3. Oil from seeds

2 hours

Different techniques are used to extract oil from a variety of seeds and nuts.

OBJECTIVES

- To know that oils from seeds and nuts have a variety of uses
- Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions

RESOURCES

Per class

- Bottles of oil from a range of sources to include corn oil, groundnut (peanut) oil, almond oil, rapeseed oil, sunflower oil, sesame oil, olive oil, vegetable oil.
- A range of seeds, nuts and crops to include maize, peanuts, almonds, walnuts, sunflower seeds with and without outer casing, sesame seeds, pumpkin seeds.

Per group of 4

- Activity sheet 2
- Samples of the different seeds and nuts from the list above.
- 1 rolling pin
- 1 seal-able clear bag per seed/nut sample
- 1 filter paper or sugar paper square (10cm x 10cm approx) per sample
- 1-2 teaspoons
- Bluetac or adhesive tape
- Camera (optional)

Safety note

Be careful not to include nut oils if involving children with nut related intolerance or allergies.

INTRODUCING THE ACTIVITY

Begin with a recap of previous activities with particular reference to non-renewable and renewable forms of energy.

Ask the children what is used to power most vehicles and where it comes from, i.e. products made from crude oil. Explain to the class that crude oil is found deep underground and was formed over millions of years. To access the oil, companies drill down under the earth or sea, pump it to the surface and send it by pipeline to oil refineries where it is separated into different parts and used for many different things.

The children are asked to discuss what other things oil is used for, e.g. to make plastic products, for lubrication, to burn for heat and to make electricity.

Explain to the class that all of this type of oil will be used up at some time in the future; i.e. it is not renewable.

Introduce the email from the company (Activity sheet 2). The email thanks the children for their help, as requested in the initial letter. The email goes on to ask for help with some further investigations.

The focus of this activity is on the extraction of the oils, i.e. the company wants you to find out if oil can be separated or 'extracted' from a selection of seeds and nuts and then explore and compare the oil content obtained.

Show the class the bottles of oils and ask the children to look carefully at the appearance of the oils and the labels, paying close attention to the names, photographs, pictures, ingredients and other information provided on the label. Can they now suggest which seeds the oils have been extracted from? Explain that oils that are extracted from seeds and nuts are from renewable sources.

Next, show children some examples of different seed and nut crops, and ask them to match the oils to their seeds and explain their choices.

Note: Children may suggest that vegetable oils come from a vegetable source e.g. carrot or cabbage. Explain that vegetable oil is made from a blend of seed oils including rapeseed and sunflower oils.

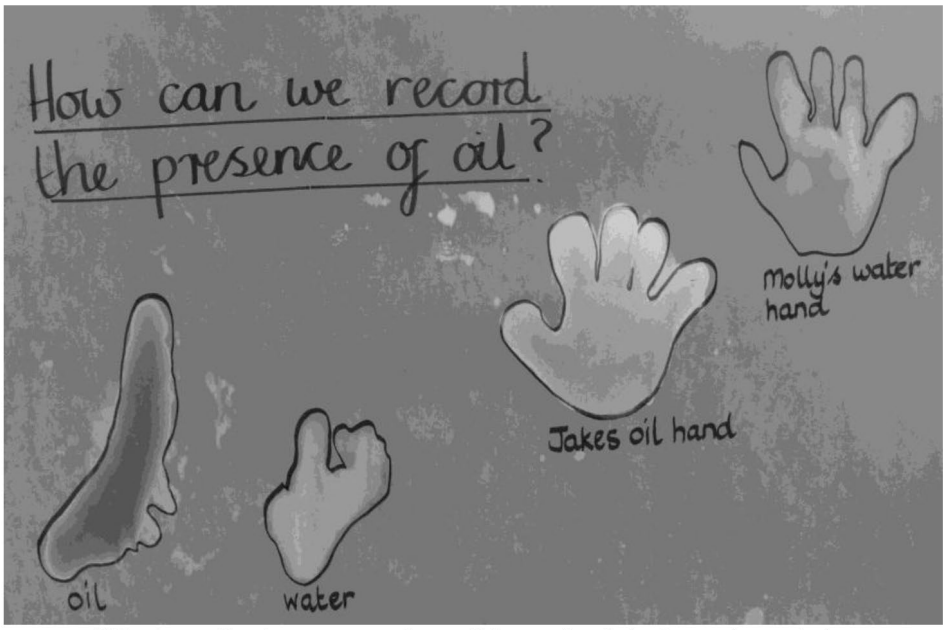
MAIN ACTIVITY

The children explore methods for separating or 'extracting' oil from the seeds and nuts and compare the oils obtained.

Begin by demonstrating how to show the presence of oil by smearing a small amount of vegetable oil across a piece of filter or sugar paper. The children should note that the paper is translucent when held up to the light. Smear a similar amount of water next to the oil and then display the sample on a window pane.

Ask the children what they think will happen when the paper dries. They may think that both samples will evaporate if left to dry. However, they will find that the oil can still be seen after the water evaporates.

Allow time for children to explore the translucency of other oils in comparison with water and make further window displays. Children can display and photograph oil and water hand prints on paper towels in the window.



Window display comparing oil based prints to water prints.

Ask the children how they think they can extract the oil from a seed, e.g. sesame or sunflower seed. Establish that the oil can be obtained by crushing the seed to leave an oily residue.

The children can use a wide range of resources, and request additional items. They can explore their own extraction ideas, or use those provided below if needed:

- Place a measured quantity of seeds/nuts on filter/sugar paper and crush with a rolling pin. This needs some force as larger nuts are more difficult to break down. A small plastic bag reduces the amount of mess created and collects the crushed material for display or to record results.
- Place the seeds/nuts into a mortar and crush with a pestle. Smear the crushed material onto a piece of filter/sugar paper. However, the results are not as clear as when crushed directly onto paper. Try using the mortar to crush the seed directly onto the paper.
- The seeds/nuts can be crushed in a mortar and then a small amount of water added and the mixture crushed again. The resulting mixture can then be filtered through filter paper and left to dry. Leave the paper overnight to allow remaining water to evaporate. This is a lengthy procedure.

Evidence can be displayed as oil marks beside relevant crushed and whole seeds/nuts. They could also be displayed in order of the amount of oil extracted. This makes a very effective window display.

PLENARY

Children share their findings with each other and discuss the merits and the weaknesses of the various methods they have used to extract oil. Encourage the children to talk about the quantity of oil extracted in each case, as well as the difficulty or ease with which each method was carried out. Children can begin to discuss how they think industry might extract oils from seeds.

Extension: Design a machine to carry out the extraction of seed/nut oils on a large scale. How would the machine be powered? How will the oil be collected?

BACKGROUND INFORMATION

A number of fruits yield oil from their flesh and these are exploited commercially for oil production, e.g. olives and avocados. Demonstration of the oil content of fruits is much more challenging. Olives are stored in brine, and therefore can be messy and it is difficult to get clear results.

Oils are extracted commercially by using a variety of techniques including drying the seed then crushing before extracting or boiling the seeds in water and then separating the oil from the water. Some of these techniques are not suitable for the classroom.

Oilseed rape is now the third most important crop in the UK after barley and wheat. It is very useful to us because the seed contains a lot of oil which is commonly used in many food products, e.g. cooking oil and margarine. Some parts of the oil can also be used in a range of cosmetic and cleaning products too. More recently, rapeseed oil has been used in the making of biodiesel for powering motor vehicles. The seeds from the plant contain the oil. The rest of the plant can be used as biofuel.