

## Is our food safe?

You are a scientist from the Pesticides Safety Directorate (PSD) and your job is to check whether food is safe to eat. You have received an anonymous email claiming that two farms have got dangerous levels of chemicals in their apples. You go to the farms to investigate.



You take ten samples of apples from each farm and test them for how much CAPTAN residue they contain. The figures you get are below.

Pesticide residues (units, mg per kg of apples)	
Holly Farm	Ivy Farm
1.4	0.1
1.5	0.3
1.8	7.1
1.6	0.2
1.5	2.2
1.5	0.8
1.6	0.5
1.4	3.7
1.7	0.4
1.3	0.5

### Pesticides

Pesticides are chemicals that are **used on crops to kill pests**. Pests can be anything damaging, including mould. **CAPTAN** is used to kill mould on a range of fruits and vegetables, including apples.

When a pesticide is used, a small amount may remain on or in the food. This is called the **pesticide residue**. Government scientists set a level that the pesticide residue must be below in food. This value is known as the **Maximum Residue Level (MRL)** and for captan in apples is **3 mg per kg of apples**.

**Variables** are the things that change in an experiment. There are 2 main types

#### Independent variables

These are ones **deliberately changed** by the experimenter. If you are testing the effects of more than one independent variable in an experiment you must **only change one independent variable at a time**.

#### Dependent variables

These are the ones that are **affected by the independent variables**, and the **ones you measure** in an experiment.

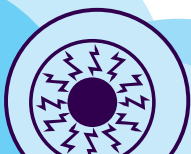
#### A Fair Test

This is one where the **only** difference between the tests is your independent variable, so any change in the results must be due to that. If other things are changing too, then they might be causing the results to be different.

Make sure that for every test you do the conditions are the same, and that **only one variable changes at a time**.

#### ! Important info!

Holly Farm also uses two **other** pesticides on their fields which you have NOT tested for.



You have to write a report for your boss on your investigation. Include answers to the following questions.

1. What is the **average** captan residue on apples at a) Holly Farm and b) Ivy Farm?
2. Are the averages of either set of data **higher** than the Maximum Residue Level (MRL) of 3 mg/kg?
3. Do you think that **all** the apples from each farm are below the MRL? (Think about the individual values within each data set.)
4. Do your results give a **valid** answer to the question, 'is this food safe to eat?' (**Hint:** see box below)
5. Can you say that apples from either farm are **definitely safe**? Justify your answer.
6. If captan levels were **above the MRL** in both **wheat** and in **parsley**, which do you think scientists would worry most about? (**Hint:** Think about which you eat more of).

**Valid** – results are valid when they are repeatable **and** they answer the question. Think of this in terms of this the question “what is my mass?”

To find out you go on the scales five times and they always read 50kg. That is **reliable** and valid because the results are always the same **AND** it answers the question.

Now imagine you put on a backpack containing 10kg of bricks. Now go on the scales again. They will read 60kg, every time you measure, so the results are repeatable so they are reliable, but they are not valid because it does not **answer the question of what your mass is.**



**Reliable** – an experiment that gives repeatable results. This doesn't always mean the results are **accurate**. They need to be **valid** too.

**I'm a Scientist**  
**Get me out of here**

#### Tip: For question 1

You need to work out the **mean** average. Using your calculator, add up the figures from one farm, then divide the total by the number of samples from that farm.

#### Things to think about

Which makes the results look safer – the average or looking at the raw data? In which set of data are the numbers more spread out? Which set of data is more reliable?

**Wheat:** Is ground up to make **flour**. Flour is used to make **bread, pasta, cakes** and many other foods. **Parsley:** Is a herb. Often put on top of food to decorate it.

#### Further info

##### Reliability vs Validity

[www.imascientist.org.uk/rvv](http://www.imascientist.org.uk/rvv)

##### Info on pesticides: from the PSD

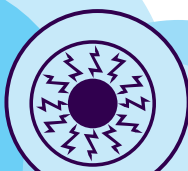
[www.pesticides.gov.uk/](http://www.pesticides.gov.uk/)

##### Info on pesticides: from the Soil Association

[www.soilassociation.org/web/sa/saweb.nsf/manuf/secondary.html](http://www.soilassociation.org/web/sa/saweb.nsf/manuf/secondary.html)

#### Further Activity:

PSD scientists make sure that pesticide levels in food are completely safe for people, but pesticides can also **affect the environment**. Can you find out about ways that pesticides affect **land, air and water** and think of one way to **reduce** the impact on each of these?



[www.imascientist.org.uk](http://www.imascientist.org.uk)

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