

Effect of Variation in the Concentration of Mineral Solution on pH and Colour Intensity of the PEM of 1.5 31211 SMJ 38 Jeewanu before and after Exposure to Sunlight

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ABSTRACT: As Jeewanu, the autopoietic eukaryote, shows the properties of splitting of water and are able to fix carbon dioxide and nitrogen, various types of Jeewanu were prepared by incorporating different materials to enhance their water splitting capacity. One of the Jeewanu prepared with success is silicon molybdenum Jeewanu. The molybdenum Jeewanu are very much near the present day cell in composition. Ferredoxin like material has been detected in Jeewanu. Minerals are widely distributed in nature and are common constituents of the present day cell. As life originated in their environment, minerals might have played a significant role in life synthesis.

KEYWORDS: Mineral solution, Autopoietic, Eukaryote, Jeewanu, Parental Environmental Medium, SMJ38, sunlight, exposure, pH.

I. INTRODUCTION

The functional approach to the origin of life led by Bahadur and Ranganayaki to study the photochemical splitting of water and fixation of nitrogen and carbon dioxide by abiogenically prepared microstructures is an important aspect of understanding the process of life synthesis [1].

Jeewanu mixture showed the presence of a photochemical reversible electron transfer system [2]. Jeewanu also has nitrogenase like activity [3] - [4]. As Jeewanu show the properties of splitting of water and are able to fix carbon dioxide and nitrogen, various types of Jeewanu were prepared by incorporating different materials to enhance their water splitting capacity. One of the Jeewanu prepared with success is silicon molybdenum Jeewanu [5]- [7]. The molybdenum Jeewanu are very much near the present day cell in composition [8]. Iron has a very significant biological importance [9]. Iron is present in ferredoxin, an iron sulphur protein, found in cells of plants, animals and in bacteria [10]. Ferredoxin helps in electron transport and acts as catalyst in a number of biochemical processes [11]. According to Hall, certain types of ferredoxin might have been the first redox catalyst of living organisms [12]. Ferredoxin like material has been detected in Jeewanu [3, 11].

Minerals act as catalysts in many biological reactions. Some metal ions not only accelerate some biological reactions but also have played a vital role in abiogenesis of bio monomers like amino acids, fatty acids, sugars etc. and bio polymers. These are widely distributed in nature and are common constituents of the present day cell. Sea water and soil are rich in mineral contents [13]. According to Sillen, the pH and the concentration of major cations in the sea water are essentially fixed by the concentration of chloride ions and a number of common carbonates and silicates [14] - [15].

As life originated in their environment, minerals might have played a significant role in life synthesis. So the effect of variation in the concentration of mineral solution on pH and colour intensity of the PEM of 1.5 31211 SMJ 38 Jeewanu, before and after exposure to sunlight, have been studied.

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II. MATERIALS AND METHODS

The following solutions were prepared:

- 4%(w/v) ammonium molybdate
- 3%(w/v) diammonium hydrogen phosphate
- Mineral solution was prepared by mixing different minerals in definite proportion.
- 36% formaldehyde solution.
- 3%(w/v) sodium chloride
- 5%(w/v) soluble sodium silicate

All the solutions, except formaldehyde, were sterilized in an autoclave at 15 lbs for 15 minutes.

Five dry, clean, sterilized corning conical flasks of 50 ml capacity were taken and labelled 1 to 5. In each flask, 3 ml ammonium molybdate and 6 ml of diammonium hydrogen phosphate was added. Then 2ml, 4 ml, 8 ml, 16 ml and 24 ml of mineral solution were added to flasks 1 to 5 respectively. After this, 2 ml of sodium chloride and 2 ml of soluble sodium silicate were added to each of the five flasks. Then 4 ml of formaldehyde solution was added to each of the five flasks. Thus the total volume of flask 1 to 5 was 19 ml, 21 ml, 25 ml, 3 ml and 41 ml respectively.

III. EXPERIMENTS

The flasks were cotton plugged, shaken carefully and exposed to sunlight for total 38 hours. After 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 240, 360 and 480 minutes respectively, the colorimetric readings and the pH were recorded for all the five flasks. Then after this, after 16 hours, 20 hours, 24 hours and 26 hours of exposure period, the pH was recorded both before keeping the solutions for exposure after a night gap and after exposure. After this, the pH were recorded both before and after exposure of 32 hours, 34 hours, 36 hours and 38 hours for only the flask labelled (3) which contained 8 l of mineral solution in 25 ml of the PEM

IV. OBSERVATIONS

TABLE-1

Intensity of the blue colour of the exposed mixture indicating the reduction of Mo^{6+} to Mo^{4+} as indicated by the colorimeter.

