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Effect of Addition of Higher Concentration of Mineral Solution in the PEM on the Colour Intensity and the pH of the PEM During the Formation of the Silicon Molybdenum Jeewanu SMJ8*

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Abstract: SMJ8 Jeewanu, the autopoetic eukaryote, was prepared under oxygenic conditions and the effect of addition of higher concentration of mineral solution in the PEM on the colour intensity and the pH of the PEM during the formation of the silicon molybdenum Jeewanu SMJ8 was investigated. It was observed that on exposure to sunlight, the colourless form Mo^{6+} is changed to blue coloured Mo^{4+} in the PEM. The blue colour appeared after about 10-15 minutes of exposure. The intensity of the blue colour was measured as absorbance with the help of a double cell photoelectric colorimeter. The pH of the five PEM solutions having different concentrations of mineral solution was measured with the pH meter at different exposure period. The PEM having 12 ml mineral solution showed maximum increasing trend in its pH with increase in its exposure time. The optimum growth of the particles took place in PEM with 4 ml of mineral solution as the dry weight of the particles of this solution as well as the number of the particles in this PEM which had 4 ml mineral solution was maximum. Maximum size was also observed in the Jeewanu of this PEM. The colorimetric readings also show optimum growth in the PEM with 4 m1 mineral solution as indicated by the maximum blue colour intensity shown by it.

Key words: SMJ8, Jeewanu, mineral solution, PEM, colour intensity, autopoetic eukaryote, pH

1. Introduction

Several minerals are found in the body of the living systems. Although the minerals are present in very small quantity in the living systems yet they are very essential for several vital processes. Minerals also help in the acid base balance of the body and regulate the osmotic pressure[1]. The blood clotting is facilitated by the presence of ionic calcium as it acts as cofactor.

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Calcium further helps in muscle contraction and bone formation.

Potassium is present in animal cells. It constitutes a very important buffer system in the cell and exerts important effects upon the function of nervous system. It helps in CO_2 transport in KHb in the red blood corpuscles. About 90% of the total base of the body is provided by the sodium present in plasma. The acid and alkaline sodium phosphate constitutes an important buffer system. 70 % of total Mg of the body is present in bones as phosphates. The essential part of green plants, the chlorophyll, is a porphyrins derivative of magnesium. Among the transition metal ions which act as component of enzyme and often as electron and oxygen carriers in living systems, iron is most important[2].

SMJ8 Jeewanu, the autopoetic eukaryote, was prepared under oxygenic conditions and effect of addition of different concentrations of mineral solution on the pH and colour intensity during the formation of the Jeewanu and the yield of SMJ8 Jeewanu was investigated.

2. Experimental

The following solutions were prepared:

(a) 4% (w/v) ammonium molybdate

(b) 3% (w/v) diammonium hydrogen phosphate.

(c) Mineral solution.

It was prepared by dissolving 20 mg each of sodium chloride, potassium sulphate, calcium acetate, magnesium sulphate, potassium dihydrogen phosphate and manganese sulphate in 80 ml double distilled water. One salt was dissolved completely before adding another salt.

In a separate test tube 50 mg of ferrous sulphate was dissolved in 10 ml double distilled water in which a drop of 6 N/H_2S0_4 was added to avoid hydrolysis.

Both solutions were mixed and the total volume of the mixture was made upto 100 ml by adding double distilled water.

(d) 36% formaldehyde solution was used in this experiment.

(e) 3% (w/v) sodium chloride.

(f) 5% (w/v) soluble sodium ortho silicate.

The solutions, except formaldehyde, were sterilized in an autoclave at 15 lbs. pressure for thirty minutes.

