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VARIATION IN THE ELECTRICAL CONDUCTIVITY BETWEEN MORINGA OLEIFERA AND SANTALUM ALBUM

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ABSTRACT:

Wood is essentially composed of cellulose, hemicelluloses, lignin, proteins, phenolics, water and mineral salts. Cellulose is responsible for the conductivity of electricity. The electrical conductivity depends upon the specific gravity, length of the wood piece, temperature and proportional water content. When stem is fresh, the Resistivity is less and conductivity is more when it is dried vice-versa process occur. In the present study Resistivity and Conductivity of Drum stick (Moringa oleifera) and Sandal wood (Santalum album) were studied by using conductivity meter and compared.

Keywords: Conductivity, Resistivity, Drumstick and Sandal wood

INTRODUCTION:

Conductivity is a measure of the ability of a given substance to conduct an electric current, equal to the reciprocal of the substance. It can be denoted as ‘σ’.

The SI unit of conductivity is Siemens per meter (S/m). Conductivity measurements are used routinely in many industrial and environmental applications as a fast, inexpensive and reliable way of measuring the ionic content in a solution. Conductivity is traditionally determined by measuring the ‘AC resistance’ of the given material or solution between two electrodes. Generally, conductivity is the rate at which matter or energy can pass through a given material. A material with a high level of electrical conductivity, for instance, would easily accommodate the movement of an electric charge.

Hydro electric conductivity describes the rate at which water can move through the porous elements of a surface. It is an important consideration for assessing the permeability of soils, rocks and plant layers. Such studies provide critical information for watershed management, agriculture and flood prevention. Hydro electrical conductivity also is used as a model to study the behavior of aquifers and subterranean water deposits.

The sap from various plant organs and made measurements of the electrical conductivity of the plant juices so obtained by means of Kohlrausch’s well known method. His conclusions were that the plant juices are good conductors and that generally the specific conductivity of the sap increases progressively from the root upwards to the shoot. The juice was afterwards incinerated and the ash so obtained diluted to the original volume of the juice; the conductivity of the resulting liquid was then measured. Therefore, it able to show that the specific conductivity is a rough measure of the relative amounts of mineral substances and water present in the juice. (Ludek et al-2006)

MATERIALS AND METHODS:

STEM MATERIAL COLLECTION AND PREPARATION:

Stem material of Drum stick and Sandal wood were collected from the botanical garden of Sahyadri College campus. Stem branches from fully grown tree was selected and 3 pieces each from each plant was cut into 12x6 cm each and brought to the laboratory for the studies.

Thus brought stem pieces were fixed to the (+) and (-) sensor clips and connected to the autocompute LCR-Q-meter 4910 of Aplab (fig 1). Reading was recorded on everyday basis upto 16 days and 10 days respectively in the mentioned wood samples. Experiment was repeated for three times for each sample. For calculations **y = a + blnX** was applied and readings were recorded and compared.

Fig 1: Conductivity meter used for the study

CONSTRUCTION AND WORKING MODE OF CIRCUIT:

The circuit is constructed by using IC555 Timer and few capacitors and resistors.

IC555, Pin 8 is connected to Power supply (+VCC), Pin 1 generated. The output is taken at Pin 3 and buzzer and LED indicator also connected. A 47K Potentiometer is connected between +VCC and Pin 4 of IC555, by varying the potentiometer we can set the conductivity level and A 22K resistor is connect between +VCC and Pin 7 and 10K is connected between Pin 7 and another end is connected to shorted pin6 and 2 and 10n F Capacitor is connected to ground and 0.1 micro fared capacitor is connected between Pin 5 and Grounded.

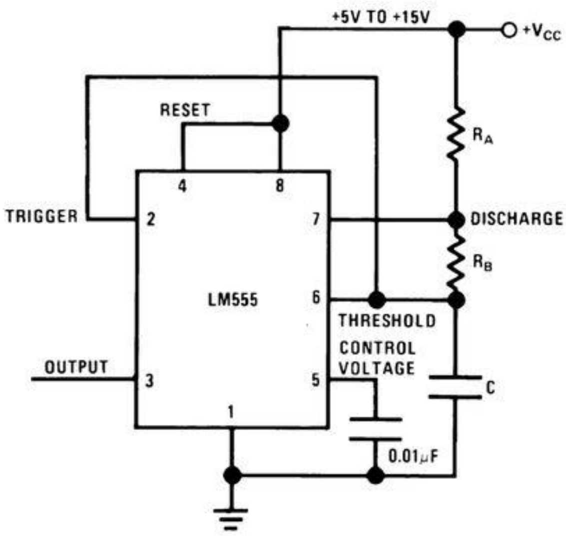

Fig 2: Circuit Diagram

This circuit sense the conductivity to turn on IC555 and create a tone that is to deliver a Buzzer Pin 4 must be held at 0.7V to turn the IC555 OFF any voltage below 0.7V will activate the circuit. The adjustable sensitivity control (Potentiometer) is needed to set the level at which the circuit is activated. When the sensitivity pot is turn so that it has the lowest resistance a large amount of conductance offered by the probes for its resistance to be low. This produces a voltage divider made up of probes between the wood samples and 47K Ohm potentiometer. As the resistance of the sample decreases, voltage across the 47K potentiometer increases. And circuit is activated and hence generated a tone along with light indication.

When the sensitivity control is taken to the 0 volts its resistance increases and this effectively adds resistance to 47 K Potentiometer. The lower part of the voltage divider now has a large resistance and this is series with the probes. Less conductivity is needed on the probes for it to raise the voltage on Pin 4 turn on the IC555.

