 or 60:40 or 80:20 etc. That means 80% coffee with 20% chicory gives the best tasting coffee. Like we talk about *coffee and chicory* in making good coffee, we talk about *greens and browns* in composting. A specific blend of ‘greens’ and ‘browns’ in our composting bed is best for keeping the microbes population high, which gives us good quality compost in a short period of time. The rule of thumb for producing good compost is to blend 25 to 30 parts ‘brown’ materials to one part ‘green’ material. This is what they call C:N ratio = 25-30:1).

Brown materials are high in carbon (C), while green materials are high in nitrogen (N). We need to pay attention on a specific blend of carbon and nitrogen (C:N ratio) for a good composting to take place. Generally in home-based composting we keep accumulating greens (N) in our composting bin, and pay little attention to browns (C). This is one of the reasons it takes long for composting. This is lesson No1. in composting. There are a few other elements like aeration, moisture level in green, (which depends on what all constitute your greens); and again what all constitute your browns, plus temperature in your place and so on. You shall learn as you go.

4. Can you give some more idea on what all you call *greens*; and what all you call *browns*?

By *greens* we mean the ‘kitchen wastes’. By *brown* we mean dry leaves, dry grass, saw dust, shredded paper etc. Let us try to list out ‘greens’ and ‘browns’ so that we understand our C:N ratio better. In other words, greens and browns ratio.

Greens (High in Nitrogen - N)	Brown (High in Carbon - C)
Discarded vegetables / Vegetable peels	Dry leaves / garden shrubs gathered
Food waste / food scraps / leftover food	Corn stalks (broken)
Coffee and tea grounds, tea bags	Saw dust, wood chips
Stale bread, egg shells, left over salad, citrus	paddy straw, hay
Cut flowers,	shredded paper, shredded card board, Newspaper
Prunings / fresh grass clippings	Twigs, and small pieces of barks
houseplants	paper napkins, tissue papers
Sewage sludge (no chemicals)	(Dry leaves / garden shrubs, and newspaper pieces are easily available)
Cow manure, poultry manure, rabbit manure, horse manure, & pig manure (NOT dog / cat's)	Soil can be added in compost, because organic carbon is generally present in garden soil.

The point is of the many elements required for microbial decomposition, C and N are the most critical.

5. How to ensure 1 part of greens (Nitrogen) and 25 – 30 parts of browns (Carbon) in my composting?

This is only a thumb rule. The moisture level, weight, and bulk density of the greens and browns you use in your composting might vary on different days. Therefore, you shall better keep 25 - 30:1 ratio as a thumb rule. There are formulas given on how to calculate each of this. That is beyond what is required for our purpose. Let us leave that puzzle to some bio-chemist. What you clearly need to bear in mind is that *browns you add must be much higher in quantity than the greens*. Greens as such, plus a few shredded paper or a handful of dry leaves does not help composting unless you *make sure your browns outweigh your greens*.

6. You mentioned about a few more elements such as aeration, moisture, temperature etc. Can you elaborate a little?

Composting is a microbial-driven process. Like other living creatures, microbes need right environment to survive and thrive. For compost to do well, microbes need nutritious ‘food’, which they get from suitable moisture, temperature, and aeration (oxygen).

Aeration: Oxygen is essential for respiration of aerobic microorganisms. Without sufficient oxygen, the process will become anaerobic and produce undesirable odours. Sometimes, you might get the rotten-egg smell of hydrogen sulfide gas too. Therefore, you need to maintain aerobic conditions. This is simple: mix and turn as frequently as necessary or at least once daily.

Moisture: A moisture content of 50 – 60% is generally considered optimum for composting. (i) Too little moisture (say, less than 30%) inhibits bacterial activity; and (ii) too much moisture (more than 65%) results in slow decomposition, odour production and nutrient leaching. How to understand the moisture level? Squeeze a handful of well-mixed compost or raw material. If your hand becomes moist but without any drops of moisture forming, the moisture content is optimal. If water trickles out when compost is squeezed, it is too wet. It indicates that you need to add some garden soil or saw dust or shredded papers or fully dried leaves in order to bring it to the optimum level. If the compost crumbles, it is too dry. That means you need to sprinkle some water and enhance the moisture level.

Temperature: At certain temperatures certain microorganisms are most active. Generally, in a range of 50 to 65 degree Celsius proper composting takes place. Actively working microbes can raise the pile's temperature by as much as 60 – 65 degree Celsius. The temperature in your compost determines how much and how often aeration is required.

7. Why is high temperature required in composting, and how to do that?

Microbial decomposition during composting releases large amounts of energy as heat. The insulating qualities of the composting materials lead to an accumulation of heat, which raises the temperature. Exposed to high temperature (i) many of the microbes become either dormant or die away; (ii) high temperature kills undesirable pathogens, diseases, weed seeds and insect larvae. However, we cannot allow this tight insulation to remain for long, if our purpose is to get good quality composting. Therefore, after exposing to active phase of high temperature, we need to allow a curing phase. After a period of time, the nitrogen-rich material is depleted, the biological process slows, and the hot compost begins to cool, we call this curing. Curing enables heat loss. This is done simply by turning and mixing with a garden fork / small spade once a day or so.

