[Experiment NO - 1]

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AIM - Study of pollen germination on a Slide.

Requirements -

Sucrose 10 g, boric acid 10 mg, calcium nitrate 30 mg, potassium nitrate 10 mg, magnesium sulphate 20 mg, distilled water, Portulaca, Pea, Brassica, Hibiscus flower for pollen grains, safranine, glycerine, slides, etc.

Procedure :

1- Preparation of culture medium : Prepare 10% sugar solution & dissolve boric acid, magnesium sulphate & potassium nitrate in it. This is known as nutrient solution or culture medium.
2- Take two clean cavity slides. Put 2-3 drops of above nutrient solution in each cavity slide. Number the slides.
3- Take a mature flower. Break the fresh anther & dust a few pollen grains on the cavity slides & cover them with coverslips.
4- Observe the slides under dissecting microscope & note the time of appearance of pollen tube.
5- After 5 minutes, observe the slide under low magnification & note down the size of pollen tube.
6- Repeat the observation after every 10 minutes. Record your observations in the table.

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S.No.	Flower	Time taken for the Origin of pollen tube (Germination)	Number of pollen showing Germination (a)	Total no. of pollen (b)	% of pollen germination = $\frac{a}{b} \times 100$
1-	Pea				
2-	Brassica				
3-	Hibiscus				

Conclusions:

Pollen grains germinate in sugar solution which act as nutrient for energy. Pollen grains absorb water & their exine ruptures. Sugar induces growth of pollen tube, through the germ pore. Probably, boron stimulates the germination of pollen grains.

Observe many pollen grains germinating over stigma. Some of the tubes penetrate deep into the stigma & push their way through the style.

Precautions:

1- Only a few pollens should be dusted in each slide.
2- Pollens dusted must be dipped in the nutrient solution in the cavity slide
3- Place the coverslip carefully
4- Check air bubbles
5- Study pollen grains carefully.

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[Experiment No- 2]

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AIM- Collect and study soil from at least two different sites & study them for texture & moisture content

PART A - Soil Texture

Requirements :

Polythene bags, scalpel, hand lens, beakers, measuring cylinders, meshes of different pore sizes, test tubes, digger, distilled water, glass rod for stirring.

Oven/Stove, dried soil samples, balance, weights, mechanical sieve set & blotting sheets/old newspapers, etc.

Procedure :

1- Different soil samples are collected, packed in poly-thene bags & dried in the laboratory. Examine dry samples by a hand lens & feel it between fingers. See & note the soil texture & record observations.

2- Collect a sample of the garden soil with a digger and fill half of the measuring cylinder with it. Add equal amount of water and stir it thoroughly.

3- Allow it to stand undisturbed for about an hour. The soil particles would gradually settle down in different layers according to their sizes.

4- Observe & note down the thickness of each layer in the observation table.

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Observations :

SN.	Type of layer	Size of the particles	Name of the particles	Height in mm (Thickness)
		– 2·00 mm & above	Gravel	
1-	Coarse sand	– 2·00 to 0·2 mm	Coarse sand	
2-	fine sand	– 0·2 to 0·02 mm	sand	
3-	Silt particles	– 0·02 to 0·002 mm	silt	
4-	clay particles	less than ·002 mm	clay	

Result :

Soil is a mixture of different mineral particles varying in size from ·002 mm. Soil texture refers to the relative proportion of size group of individual soil particles. Depending upon the proportion of the particles present, the soil could be of varidus types namely sandy, clayey or loamy.

Precautions

1- Stir the soil well in measuring cylinder & place it undisturbed for about an hour.
2- Note carefully different components of soil in water.

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PART - B - MOISTURE CONTENT OF SOIL

Requirements :

Test tube or box containers, soil sample, balance & Oven etc.

Procedure :

Soil is collected at desirable depth with the help of a digger, in a test tube or container, which is immediately closed tightly so that moisture from the atmosphere is not absorbed. The container is weighed properly. Now, dry the soil in an Oven at 105°C for about 24 hr till a constant weight is attained. Note the weight after drying.

