Royal Horticultural Society
Sharing the best in Gardening

The Compost Kitchen – Prepare Designer Growing Media

The Compost Kitchen	
Group: Year 9 pupils	**Duration: 45 minutes**

Learning Objectives: *Student will discuss:*

- Plant root requirements - water, air and nutrients
- Container plant requirements - why soil is not a suitable medium for container plants.
- Physical properties of different growing media ingredients and how these can be combined to make the perfect container growing media.

English National curriculum:
Key stage 3/4 : *Science* - Develop experimental skills by working scientifically
Key stage 3: *Biology* - Respiration and Photosynthesis, *Chemistry* - Earth and atmosphere
Key stage 4: *Biology* - Respiration, Transport systems, Photosynthesis and Ecosystems, *Physics* - Matter

Stage	**Topic/Teaching Method/Activity**	**Resources Required**
Introduction	The aim of the session will be for students to make their own designer growing media. What is '*growing media*'? When we grow plants in containers, pots or hanging baskets we don't use soil. We use a growing media which is often sold as 'potting compost'. The bag does not contain just one material but is a mix specially designed to help plants grow in containers. What are the ingredients of 'potting compost'? Students observe and make predictions.	Example empty bags of different commercial 'potting compost' multipurpose, ericaceous etc. Samples of growing media to feel/observe in trays(variety of composts and topsoil)
Pair or small group discussion	**Challenge with the question:** *Why don't we just use soil to grow plants in containers?*	Ready planted container

	***Things to consider**:* • We need to create an environment for plant roots that allow them to grow. • What 3 things do plants roots need to survive? (Water, air and nutrients). With limited space in a container we need to make sure a plant has everything it needs, because it cannot spread out roots to find what it needs elsewhere.	
Mini plenary	Have students discussed/considered the following points? • Soil is very dense and in a container becomes easily 'compacted' resulting in little space for air or water. • How can we give a plant enough nutrients? We can add fertilizer which contains plant food. Different fertilizers have specific benefits to plants (nitrogen/potassium/phosphorus).	Packages of commercial fertilizers to observe.
Revise knowledge	How do plants make food for themselves? (***Photosynthesis equation***)	$6\ CO_2 + 6\ H_2O \xrightarrow{SUN} C_6H_{12}O_6 + 6\ O_2$
	Look at a variety of growing media (commercial compost) to consider whether it can provide the 2 other necessary ingredients for growth – Air and Water. When choosing materials to include in growing media we need to make sure that they will hold the correct amounts of water and air to allow plant roots to flourish.	Samples of growing media to feel/observe in trays (variety of composts and topsoil)
Whole group practical	Introduce 5 ingredients that are commonly used to make growing media for container plants: **PINE BARK**, **GREEN COMPOST**, **PERLITE**, **COIR**, and **PEAT***. Allow students time to observe/feel each before experimenting. *Check ingredients: Peat can be difficult to acquire as a potting compost - the ones bought from garden centres usually contain other materials.	3 litre bags of each: Pine bark, green compost, perlite, coir and peat. A small amount of top soil to test (but not to use as a growing material)

	Set up an experiment to show the ability of each material to hold water/air. Involve students to participate practically. *Method* Measure an equal amount of each growing material into each aquatic plant basket. Place each basket into a measuring container. Pour an agreed amount of water into each basket and observe what happens. **Pine Bark:** Made from the bark of trees, it has very large particles creating large air spaces between called **pores**. These pores are not good at holding water, but are very good at holding air. **Green Compost:** Vegetable matter that has been rotted down to form a crumbly black material – this is what is created from a garden compost heap. It has a mixture of particle size from very small to large. **Perlite:** Perlite is a volcanic glass that is heated to a high degree whereupon it pops much like popcorn, and expands massively, resulting in an incredibly lightweight material.The key property is that it increases air space and drainage. **Coir:** Made from coconut fibres. A light material with a variety of sized particles that hold a large amount of water well. **Peat:** Comes from peat-bogs. It used to be the most common constituent of growing media as it has a good mixture of particle size and holds both water and air very well.	6 measuring containers, 6 aquatic plant baskets (that will fit into the top of the measuring containers), water, measuring jugs.
Feedback discussion	From the results students discuss: The problem of water draining too freely, waterlogging causing roots to 'drown', over watering and material sustainability (peat bogs take many 1000's of years to form and are important habitats). Can anyone give other examples of unsustainable resources?	
Individual practical (discuss in pairs)	*Making growing media:* Using their newly acquired knowledge students design their own growing media to fill a 1 litre plant pot.	Materials per student: Gloves, 1 litre plant pot, container marked with 200mls, fertiliser (pre-

Individually:	In pairs students 'feel' the materials and decide which combinations will work best for container plants. Discuss and consider which combination will hold a good balance of air and water. Students collect 5 x 200ml growing material, record the chosen selections on the recording sheet (there is no correct combination, it's an experiment!) Mix the materials by hand on a table. Add the small bag of fertiliser. Although they need to thoroughly combine everything, the more the materials are mixed, the more the structure of the material will be broken up, and this may reduce its ability to hold air. Select a bedding plant. Students half fill their litre pot with their mixed growing media then gently remove their plant from its module (being careful to not damage the roots). Place the plant into the 'compost' and then infill at the sides tapping to insure all the materials are filling the gaps – push the plant down firmly, but gently. Label with the plant variety and student's name. Teachers to make a control plant using commercial multi-purpose compost.	measured into small bags), and a student recording sheet. Bedding plant (buy in modules from a garden centre), plant label. Available for student's choice: Bags of pine bark, green compost, perlite, coir and peat. Control bedding plant potted in commercial multi-purpose compost.
Whole group discussion	Discuss individual student's choices for a growing media. Make predictions about whose might work best, and why.	
Health and safety	Remove gloves and wash hands thoroughly.	
Follow up	All plants, (including the control) need to be placed on a sunny window sill and treated identically when watering, in order to make fair comparisons.	

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Further instructions – Plant growth experiment

To continue the experiment and find out which 'mixes' have worked best, all plants should be kept in the same place on a windowsill, greenhouse etc.

The control pot – this contains a branded multi-purpose product which has been formulated to work well for the plants you have potted up. The control pot is your guide; water this as instructed on the plant label. All other plants should receive the same amount of water as the control (even if some of them seem to require more or less). This can be measured out in a beaker.

Notes to assist conclusion

- If a student's custom pot is drying out considerably quicker than the control, the mixture probably contains too much air and is too free draining. Conversely, if the mixture seems too wet (even when the control is drying out), then the combination of materials is such that not enough larger pores are present, and so drainage is poor.
- After a week or two you should see differences emerging and you can then discuss why some might be doing better than others by looking at what is in the growing media.

Differences to look out for:

Plants that are:

- too dry (pot is light)
- too wet (pot is heavy)
- leaves are turning yellow (nutrient deficiency)
- roots growing out of the bottom (good growth)