

Studies on pH of the PKL Extract during Electricity Generation for day and night time collected Pathor Kuchi Leaf

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Abstract

In the analysis of a PKL it is shown that the Major and minor acids present in dried leaf tissue of *Bryophyllum calycinum* were identified or characterized using the combined methods of ion exchange chromatography, paper and thin-layer chromatography, gas chromatography, and infrared spectroscopy. After esterification of the acids in methanol containing H^+ form cation exchange resin, their amounts were determined by gas chromatography. The acids identified and their approximate percentage amounts of the total acid content were: malic 32.5%, citric 10.1%, isocitric 46.5%, succinic 1.0%, fumaric 0.9%, pyruvic 1.0%, oxalacetic 0.4%, α -ketoglutaric 0.5%, glyoxylic 0.1%, lactic 0.2%, oxalic 0.2%, and cis-aconitic 1.6%. Tentative characteristics were proposed for previously undetermined acids present mainly in amounts from 0.05% to 0.6%. These were apparently mono-, di-, and tricarboxylic acids containing from three to seven carbons in the carbon chain. Most of these evidently had additional functional groups, including methyl, keto, and hydroxyl groups. The boiling points of the methyl esters of these acids ranged from 140°C to 300°C. It is seen experimentally that there are seventeen elements in the plant which helps to grow their full physiology. These are: Carbon, Hydrogen, Oxygen, Nitrogen, Potassium, Calcium, Phosphorous, Copper, Magnesium, Iron, Manganese, Zinc, Boron, Molybdenum, Sodium and Chlorine. Plant absorbs carbon, Hydrogen and Oxygen except rest of the 14 elements. Furthermore, plant absorbs 10 types of cation and 7 types of anion. The solution of the sand has adequately Ca^{++} , Mg^{++} , K^+ , Na^+ , H^+ as a cation and Cl^- , SO_4^{--} , HCO_3^- , NO_3^- and OH^- as anion. But the rate of absorption of ions is different. The plasma membrane of the cell is not allowed to penetrable for all ions. It is considered that K^+ and NO_3^- absorbed rapidly. On the other hand the rate of absorption Ca^{++} and SO_4^{--} is slow. To keep it in mind we have studied the variation of pH with time during day and night time.

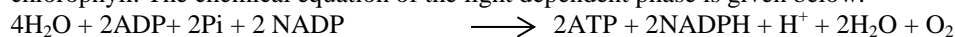
Keywords: pH, PKL Cell, Electrode, Standard Electrode, Hydrogen Electrode, EMF

I. Introduction

The water of the soil is the main required mineral salt of the plant. The such type of salt are in the soluble in the water. There are two theories for Ion exchange system [1-13]. It is considered that the ion absorbs by the ion-exchange system is the root. The ion-exchange systems are:

- (i) Cation exchange theory and
- (ii) Carbonic Acid exchange theory.

The reaction of the light dependent phase of the plant occurs in the thylakoid membrane in presence of light only. Here, solar energy converts into chemical energy. When the leaf absorbs photon particle from solar radiation, then the high energy electron emits from the leaf or plant and then it transferred through the conducting medium [14-23]. The acquired energy ready to catch again energy by transferring ATP and $NADPH_2$ but it divided water to get again the loss of electron of the chlorophyll. The chemical equation of the light dependent phase is given below:



For creation of high energy ATP and $NADPH + H^+$ needs that huge energy from the sun. The process by which we can get ATP using huge sun's energy is called photo phosphorylation [24-31].

II. Methodology

II A. Light independent or Dark Phase

The main objective for photosynthesis is to product Carbohydrate. This process occurs cyclically that is why it is not called Carbon reduction cycle. This occurs in the region of stomach of the chloroplast. There is not necessary for direct light in that Carbon-reduction cycle in this dark phase [32-56].

IIB. Factors of Photosynthesis

There are lot of factors for photosynthesis. Such as – light, CO₂, temperature, H₂O, O₂, mineral matters, chemical matters which are known as external catalyst. There are some internal catalyst such as chlorophyll, age of the leaf, internal construction of the leaf, quantity of the carbohydrate and enzyme[57-70].