Calculations :

(i) Weight of box (a) =
(ii) Weight of box + soil (b) =
(iii) Weight of soil (b - a = c) =
(iv) Weight of oven dry soil + box (d) =
(v) Weight of box =
(vi) Dry weight of soil (d - e = f) =
(vii) Amount of moisture content in soil (c - f) =

$$\text{Moisture \% in 100 g dry soil} = \frac{\qquad}{\qquad} \times 100$$

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Observation :

SN	Soil Sample	Initial weight of soil (g) A	Final weight of soil (g) B	Weight of water (g) A - B	% of Moisture content per unit dry weight of soil = $\frac{A-B}{B} \times 100$
1-	Sandy Soil				
2-	Clayey soil				
3-	loamy soil				
4-	Sandy loam				
5-	Clay loam				

Result :

(i) Soil sample A has ..... % moisture content
(ii) Soil Sample B has ..... % moisture content
(iii) Soil Sample C has ..... % moisture content per unit dry weight

The soil which has high water holding capacity has a higher % of moisture content, for example, clayey soil has higher moisture content as compared to sandy soil.

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[Experiment No-3]

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AIM - Study the pH and water holding capacity of soil. Correlate it with the kinds of plants found in them.

PART. A - Test for pH of soil

Requirements

Soil sample, beaker, funnel, filter paper, test tubes, test tube stand, pH chart, conical flask.

Procedure

(a) 1- Take 10 g of soil sample in a beaker & add 100 mL of water in it

2- Dissolve 25 mL of 1 N potassium chloride solution (74.5 g of KCL in 1000 mL of water) in it. Shake it well & leave it undisturbed for sometime

3- Filter it & take the filtrate

4- To 20 mL of filtrate add 5-10 drops of universal indicator solution for pH to develop the colour. Compare the colour with standard pH chart paper.

(b) Add a pinch of soil to 5 mL distilled water. Take a broad range pH indicator and dip it in the soil water suspension. The colour of pH paper changes. Match the colour with the colour scale

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given on a booklet. This gives an approximate pH value. For more correct value, narrow range pH indicator of the value indicated by broad range paper is taken.

(c) A spoonful of soil is added to an equal amount of barium sulphate. Add about 10-20 mL of distilled water to the test tube containing soil suspension. Now, sufficient quantity of pH indicator is added to the test tube and the contents are shaken well & leave the contents undisturbed for sometime till the clear liquid appears. Match the colour developed with pH colour chart & note the pH value of the soil.

Observation :

The pH of soil sample is

Results & Conclusions :

Depending upon the source, the nature and pH of the soil varies. It may be acidic, alkaline or neutral.

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PART-B - To determine the water holding capacity of soil.

Requirements :

Filter papers, brass/tin boxes, balance, soil sample, petri dishes, water, oven, etc.

Procedure :

Crush the soil after drying. Place a filter paper at the perforated bottom of the box. A special brass box is used for this purpose. Instead, cigarette cans or small sized tin box, perforated at bottom would serve the same purpose. Weigh this box with filter paper. Now, fill the box with soil gradually by tapping often to ensure uniform filing. Place this soil-filled box in a petri dish containing water. Allow it to remain overnight. Weigh the container once again. Place the container in an oven at 105°c for about 24 hrs, till the constant weight is attained. Record the weight. Take a few filter papers. Dip them in water and find out the average amount of water absorbed by a filter paper.

Observations & Calculations

1- Wet soil + Box + Wet filter paper =

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2- Weight of box =

3- Weight of a wet filter paper =

4- Weight of wet soil
(1) - (2+3) =

5- Weight of oven dry soil + box + dry filter paper
=

6- Weight of box =

7- Weight of dry filter paper =

8- Weight of oven dry soil
(5) - (6+7) =

9- Water in the soil (4-8) =

∴ Water holding capacity = _____ x100 =

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[Experiment NO - 4]

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AIM - Collect water from two different water bodies around you & study the samples for their pH, clarity and presence of any living organisms.

PART. A - TEST FOR pH OF WATER

Requirements -

four 250 ml beakers, pH indicator papers, pH meter and the electrodes, standard buffer solution of pH-4 & pH-9.2, filter paper, well water, pond water, lake water, river water.

Procedure:

pH of water from the different water bodies can be determined by different methods

(1) By using pH indicator paper
(2) By using pH meter.

S.N.	Test Solutions	Wide Range	Narrow Range
1.			
2.			
3.			
4.			

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Observation:

S.No.	Different types of water Sample	pH
1-	Pond water	
2-	Well water	
3-	lake water	
4-	River water	

Result :

The pH of different water Samples is different. It depends upon the different soluble nutrients present in it.