3. Preparation of Abiogenic Mixture

Five clean, dry, sterilized flasks of 50 ml capacity were taken and labelled A, B, C, D and E respectively. In each flask1.5 ml of ammonium molybdate solution and 3 ml of diammonium hydrogen phosphate was added. Then 1 ml, 2 ml, 4 ml, 8 ml, 12 ml of mineral solution was added to

flasks A, B, C, D, and E respectively. 11 ml, 10ml, 8 ml, 4 ml and 0 ml of double distilled water were added to flasks A, B, C, D, and E. respectively to keep the total volume of each flask same. After this, 1 ml of sodium chloride and 1 ml of soluble sodium silicate were added to each of the five flasks. Finally 2 ml of 36 % formaldehyde solution was added to each flask. The total volume of each flask was 20.5 ml. Each flask was cotton plugged and shaken carefully to mix the contents. All the five flasks were exposed to sunlight simultaneously for a total of 8 hours of exposure. The colour intensity and pH of the solution of each flask was recorded after 10 min, 20 min, 30 min, 40 min, 50 min, 60 min, 70 min, 80 min, 90 min, 100 min, 110 min, 120 min, 240 min, 360 min, and 480 min. Then the particles of each flask were filtered, washed with 1 ml double distilled water, dried in a desiccator and weighed. The yields of each of the five types of particles were noted.

The contents of the five flasks were as follows:

A) 1.5:3: (1+11): 2:1:1
B) 1.5:3:(2+10):2:1:1
C) 1.5: 3 :(4+8): 2:1:1
D) 1.5:3: (8+4): 2:1:1
E) 1.5:3 :(12+0):2:1:1

The first figure of the bracket indicates the volume of mineral solution added and the other indicates the volume of distilled water added. The total volume in each case was 12 ml.

4. Observations

Table -1

Degree of reduction of Mo^{6+} to Mo^{4+} during the exposure of the PEM to sunlight as indicated by measuring the blue colour intensity with the help of a photo electric colorimeter.

Period of exposure (in min)	Volume of mineral solution added (in ml) 1	2	4	8	12
10	38	6	61	31	68
20	119	77	180	115	181
30	124	94	230	123	145
40	160	106	236	152	185
50	168	91	270	135	181
60	149	66	214	129	185
70	105	68	142	78	156
80	82	37	123	72	179
90	76	25	103	59	120
100	39	4	75	42	96

110	27	4	61	19	63
120	17	4	33	2	48
240	340	280	850	385	920
360	750	580	900	915	930
480	800	435	910	925	940

Table -2_
The pH of the five PEM at different periods of exposure

Period of Exposure in min.	Volume of mineral solution added (in ml) 1	2	4	8	12
10	3.85	3.80	3.19	3.81	2.95
20	3.16	3.44	3.12	3.86	3.09
30	3.16	3.51	3.73	3.81	3.16
40	3.14	3.51	3.11	3.19	3.25
50	3.73	3.52	3.10	3.16	3.30
60	3.15	3.53	3.68	3.14	3.35
70	3.12	3.55	3.65	3.15	3.36
80	3.80	3.53	3.11	3.61	3.46
90	3.12	3.58	3.64	3.13	3.43
100	3.11	3.56	3.65	3.15	3.45
110	3.16	3.58	3.68	3.73	3.45
120	3.16	3.58	3.65	3.72	3.44
240	3.82	3.66	3.12	3.18	3.52
360	3.62	3.55	3.61	3.58	3.33
480	3.52	3.46	3.50	3.72	3.48

Table -3
Effect of variation in the concentration of mineral solution in the PEM on the number of SMJ8 formed during exposure to sunlight.

Period of exposure in hours	Number of particles (SA/view) Volume of mineral solution added (in ml) ± 1	2	4	8	12
4	No Jeewanu	No Jeewanu	No Jeewanu	No Jeewanu	No Jeewanu
6	No Jeewanu	No Jeewanu	3.4±o.50	1.8±0.37	7.2 ± 0.37
8	1.2±0.20	No Jeewanu	5.5±0.23	4.2±0.28	10.2±0.50
After keeping in shade for 11 days.	5.9±4.30	29.2±1.66	44.61±1.54	9.6±0.43	26.2±1.35
After Keeping in shade for the next 6 days.	63.4 ±6.48	24 ±1.41	82.2 1±1.50	No Jeewanu	No Jeewanu
After Keeping in shade for the next 5days.	30.4±1.63	No Jeewanu	114.6±7.74	No Jeewanu	No Jeewanu