RESULTS:

VARIATION OF ELECTRICAL PARAMETER IN SANDAL WOOD:

The graph is set to the equation, **y = a + blnX**

Where, a = -31.328

b = -2.733

a,b are graph constants.

X is conductivity in mho

Y is No. of days.

Table 1: Readings recorded for Sandal wood

X Value	Y Value	Y Predict
2.63E-07	10	10.07935
4.90E-07	9	8.378731
5.78E-07	8	7.927325
9.61E-07	7	6.537864
1.00E-06	6	6.429142
1.63E-06	5	5.093851
2.08E-06	4	4.427577
3.04E-06	3	3.39043
4.02E-06	2	2.626762
1.01E-05	1	0.108972

Where, Y predict values by Graph (depends upon the equation)

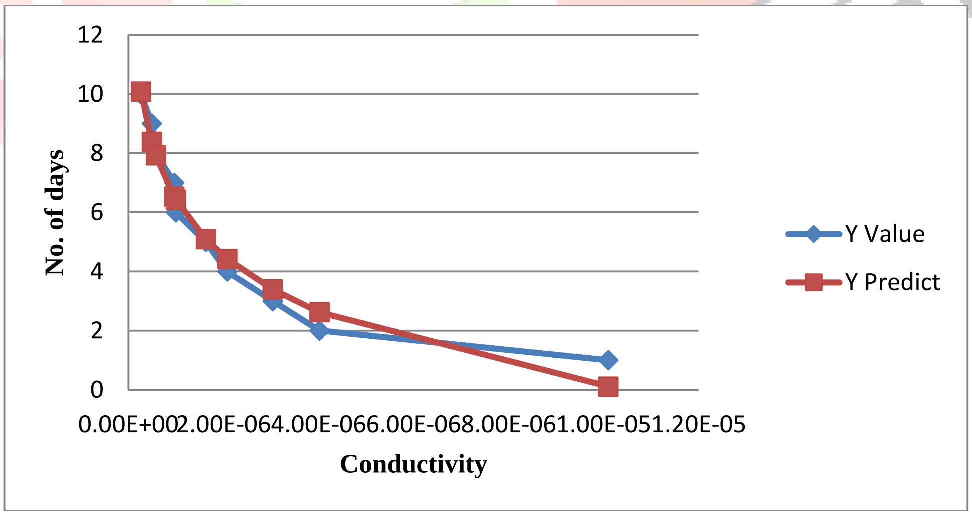

Fig 3: Graph showing decline in Conductivity of Sandal wood

VARIATION OF ELECTRICAL PARAMETER IN DRUM STICK:

The graph is set to the equation, **y = a + b/lnX**

Where, a = 52.295

b = 553.67

a,b are graph constants.

X is conductivity in mho

Y is No. of days.

Table 2: Readings recorded for Drum stick wood

X value	Y value	Y predict
2.53E-07	15	15.84541
8.33E-07	14	12.74247
1.03E-06	13	12.13342
1.26E-06	12	11.53753
1.66E-06	11	10.69317
1.72E-06	10	10.58188
2.43E-06	9	9.466834
3.18E-06	8	8.556741
4.18E-06	7	7.59111
5.14E-06	6	6.832205
1.10E-05	5	3.802631
1.12E-05	4	3.725981
1.20E-05	3	3.430237
1.58E-05	2	2.214278
2.12E-05	1	0.846116

Where, Y predict values by Graph (depends upon the equation)

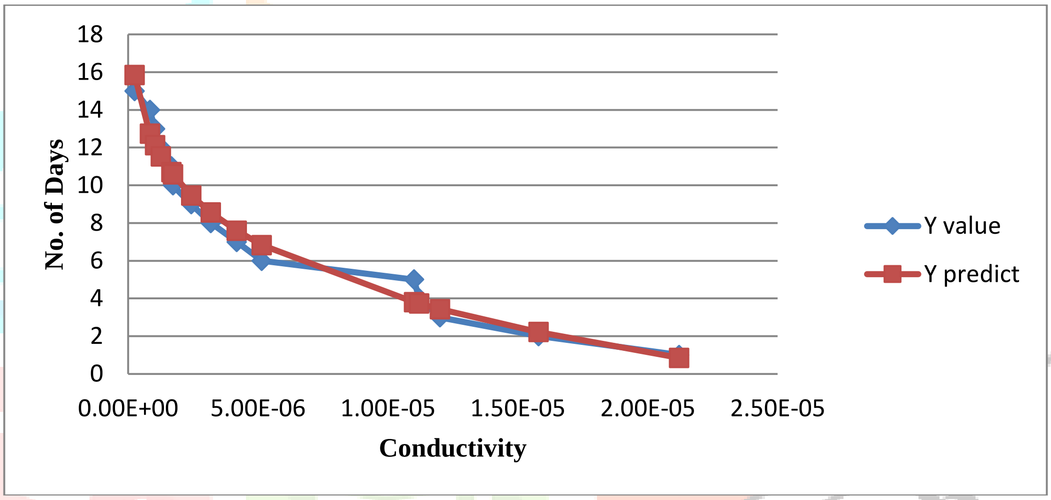

Fig 4: Graph revealing decrease in the Conductivity

CONCLUSION:

It was evident from the studies that when the stem was fresh it showed less resistivity and more Conductivity. As it started drying, we could see less conductivity and more resistivity. When compared to the Sandal wood and Drum stick, it was learnt that the rate of Conductivity is high in Drum stick over Sandal wood. Also observed that drying process in Sandal wood is very fast compared to Drum stick as it contains large amount of water. Even after drying the dried wood containing Cellulose was responsible for Conductivity. However, the rate of conductivity is comparatively high in Drum stick when compared to Sandal wood even at dried condition.

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