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PART. B - CLARITY OF WATER

Requirements :

A cardboard box with two holes, a torch, beaker, water samples from different sources.

Procedure

(i) Take a cardboard box & make two holes on opposite walls.
(ii) Arrange and fix a light source near one of the hole on one side of the box.
(iii) Keep the beaker containing water sample in the box.
(iv) Flash the beam of light with the help of torch from one of the hole.
(v) Observe sample of water for the turbidity or clarity from the other hole.
(vi) Repeat the experiment with water samples from ~~diff~~. different sources.

Observation - large number of particles can be seen moving in water. It is turbid water & the phenomenon is called tyndall effect.

Result - (a) _____ water is turbid
(b) _____ water is clear

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Experiment no. 5

Aim → Study the presence of suspended particulate matter in air at the two widely different sites.

Requirements → Cardboard, razor, white tissue paper, rubber-bands, glass slides, glycerine microscope, handkerchief or cotton wool.

Procedure -

Choose a public garden & an industrial area. There are two different methods -

(i) Take 2 clean slides in a convenient place in the garden & in an industrial area, for 2 or 3 hours. Collect the glass slides & observe them under low power of microscope for the study of particular matter.

(ii) Take a cork pad or cardboard & cut in the 2 of pieces 6" × 6" with the help of a sharp razor or knife. Pluck a leaf of a plant growing in the garden & another from the plant growing in industrial area. Place the leaves between the fold of a white tissue paper. Place the above leaves along with folds of tissue paper between 2 pieces of

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cork pad. Put some weight or rubber bands around the cork pieces to make it very tight. The impression of the particulate matter will come on the white tissue paper & examine it with the help of a hand lens.

Observation -

The study of presence of particulate matter in the air of the garden, shows the presence of pollen, spores of fungi, some bacteria & few soil dust particles while the study of particulate matter in the air of the industrial area will show the presence of a large no. of coal particles, soot, dust particles, iron particles, talc, fire sand. etc & metal like - Hg, Cu, Fe & Pb.

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[Experiment no. 6]

Aim → To study & prepare a temporary mount of onion root tip to study mitosis.

Requirements- Onion bulbs, conical flask / bottle, corked tube, petri dish scissors, forceps, needles, methyl alcohol/ acetic acid hydrochloric acid, acetocarmine distilled water, spirit lamp, microscope, slides, coverslips, blotting paper etc

Procedure-

1. Take medium size bulb of onion & trim off the old roots from its base by means of a sharp blade.
2. Place the onion on a conical flask full of water, with its base touching the water. Keep it for a week to grow the roots.
3. Cut 5mm off the tip of roots & put them into a tube containing a mixture of 1:3 acetic acid & methanol. Keep for one hour. This process is called fixation.

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4. Remove 2 or 3 root tips & hydrolyse them by warming to 60°C in 1N hydrochloric acid for 15 minutes.

5. Remove the root tips & wash them thoroughly in water.

6. Place a drop of aceto carmine on a slide. Put one hydrolysed root tip in a drop & place a coverslip on the root.

7. Gently squash the root by tapping the coverslip with the blunt end of a pencil until cells separate & spread out into a very thin layer.

8. Gently warm the slide over a flame for few seconds.

Observe first under the low power of microscope to locate the dividing cells. Examine different stages of mitosis under the high power of microscope.

Observation -

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[Experiment no. 7]

Aim - To study the effect of different temperature on the action of salivary amylase on starch.

Requirements - Testtube, Testtube stand, measuring cylinder, beakers, ice, funnels spirit lamp, pipette, water bath, thermometer, cotton, starch, Iodine, Potassium Iodide, Sodium chloride, Paraffin wax, marker etc.

Procedure -

- Collect the saliva & filter it by passing through cotton & make 1:20 dilution of it. as:
- Make 3 series of testtube having 1 mL of iodine solution in each. Keep them separately in stand.
- Make 3 experimental tubes, A, B & C each containing 5 mL of 1% starch & 1 mL of 1% NaCl. Keep them at different temperature ie $5 \pm 2°C$, $37 \pm 2°C$ & $70 \pm 2°C$ in different water baths.
- To each experimental tube add 1 mL of dilute

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enzyme, Immediately take a drop from each experimental tube & added to the test tube having iodine.

