
EXPERIMENT 14 ESTIMATION OF PROPERTIES OF SEAWEED GUMS

Structure

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14.1 INTRODUCTION

The economic importance of seaweed is chiefly on account of the gums obtained from them. The unique properties of gums are applied in several areas. You will be given a few seaweed gums such as agar and alginate. You can verify some of the properties you've learnt in theory. You will also prepare a few products in order to understand their applications.

Objectives

After performing this experiment, you will be able to:

- identify some of the properties of seaweed gums such as agar and alginates; and
- summarize some of their applications.

14.2 EXPERIMENT

14.2.1 Principle

In order to study the properties that are applicable commercially, the given gum must be dissolved in water. The two basic properties of a gum are the ability to form viscous solution and gel. Most other useful properties or applications are based on these.

14.2.2 Requirements

- Gums – agar and sodium alginate
- Hydrochloric acid, sodium carbonate, calcium chloride
- Nutrient agar
- Glassware – beakers, measuring cylinder, Petri dishes, conical flask, thermometer
- Balance
- Stove
- Autoclave

14.2.3 Procedure

Agar (china grass) will be given as powder or strips and sodium alginate as a powder. Record your observations as you proceed.

A) Agar

- 1) Observe appearance, colour and odour.
- 2) Take two beakers and pour 100 ml water into each. Weigh two lots of agar: 1g and 2g. Mix each with the water taken in the beakers. Observe for any dissolution.
- 3) Heat the beakers. Using a thermometer measure the temperature at which dissolution starts. Continue heating till the agar completely dissolves.
- 4) Observe the viscosity of the solutions. Allow them to cool. Measure the temperature at which the solutions start to gel.
- 5) After cooling down to room temperature, check the strength of gel formed in each beaker. This can be done by pressing a piece between your fingers.
- 6) Heat any one gel and measure the temperature at which the gel begins to melt.
- 7) Next, take the given dehydrated nutrient agar. Go through the label of the bottle and note down the composition.
- 8) Take 100 ml water in a conical flask. Add the appropriate quantity of nutrient agar powder as per the instructions given on the label and mix. Observe what you see.
- 9) Plug the flask with cotton. Sterilize it in an autoclave at a pressure of 15 psi for a period of 15 minutes along with a few Petri dishes.
- 10) Cool the dishes. Pour the molten nutrient agar into the dishes.
- 11) Allow the nutrient agar to cool to room temperature so as to set the gel.
- 12) Open the nutrient agar plates and expose them to air for a few minutes. Then close and store at room temperature for 1 or 2 days (incubation).
- 13) Observe the plates for any microbial colonies.

B) Alginate

- 1) Prepare two 100ml solutions of sodium alginate in beakers- one containing 1g alginate and the other 3g.
- 2) Observe the effect of concentration on viscosity of the solution. Feel the slippery nature (lubrication effect) of the solution with your fingers.
- 3) To test for stabilization of a suspension; take some water in a test tube. To this add a pinch of some powder (e.g. wheat flour). Shake the test tube vigorously and keep it undisturbed. See how fast the particles settle.
- 4) Next, add to it a pinch of sodium alginate and again shake till the alginate dissolves. Then observe the rate of settling of particles.
- 5) Conversion of sodium alginate to alginic acid: Take any beaker containing sodium alginate prepared as above. Add a dilute solution of hydrochloric acid and mix. Observe for any precipitate formation (that is, formation of alginic acid).
- 6) Formation of calcium alginate: To another beaker containing sodium alginate solution add dilute solution of calcium chloride and mix. If you get a precipitate it's of calcium alginate.

14.2.4 Observations

After conducting each test, record your observations as given below: Comment on the observations based on what you've learnt in theory.

Agar:

Test	Observations	Comments
Colour and odour of agar		
Solubility in water at room temp.		
Temp. of dissolution of powder		
Effect of concentration on gel strength		
Temp. of melting of gel		
Concentration of agar in Nutrient agar		
Microbial growth in agar plate		

Alginate:

Test	Observations	Comments
Effect of concentration on viscosity of solution		
Lubricating effect		
Stabilization test : - without algin - with algin		
Sod. alginate + HCl		
Sod. alginate + CaCl ₂		

14.2.5 Results

The properties observed for agar were:

The properties observed for sodium alginate were:

14.3 PRECAUTIONS

- Note that there can be slight variations in the properties depending on the fractions of the gum present, age of the material, etc.
- When heating a gum or gel for dissolution, take care not to overheat the material. Care must be taken to prevent frothing by excess heating as otherwise the material will boil over.