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The radiation absorption of β-rays by different leaves

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INTRODUCTION :

We know that hydrogenous materials are good absorbers of radiations. To measure the water status of a plant tissue diffusion pressure deficit (DPD) is the most suitable index. It expresses the total forces of water absorption in the same units as may be used for water retention by the soil and atmosphere environment with which moisture exchange occurs. The possibility of estimation by correlation with more easily measured indices of water status was examined for leaf tissue of sorghum vulgare. The two widely used methods were involving relative turgidity (RT) and β – radiation absorption. β – Radiation absorption is highly correlation and is sensitive to small changes of relative turgidity. This provides a chance of continuous nondestructive record of changes in the plants water status. The study of record of changes in the plants water status. the study of β-radiation absorption - RT relation is useful to get the RT-DPD correlation. This correlation is useful to estimate the DPD values for a given leaf position on plant at a constant stage of leaf expansion. The variation in β-radiation absorption was shown to vary widely between the different leaves on the plant and between different plants. This can understood as there is variation in thickness and density.

A green leaf contains green colored cells called chloroplast. Which is the site of photosynthesis. Chlorophyll is a light absorbing, photosynthetic pigment present in chloroplast. Nearly 60% of the light reaching part is absorbed. About 10% to 40% is reflected and remaining part is transmitted. 'Chlorophyll is a ring compound with central Mg^2+ and its chemical formula is $C_{55}H_{72}O_5N_4Mg$.

Geiger Muller counter, a radiation detector based on ionization effect of radiation to count the β-rays Nucleonix Hyderabad make GM counter available in our college.

I took fresh and dried leaves from five different plants or tress. The leaves are cut for the same dimensions and were placed in the same sample holder The β-ray source Sr^{90} is kept at a distance of 4 cm. The GM counter is kept in a lead shielding to minimize the background radiation The readings variety of the leaves were observed and noted the same day.

OBJECTIVES:

- To study the factors that influence the absorption of radiations of β –rays.
- To examine the fresh leaf contains 70% to 75% of water.
- To examine dry leaf hardly contains 1% to 2% of water. Considering the leaf of a plant.
- The fall in β-radiation absorption in the leaves can be used to estimate the loss of water in ageing of the leaves.

  I thought of a mathematical model for the loss water with the ageing of the plant by measuring the β –absorption in the leaves. The variation of β-absorption in leaves of different plants will also throw some light on the constituent of leaves and effect of chlorophyll.

Then calculating the absorption coefficient of fresh and dry

Leaves of five plants trees.

$$\text{Absorption coefficient of a leaf} = \frac{\text{No. of } \beta\text{-rays absorbed by the leaf}}{\text{No. of } \beta\text{-rays incident on the leaf}}$$

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DESCRIPTION OF DIFFERENT LEAVES

Banana leaf:

Common Name	Scientific Name	Family Name	Nature	Thickness	No. of counts per 3 minute	Absorption Co-efficient
Banana	Musa-paradiscia	Musaceae	Fresh leaf	0.20 mm	2,12681	0.7514 calculated
			Dry leaf	‘ ’	2,44801	0.8680 calculated
				Difference	32,120	

Mango leaf :

Common Name	Scientific Name	Family Name	Nature	Thickness	No. of counts per 3 minute	Absorption Co-efficient
Mango	Mangiferaindca	Anacardia	Fresh leaf	0.21 mm	2,09599	0.7432 calculated
			Dry leaf	‘ ’	2,47913	0.8791 calculated
				Difference	38,314	

Custard Apple leaf :

Common Name	Scientific Name	Family Name	Nature	Thickness	No. of counts per 3 minute	Absorption Co-efficient
Custard Apple	Anonasquamosa	Ananaecae	Fresh leaf	0.17 mm	2,35678	0.8357 calculated
			Dry leaf	‘ ’	2,58262	0.9158 calculated
				Difference	22,584	

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Hibiscus leaf:

Common Name	Scientific Name	Family Name	Nature	Thickness	No. of counts per 3 minute	Absorption Co-efficient
Hibiscus	Hibiscus rosasineusis	Malveaceae	Fresh leaf	0.17 mm	2,36,898	0.8400 calculated
			Dry leaf	‘ ’	2,67115	0.9472 calculated
				Difference	32, 217	

Teak wood leaf:

Common Name	Scientific Name	Family Name	Nature	Thickness	No. of counts per 3 minute	Absorption Co-efficient
Teak wood	Tectoragrandsis	Verbenaceae	Fresh leaf	0.21 mm	2,34,175	0.8304 calculated
			Dry leaf	‘ ’	2,46687	0.8747calculated
				Difference	12, 512	

DISCUSSION :

In all the verify of leaves, I found significant difference in β-radiation absorption in fresh and dried leaves. The fresh leaves absorb more radiations than the dried ones. The more difference in mango leaf and less difference in teak leaf. The absorption difference may be due to loss of water, absence of metabolic function etc.

I am planning to study the loss of water is successive days after the leaf is detached from the plants by taking the measurement of β absorption.

CONCLUSION:

- The passage of time, depending upon ambient temperature and humidity in the air, water content in the leaves reduces and they become dry.

- Absorption coefficient of a leaf for β-radiation is proportional to the water content in a tool to measure the ageing of the leaf.
- β-radiation absorption can be taken as a tool to measure the ageing of the leaf, alternatively the efficiency of vegetable preserving machinery can be ascertained by measuring the β-radiation absorption

Coefficient of vegetable leaves preserved in the machinery.

RESULTS :

Time of exposure of the leaves to β –rays	: 180 sec or 3 minute
Background count	: 26 say
Number of counts without any shield	: 2,82,000

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