WJEC Wales Biology A Level

SP 4.2a: Investigation of the digestion of starch agar using germinating seeds

Practical notes

Introduction

The **endosperm** of a seed is the **food source** which surrounds the embryo. It consists primarily of **starch** as well as proteins and oils. During **germination**, starch in the endosperm is **hydrolysed** to **maltose** by **amylase**.

The digestion of starch by germinating seeds can be investigated using **starch agar plates**.

Equipment

- Soaked maize seeds
- 2× starch agar plates
- Iodine-potassium iodide solution
- Boiling tube
- Scalpel
- White tile
- Ruler
- Water bath

Risk assessment

Hazard	Risk	Precaution	Emergency
Broken glass	Cuts	Keep glassware away from the edge of the desk	Dispose of broken glassware carefully; elevate cuts and apply pressure; do not remove glass from cuts; seek medical assistance
Scalpel	Cuts	Direction of cut away from the body; do not attempt to change blade; keep scalpel away from the edge of the desk	Elevate cuts and apply pressure; wash minor cuts in cold water; seek medical assistance
Boiling water	Scalding	Handle boiling water with care; use tongs to transfer boiling tubes; wear safety goggles	Run burn under cold water; seek medical assistance
Water bath	Electric shock	Ensure hands are dry before plugging in/ unplugging water bath	Seek medical assistance

Iodine-KI solution	Irritation to eyes	Wear safety goggles	Flood eye(s) with tap water; seek medical assistance
	Irritation to skin	Wear gloves when handling solution	Remove contaminated clothing; run the affected area under cold water; seek medical assistance

Method

1. Using a **scalpel**, cut a single maize seed in **half.**
2. Place **one half** of the seed face down onto the surface of a **starch agar** plate.
3. Set up a water bath at **80°C.**
4. Put the other half of the seed into a boiling tube filled with water and place this into the 80°C water bath for **10 minutes**. *This denatures enzymes within the seed.*
5. After 10 minutes, extract the seed from the boiling tube and place it face down onto the surface of a second starch agar plate. *This seed is a **control** to ensure no other factors affect the digestion of starch*.
6. Incubate the two plates at **25°C** for **24 hours.**
7. After 24 hours, remove the maize seeds from the starch agar plates. **Flood** the plates with **iodine-potassium iodide solution**. *In the presence of starch, iodine-KI solution changes from yellow-brown to blue-black.*
8. Record observations. *The control plate should dye completely blue-black with no visible clear zone.*
9. Measure the **diameter** of the 'clear' zone (the area that is **not** dyed blue-black) on each agar plate. Calculate the **area** of the 'clear' zone using **πr^2**.

Conclusion

The area of the 'clear' zone indicates the activity of amylase.

A **larger 'clear' zone** shows **increased digestion of starch** and thus **greater amylase activity**.