

INVESTIGATING FLOURS (Suggested responses)

Method 2

Aim

Investigating the effects of other ingredients (caster sugar and lemon juice) when making a cornflour based gel.

Equipment

- Digital scales
- Digital timer / stopwatch / clock with a second hand
- 5 small bowls (preferably clear and glass, but any material will do, to store the thickened starches after heating)
- 5 plastic spatulas
- Lemon juicer
- Chopping board
- Chef's knife
- Pastry brush
- 5 sticky labels and marker pen
- 5 small saucepans
- 5 wooden spoons
- 1 measuring jug

Ingredients

- Saucepan 1: 10g cornflour, 100ml cold water
- Saucepan 2: 10g cornflour, 20g caster sugar, 100ml cold water
- Saucepan 3: 10g cornflour, 100g caster sugar, 100ml cold water
- Saucepan 4: 10g cornflour, 20ml lemon juice, 80ml cold water
- Saucepan 5: 10g cornflour, 100ml lemon juice, NO water

Method

- Write the saucepan number (with ingredients and their weights) on each sticky label and stick to the outside of your small bowls.
- Using the pastry brush, gently brush the inside of the bowl with cold water.
- Add 10g of cornflour to each pan, and then add the remaining ingredients as listed above.
- Stir gently using the wooden spoon.
- Heat slowly, stirring all the time until the mixture thickens, then cook for 1 minute (use the timer).
- Make sure that you stir the starch and water continuously, and observe what is happening.
- When you start to see the starch thicken, cook for 1 minute, and make sure that you stir continuously. DO NOT LEAVE UNATTENDED.
- After 1 minute of stirring, transfer the cooked starch into the pre-wetted small bowls. Make sure that you scrape all of the thickened starch into the bowl using the plastic spatula. Leave the gel to cool.

Results

You are now going to compare the colour and the viscosity of each set gel. Create a table to record your results.

	Saucepan 1: 10g cornflour, 100ml cold water	Saucepan 2: 10g cornflour, 20g caster sugar, 100ml cold water	Saucepan 3: 10g cornflour, 100g caster sugar, 100ml cold water	Saucepan 4: 10g cornflour, 20ml lemon juice, 80ml cold water	Saucepan 5: 10g cornflour, 100ml lemon juice, NO water
Colour	White, bright	Off-white/grey	Beige/light brown	Off-white	Creamy yellow
Viscosity (how far does the gel spread?)					
Visual presentation	Very thick and solid when set. Dry, no free moisture.	Slightly softer than saucepan 1, although still solid when set. Dry, no free moisture.	Runny, wet and flows, rather than forming a gel which stays in one place.	Thick and firm, but not as much as saucepan 1.	Thick and firm, but not as much as saucepans 1 or 4.



Conclusions

Summarise your findings here. You should consider:

Which additional ingredients (caster sugar and lemon juice) affect the gelatinisation of the starch?

What does this mean if you are making a pie filling or a lemon meringue pie filling?

Sugar will soften a starch gel – it won't affect the thickness of the mixture unless used in large quantities (see experiments 2 and 3 to compare the difference in viscosity).

This is why it is recommended that sugar is added after the starch is gelatinised.

The addition of lemon juice (acid) will reduce the thickening power of the cornflour starch. This is because the acid in the lemon limits the ability of starch to capture moisture. To prevent this from happening, the starch and liquid should be allowed to thicken before the lemon juice is added.

Extension task

Research recipes for pie fillings which include starch as a thickening agent (try cherry pie filling, apple pie filling and lemon meringue pie filling from a variety of sources).

Study the recipes carefully. When is the caster sugar (and lemon juice in the case of lemon meringue pie) added? Why is this? Do the recipes vary in terms of when the sugar and lemon juice is added? What happens to the stability of the gel if you increase the sugar or lemon juice? Do you think some recipes will have more reliable outcomes than others?