5. After every 2 minute repeat this process till iodine keeps giving blue colour with starch.

6. Note the time taken for the tubes to reach achromatic point ie, no blue colour with iodine is obtained

Observation Table.

Time required to reach the end point in digesting 5mL of 1%. starch at different temperature by the diluted enzymes.

Temp	Time taken to reach achromatic point	Remarks
5 ± 2°C		
37 ± 2°C		
70 ± 2°C		

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Conclusions

It is seen that time required to reach achromatic point at 5°C & 70°C is more. for the enzyme salivary amylase the optimum temperature is 37°C. Therefore starch digestion is fastest at 37°C whereas at higher temperature, the enzyme are denatured & therefore their activity is reduced.
At low temp, the enzyme are deactivated so their activity is reduced.

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Experiment no - 8

Aim → To study the effect of three different pH on the activity of salivary amylase on starch.

Requirement - Test tube, test tube holder stands, beakers, pipette, funnels, measuring cylinder, cotton, starch, iodine, potassium iodide, sodium chloride etc.

Procedure

1. Make thin film of cotton & dip it in water. Press it in between the hands to drain out excess of water.
2. Put wet film of cotton over funnel in such a way that it acts as a filter. Now, keep this funnel over a clear test-tube.
3. Chew a piece of rubber & pour the incoming saliva into the funnel. Thus, collect about 1mL of saliva.
4. Take 1mL of saliva & add 49 mL of water to get 1:50 dilution of the enzyme.
5. Make 3 series of test tube having 1mL of iodine in each. Keep them separately in 3 stands.

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6. To the testtube I. add 5ml of 1% starch solution. 1ml of 1% NaCl & a known pH table (say pH = 3)
7. Add 5ml of 1% starch solution 1 mL of 1% NaCl & a (pH - 6.8) in test tube II. Also to another testtube III add 5ml of 1% starch solution. 1mL of 1% NaCl & a known pH (say pH = 10)
8. Now put these 3 testtube in a water bath maintained at 37°C approx. for about 10 min.
9. To the testtube add 1ml of diluted enzyme. Immediately with the help of a dropper take a drop each from these testtube & add to the test tube having iodine.
10. After an interval of 2 minutes, again take a drop from each test tube & add to the iodine tubes. & note the change of colour in iodine.
11. Keep repeating it after an interval of every 2 minutes till the colour of iodine does not change any further. Note the total time taken for these 3 testtube till they do not give any colour with iodine.

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Observation Table :

Time required to reach the achromatic point in digisting 5mL of 1% starch at different pH by the diluted enzyme

Result & Explanation

pH	Time taken (minutes) to reach the achromatic point

In all the test tubes achromatic point is reached ie. a stage when starch is completely digested & hence, no blue colour with iodine. However the time taken to reach the achromatic point in these test tube is different. This shows that pH has got an effect on activity of salivary amylase.

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[Experiment NO-9]

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AIM- Isolation of DNA from available plant material such as spinach, green pea seeds, papaya etc.

Requirements

Ezee a liquid laundary detergent, non-iodized sodium chloride, distilled water, meat tenderizer or papain solution / Juice of papaya / pineapple juice, 95% ethanol.

Preparation of solutions:

(i) Prepare detergent-salt solution by adding 10 mL detergent and 10 g of salt to 90 mL of distilled water.

(ii) Repare 5% of meat tenderizer solution by adding 5g of tenderizer to 95 mL of distilled water. Juice of papaya / pineapple can be substituted for tenderizer.

(iii) A plastic bottle containing 95% ethanol must be left in the freezer over night.

(iv) Prepare 5% NaCl solution by adding 5g non-iodized salt to 100 mL distilled water.

Procedure -

(1) Take spinach leaf tissue in 100 mL beaker, add 10 mL detergent salt solution. Homoge-nize in a blender and filter through

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muslin cloth.

(2) Take 10 ml of filtrate, add 3-4 mL meat tenderizer / papaya juice. Swirl the test tube to mix the contents.

(3) Pour 10 mL ice cold ethanol carefully down the side of the test tube to form a layer on top. Let it stand undisturbed for about 3 minutes.

(4) Using glass rod stir gentally through ~~interph~~ interface of two layers to collect ppt. of DNA and place it in test tube with 5% NaCl or distilled water.

Observation

Addition of ethanol to the solution causes precipitation of DNA. DNA fibrs get spooled on glass rod can be dissolved in saline solution for UV absorption.

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