8. Are there techniques for faster composting?

These days in order to speed up composting or shorten the time taken for composting, there are artificial solutions, and powders commercially available in the market. The problem with them is none of them tell you that X amount of that powder reduces your composting time by Y amount. Again it means money, whereas we suggest no cost operation. Our set of suggestions is: (i) take care of your C:N ratio properly; (ii) the temperatures at desirable levels; (iii) make sure that the particle size of your greens and browns are small; and (iv) do not add too hard items such as bones, or oily and greasy items such as cheese. That will do.

Fruits and vegetable wastes tend to degrade fast, because they contain mostly simple carbohydrates (sugar and starches). Similarly, twigs, sticks, wood chips, straw and hay take slightly longer to decompose, but they provide the pile a porous structure enabling air flow through the pile. Regular mixing and stirring the pile loosens the material and maintains proper aeration. If you are very much after speeding up, you can sprinkle sugar or *gur* water, and sour butter milk. These can help speed up composting. However, beware that sugar can attract ants – just in case you have home-based composting, and if you don't like disturbances caused by ants. You can drive away ants by sprinkling turmeric powder (*haldi*), which is natural.

9. How about the odour (bad smell)?

We have mentioned elsewhere in this booklet that at lower ratios of C:N, N will be supplied in excess and will more likely to be lost as ammonia gas, causing undesirable odours. More greens, at excessive levels of moisture in your compost tend to produce undesirable odour. That means your C:N ratio require proper balancing. So, your composting as such does not create any smell or odour. Into your composting bin, you keep throwing all the kitchen waste and wasted food, and feel lazy to add browns or shredded paper the resultant outcome is not composting but bad odour only.

10. I have noticed some ants, bugs, worms and other insects during composting. It's but natural that I need to deal with insects and worms also, during composting, right?

It's possible they might generate. It is actually called *food web of the compost pile*. In other words, during the process of composting you shall see different organisms including some bugs, insects, and worms. Actually, they feed on each other, and it is possible, they eat up some of the

microbes also. Most of them, in fact, assist the process of decomposition by eating up bigger pieces of kitchen waste such as decomposing broccoli, cauliflower etc. But make sure that they do not harm the earthworms, if you have introduced earthworms and garden soil along with your kitchen waste. For instance, red ants might harm earthworms. You can drive the red ants away by sprinkling turmeric powder. Some worms you notice might eat fungi, which is no problem. They facilitate your composting. Yet, sometimes, it's possible we get centipedes also, which have poison claws. That's the reason it is good to stir and turn the compost pile with a garden fork, or a compost turner rather than doing with bare hands. Once the curing phase starts, you shall find all these insects and bugs vanish. They have nothing left to feed on and survive.

11. How to spoil my composting?

It's possible you might spoil your composting – yes, unintentionally so. This happens when we take it easy and assume composting will take place if you just keep adding your kitchen waste day after day, but pay very little attention to other things such as: (i) proportion of greens and browns; (ii) add leftover meat and big pieces of bones, and fish remains etc. which can attract dogs, and even pigs; (iii) not preventing plastic carry bags and similar items from getting mixed up with kitchen waste in the composting bin. Good quality composting can become organic fertilizer for growing healthy vegetables in your kitchen garden. Poorly maintained compost can become a source of odour, and futile work.

12. They say 'aerobic composting' and 'anaerobic composting' – what is it after all?

Respiration or 'aeration' is important for composting. '*Aerobic*' means a condition where oxygen is present; and '*anaerobic*' means 'non-oxygen condition'. In aerobic conditions, the pile gets broken down into smaller particles with right amount of moisture. Anaerobic composting is the slow decay of organic matter through fermentation. By definition, anaerobic composting means a controlled process involving microbial decomposition of organic matter in absence of oxygen. Unlike aerobic composting, the pile does not heat up, rather it ferments. The main by-product of anaerobic degradation is methane, which is harmful to the environment if let open from a landfill. But it is a useful alternative energy if properly used as fuel. Those planning to go for *bio-gas from kitchen waste and food scraps* plan for gasification plants using anaerobic method.

Box – 1: What do they mean by Zero Waste?

Zero Waste is a goal that is ethical, economical, efficient and visionary to guide people in changing their lifestyles and practices to emulate sustainable natural cycles, where all discarded materials are designed to become resources for others to use. Zero waste means designing and managing products and processes to systematically avoid and eliminate the volume and toxicity of waste and materials, conserve and recover all resources, and not burn or bury them. (Waste, 2015)

Useful References & Websites

Technological Options for Solid and Liquid Waste Management in Rural Areas, Ministry of Drinking Water and Sanitation, SBM (G), GoI, New Delhi, April 2015.

Solid and Liquid Waste Management in Rural Areas – A Technical Note. UNICEF and GoI, Ministry of Rural Development, Department of Drinking Water Supply. 2007.

Guidelines on Solid and Liquid Waste Management (SLWM) in Rural Areas, MDWS & ADB, July 2014.

Waste: An approach paper for sustainable management of waste, Suchitwa Mission, Local Self-government Department, Government of Kerala (Dr K Vasuki, 2015)

<http://compostguide.com/>

<http://www.alternative-energy-tutorials.com/aerobic-composting/vermicomposting.html>

http://eartheasy.com/grow_compost.html#e

www.Lessismore.org

<http://www.compostinstructions.com/>

http://www.compost-info-guide.com/beginner_guide.htm

<http://www.recycling-guide.org.uk/materials/composting.html>

<http://www.greencalgary.org/name-it/guide-composting/>

<http://www.cleanup.org.au/au/LivingGreener/composting.html>

<https://www.ohio.edu/recycle/composting-guide.cfm>