IIC. Metal content of Bryophyllum Leaf or PKL

The main organic acids are Mellic acid, cyric acid and Iso- citric acid. Besides these there are some trace elements in the PKL[71-89].

IID. Measurement of pH of the Solution of day time picked PKL



(a)pH for water & (b) PKL during day time.

Fig.: An experimental set-up of the pH measurement of the PKL juice during day time.

pH of the solution is a great factor for electricity generation. pH defines the acidity measurement of a solution and indicate the rate of H⁺ ion dissociation. Previous we discussed about the pH measurement of PKL solution. Electricity generation is high from that solution whose mixture's pH is low. The pH of Pathor Kuchi Leaf juice without water is 4.6 and the pH of Pathor Kuchi malt with water (10% solution) is 4.8 which is ideal for electricity generation. It was a finding that pH varies on picking time. It is a very interesting character of Pathor Kuchi Leaf is that pH of PKL juice whose leaves are picked at night time is higher than PKL juice whose leaves are picked at day time.

Consider this experiment we picked Pathor Kuchi Leaf from trees in different two days. Both at two days it was picked Pathor Kuchi Leaf at day time. Then we crushed those leaves with 10% water. After making PKL solution it was made a PKL cell and battery and set up a light load with that battery. In that situation we took some reading of pH measurement of a unit cell using pH meter[90-100].

IIIE. Experimental data

Date	Pick Time of PKL	Local Time of pH measurement	Time duration (minute)	pH of the PKL solution
22.04.2016	10.30 AM	12.00 PM	00	4.6
„	„	12.30 PM	30	
„	„	1.00 PM	60	
„	„	1.30 PM	90	
„	„	2.00 PM	120	
„	„	2.30 PM	150	
„	„	3.00 PM	180	
„	„	3.30 PM	210	
„	„	4.00 PM	240	
„	„	4.30 PM	270	5.61

Table1: Determination of pH of PKL solution at First day whose leaf are picked at Day time.

Date	Pick Time of PKL	Local Time of pH measurement	Time duration (minute)	pH of the solution
23.04.2016	9.00 AM	11.00 AM	00	4.7
”	”	11.20 AM	20	4.8
”	”	11.40AM	40	4.9
”	”	12.00 PM	60	5.1
”	”	12.20 PM	80	5.2
”	”	12.40 PM	100	5.3
”	”	1.00 PM	120	5.4
”	”	1.20 PM	140	5.6
”	”	1.40 PM	160	5.65
”	”	2.00 PM	180	5.69

Table 2: Determination of pH of PKL solution at Second day whose leaf are picked at day time.

IIF. Measurement of pH of the Solution of night time picked PKL



(a) pH for water (b)PKL during night time

Fig.: An experimental set-up of the pH measurement of the PKL juice during night time.

To compare the study of variation of pH of different time picking PKL solution, we also picked Pathor Kuchi Leaf in both two days at night time. Then we crushed those leaves with 10% water. After making PKL solution we made a PKL battery and set up a light load with that battery. In that situation we took some reading of pH measurement of a unit cell using pH meter[101-103].

IIIG. Experimental data

Table 1: Determination of pH of PKL solution at First day whose leaf are picked at night time.

Date	Pick Time of PKL	Local Time of pH measurement	Time duration (minute)	pH of the solution
22.04.2016	8.00 PM	8.30 PM	00	4.55
”	”	9.00 PM	30	4.59
”	”	9.30 PM	60	4.60

„	„	10.00 PM	90	4.61
„	„	10.30 PM	120	4.62
„	„	11.00 PM	150	4.65
„	„	11.30 PM	180	4.85
„	„	12.00 AM	210	4.95
„	„	12.30AM	240	5.2
„	„	1.00AM	270	5.39

Table 2: Determination of pH of PKL solution at Second day whose leaf are picked at night time.