Period of exposure minutes	Colorimetric readings				
	Volume of mineral solution added to the PEM(in ml)				
	2	4	8	16	24
0	20	18	19	20	20
10	288	222	137	20	21
20	310	180	160	60	30
30	340	240	220	140	80
40	350	260	250	180	130
50	370	365	330	210	152
60	375	380	300	193	155
70	385	350	274	174	149
80	370	335	264	160	152
90	370	320	240	157	131
100	335	284	216	150	120
110	335	300	190	137	104
120	368	344	280	210	168
240	400	385	360	274	226
360	388	382	356	272	198
480	375	385	315	272	174

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TABLE-2

Effect of exposure of PEM having different concentrations of mineral solution on the pH of the PEM.

Period of exposure minutes	pH of the PEM				
	Volume of mineral solution added to the PEM(in ml)				
	2	4	8	16	24
0	3.23	3.19	3.17	2.99	2.81
10	3.00	3.03	3.07	2.94	2.75
20	2.97	3.00	3.05	3.03	2.85
30	2.90	2.95	3.00	3.05	2.87
40	2.85	2.90	3.00	3.03	2.95
50	2.83	2.89	3.01	3.04	2.98
60	2.72	2.80	2.93	3.02	2.99
70	2.78	2.83	2.95	3.00	3.08
80	2.80	2.85	2.97	3.05	3.14
90	2.81	2.87	2.98	3.08	3.18
100	2.83	2.88	2.99	3.9	3.24
110	2.84	2.889	3.01	3.10	3.26
120	2.85	2.91	3.04	3.12	3.33
240	2.86	2.92	3.04	3.26	3.40
360	2.88	2.93	3.01	3.22	3.34
480	2.83	2.88	2.99	3.18	3.28

TABLE- 2 CONTD

Period of expo. in hours	Volume of mineral solution added to the PEM (in ml)									
	2		4		8		16		24	
	Before expo.	After exp.	Before expo.	After expo.	Before expo.	After expo.	Before expo.	After expo.	Before expo.	After expo.
16	-	2.74	-	2.66	-	2.98	-	2.90	-	2.96
20	-	2.60	-	2.67	-	2.94	-	2.86	-	2.92
24	2.67	2.58	2.68	2.65	2.97	2.92	2.86	2.84	2.93	2.89
26	2.62	2.54	2.67	2.64	2.93	2.90	2.84	2.82	2.86	2.84
32	-	-	-	-	2.91	2.88	-	-	-	-
34	-	-	-	-	2.87	2.85	-	-	-	-
36	-	-	-	-	2.84	2.82	-	-	-	-
38	-	-	-	-	2.83	2.80	-	-	-	-

V. CONCLUSION

The results show that if 2 ml mineral solution per 19 ml of PEM is added to the PEM, the intensity of the colour produced is more and it decreases with increasing concentration of mineral solution in the PEM. In the PEM with 2 ml mineral solution per 19 ml PEM, 4 ml mineral solution per 21 ml PEM, 8 ml mineral solution per 25 ml PEM, 16 ml mineral solution per 33 ml PEM and 24 ml mineral solution per 41 ml PEM, the intensity of the colour increase, with

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increasing period of exposure but this is also lessened with increase in the concentration of mineral solution within this range

It is observed that pH decreases during exposure for up to 60 minutes, when 2 ml mineral solution per 19 ml PEM, 4 ml mineral solution per 21 ml PEM and 8 ml mineral solution per 25 ml PEM are added to the PEM. But when 16 ml mineral solution per 33 ml PEM and 24 ml mineral solution per 41 ml PEM are added, the decrease in the pH is observed only for first 10 minutes. Then after this, the pH in all the five cases increases. This increase in pH continues up to 6 hours in PEM having 2 ml mineral solution per 19 ml PEM and 4 ml mineral solution per 21 ml PEM, and for 4 hours for higher concentrations of mineral solutions in the PEM. After this, a decreasing trend of pH is observed in all the five cases. It is further observed that the initial pH is more than the final pH after 8 hours exposure in the PEM having 2 ml, 4 ml and 8 ml mineral solutions, per 19 ml, 21 ml and 25 ml PEM respectively. But when 16 ml or 24 ml mineral solution per 33 ml and 41 ml PEM respectively are added to the PEM, the final pH of the PEM after 480 minutes of exposure is more than the initial pH before exposure. This might be probably because no proton formation is taking place in these PEM having 16 ml or 24 ml mineral solution per 33 ml and 41 ml PEM respectively as no formation of Jeewanu was observed up to 8 hours of exposure in these PEM.

When the pH was recorded after a night gap before exposure and then after exposure, of 24 hours, 26 hours, 32 hours, 34 hours, 36 hours and 38 hours, giving 2 hours exposure daily, it was observed that on exposure the pH decreases in all the five cases indicating the proton formation. As after each exposure, a night gap is given to each of the five solutions, it appears that the pH increases during night and decreases during the exposure to sunlight

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