

BIEA INTERNATIONAL YOUTH AUTUMN STEM CHALLENGE

Your challenge is to develop an urban composting system to reduce the amount of organic kitchen waste that goes into landfill.

Aerobic composting uses microbes to convert kitchen waste and other organic material into compost which can be used as homemade plant fertiliser. Compost is rich in nitrogen, phosphorus, and potassium and is used to add nutrients garden soil.

In this project we are asking you to create and produce compost from your kitchen waste. Note this is not Bokashi (a Japanese form of composting that uses fermentation).

Certificates will be issued to all participants & prizes for those gaining the most marks with judges!

Successful composting follows this rule:

Three parts brown matter (shredded newspaper, torn cardboard, nut shells, eggshells, coffee grounds, and tea bags)

One-part green matter (food waste and plant clippings like raw fruits and vegetables (flesh and peels), coffee grounds, and tea leaves)

Safety

- The compost bin should be kept somewhere sheltered and dry **outside of your home** with a consistent temperature.
- Never place cooked food, dairy products, meat, fish bones, or fat in your compost bin.
- Do not compost onion peelings or very smelly or watery items
- Cover waste with brown matter to prevent fruit flies and other pests.
- Always wash your hands after handling any form of waste and ensure surfaces are kept clean.

Remember

- Start off your composter by adding a layer of garden soil to the bottom to add beneficial microbes. Compost that is bought from garden centres is usually sterilised and has very few microbes.
- Turn the contents often to add oxygen to the mix
- Chop kitchen scraps smaller to allow microbes to break down materials more quickly.
- Do not let the compost bin get too wet or too dry – about as moist as a wrung-out sponge

The Challenge

Stage one

Measuring household waste:

To reduce waste, you will first need to identify how much waste your household produces on an average day.

How much recyclable waste does your household produce on an average day? This includes paper, cardboard, glass, metals such as aluminium cans and plastics (only recyclable ones)

How much non-recyclable, non-organic waste? This includes non-recyclable plastics and multi-material items such as pet food pouches and toothpaste tubes.

How much organic waste (kitchen and food scraps)?

Challenge

1. Sort kitchen waste into 3 types (recyclable, non-recyclable, organic). Produce a list of common materials in each pile.
2. Measure the mass of each type of material.
3. Construct an appropriate graph to show the mass of each type of waste produced in your home on an average day.
4. Work out the percentages of each type of waste of the total amount. Complete these calculations and show your method/workings.
5. Construct an appropriate graph to show each type of waste as a percentage of the total mass.

Submit this work in pdf format to competition@biea.org.uk by 27th November 2020

Stage Two

Start composting!

For your indoor compost bin, you will need a sturdy container with a lid. You will need to put holes in the bottom of the container to allow it to drain (remember to store it on a tray to catch the liquid draining out!)

Challenge

6. List the materials you are going to add to your compost bin regularly and classify them as either green or brown waste.
7. Measure the mass of materials before you add them to your composter.
8. Construct an appropriate graph to show the masses of different types of waste (brown waste, green waste, and any starting materials).
9. Keep a running total of the mass of each material in a spreadsheet or appropriate table.

Submit this work in pdf format to competition@biea.org.uk by 27th November 2020

Stage Three

10. Record the progress of your compost on a weekly basis. This can be using photographs or a short video to show
- i. Materials added to the composter
 - ii. What your compost looks like
 - iii. Record anything else that you think is important (i.e. temperature, liquid runoff)
 - iv. What things decay the best?
 - v. What things decay the worst?

Submit weekly up to 27th November 2020 to competition@biea.org.uk (via wetransfer, google drive or youtube link)

Remember

Beneficial microbes will moisture, oxygen, and warmth. If it is too wet or dry, microbial action will stop.

If there is not enough oxygen, anaerobic bacteria will grow and make your compost slimy and smelly

If it is too cold, microbial action will stop. If it is too hot, the microbes will die. Your composter should be at constant temperature of around 21- 32°C. Microbial action will cause the internal temperature to rise.