Table -4
Effect of varying the concentration of mineral solution on the size of the SMJ8Jeewanu formed

Period of Exposure in hours	Size of the particles in μ (SA/view)				
	Volume of mineral solution added in ml.				
	1	2	4	8	12
4	No Jeewanu	No Jeewanu	No Jeewanu	No Jeewanu	No Jeewanu.
6	No Jeewanu	No Jeewanu	1±0.005	1 ±0.001	0.5 ±0.002
8	0.50±0.002	No Jeewanu	0.75±0.001	0.52±0.002	0.50±0.004
After keeping in shade for 11 days.	0.19±0.360	0.250±0.00l	0.5 ±0.003	0.25±0.001	0.5±0.003
After keeping in shade for the next 6 days.	0.14 ±0.002	0.14±0.002	0.5±0.008	No Jeewanu	No Jeewanu
After keeeping in shade for the next 5 days.	0.22±0.010	No Jeewanu	0.l± 0.003	No Jeewanu	No Jeewanu

Yield of the solid material of the five flasks were as fol1ows:-

	Yield of SMJ 8 in g
1) In PEM with 1 ml of mineral solution	0.0180
2) In PEM with 2 ml of mineral solution	0.0110
3) In PEM with 4 ml of mineral solution	0.0336
4) In PEM with 8 ml of mineral solution	0.0200
5) In PEM with 12 ml of mineral solution	0.0292

5. Discussion

It was observed that on exposure to sunlight, the colourless form Mo^{6+} is changed to blue coloured Mo^{4+} in the PEM. The blue colour appeared after about 10-15 minutes of exposure. The intensity of the blue colour was measured as absorbance with the help of a double cell photoelectric colorimeter for all the five solutions.

It was observed that the initial colour intensity increased with increase in the concentration of mineral solution in the PEM. In all the five cases the absorbance increased for the first 50 minutes of exposure, and then there was a gradual decrease in absorbance upto 120 minutes. After 2 hours of exposure, there was a sudden rise in the absorbance in all the five cases in accordance with the rise in the concentration of mineral solution in the PEM. However, during the first 50 minutes of exposure, maximum absorbance was observed in the PEM having 4 ml mineral solution but after 8 hours of exposure, maximum colour intensity was observed in the PEM having 12 ml mineral solution.

The pH of the five PEM solutions having different concentrations of mineral solution was measured with the pH meter at different exposure

period. It was observed that when the concentration of the mineral solution in the PEM was increased, there was a decrease in the initial pH of the solution which may be due to the initial acidic nature of the mineral solution but soon it picked up in all the five cases. After six hours of exposure, there was a decrease in pH in the all the five cases. At 8 hours exposure, the decreasing trend of the pH was continued in the PEM having 1, 2 and 4 ml mineral solution but a rise of pH was observed in the PEM having 8 ml and 12 ml of mineral solution. However, the PEM having 12 ml mineral solution showed maximum increasing trend in its pH with increase in its exposure time.

An interesting observation was the movement of the particles which was observed in all the five solutions after keeping them in shade for 11 days. The motion itself was not zigzag as in Brownian motion but it was rhythmic and oscillatory. It is quite possible that the motion of the particles is due to some specific effect of the concentration of the constituents of the PEM.

Thus the overall conclusion is that the optimum growth of the particles took place in PEM with 4 ml of mineral solution as the dry weight of the particles of this solution as well as the number of the particles in this PEM which had 4 ml mineral solution was maximum. Maximum size was also observed in the Jeewanu of this PEM. The colorimetric readings also show optimum growth in the PEM with 4 m1 mineral solution as indicated by the maximum blue colour intensity shown by it.

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