Date	Pick Time of PKL	Local Time of pH measurement	Time duration (minute)	pH of the solution
23.04.2016	8.30 PM	9.00 PM	00	4.57
„	„	9.20 PM	20	4.91
„	„	9.40 PM	40	5.16
„	„	10.00 PM	60	5.33
„	„	10.20 PM	80	5.51
„	„	10.40 PM	100	5.72
„	„	11.00 PM	120	5.89
„	„	11.20PM	140	6.07
„	„	11.40P	160	5.91

		M		
		12.00A		
„	„	M	180	5.41

II H. Comparison of the pH of PKL solution between day and night time

During data collection at research time “ The duration of data taking ” were same for both two days for easily comparing by the pH measurement between day time and night time picking Pathor Kuchi Leaf (PKL)[104]. The data is given below:

Fig. 8.1: Compare of pH value of PKL solution between day time and night time picked Pathor Kuchi Leaf at first day.

Date	Time duration (minute)	pH of Day time picking PKL solution	pH of Night time picking PKL solution
23.04.20			
16	00	4.95	4.70
„	20	5.14	4.91
„	40	5.30	5.16
„	60	5.50	5.33
„	80	5.65	5.51
„	100	5.79	5.72
„	120	5.92	5.89
„	140	6.07	6.07
„	160	6.22	5.91
„	180	6.36	6.12

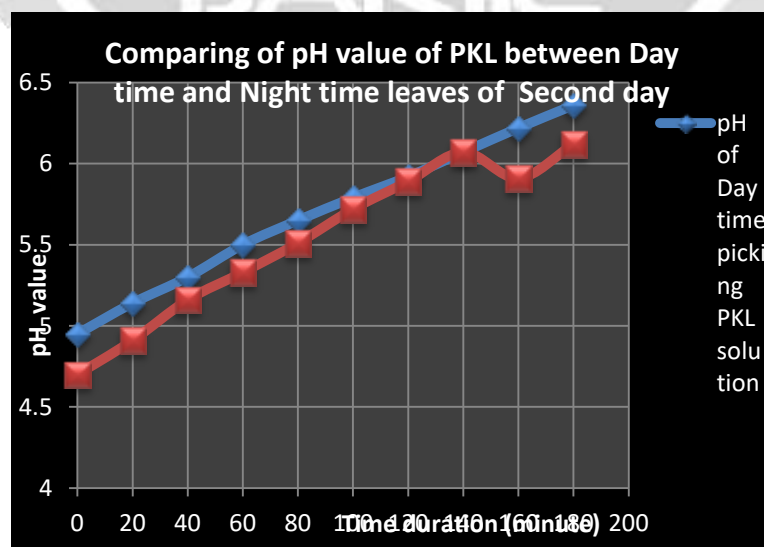


Fig. 2: Compare of pH value of PKL solution between day time and night time picked Pathor Kuchi Leaf at Second day.

III. Results and Discussion

The pH was studied during electricity generation for both day and night time. The V_{oc} , I_{sc} , V_L , I_L , P_{max} , V_R , R_{in} , Energy efficiency, Capacity, Pulse performance, Temperature effect, Discharging characteristics etc have been studied in the earlier chapters. Here, It was studied only Variation of pH with time during electricity generation.

From Fig.8.1, it is shown that the pH of the day time picked PKL is always higher than the pH of the night time picked PKL. It is clear from Fig. 8.1 that the difference between the pH of the picked PKL is almost same except some special cases. But from Fig.8.2, it is also shown that the pH of the day time picked PKL is always higher than the pH of the night time picked PKL. It is also clear from Fig. 8.2 that the difference between the pH of the picked PKL is also almost same except some special cases. Although from the Fig. 8.2, it is shown that the difference between the day and night time came very closer and instantly they maintained a little difference again. From these results it is shown that during night time there are something is happening to increase the $[H^+]$, this is the presence of the malic acid, because one of the main characteristics of the *Bryophyllum* leaf is gain of malic acid during night time and loss of malic acid during day time.

IV. Conclusion

The one of the most important findings of this PhD research work is shown that the valuable hydrogen gas is produced during electricity generate on the Zn/Cu based device. Since pH is changed during electricity generation then it proves that H_2 gas is produced. Although the other bi-product of this system is Bio-fertilizer and Methane gas which have been described in the earlier chapters.

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