

Study of the effect of addition of Sodium Chloride on the pH and blue colour intensity of the PEM of the BMJ24 Jeewanu

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ABSTRACT: The present form of cell as we see it today has undergone evolution of 3.2 billions of years. According to Bahadur and Ranganayaki the earliest living cells was very simple in structure and were full of the properties of biological order.

Bahadur in 1967 suggested that the way in which the systems organize themselves with properties of biological order is very important feature of the study of origin of life. Jeewanu, the autopoietic eukaryotes were prepared by Bahadur in 1967.

It was observed that when a mixture of Jeewanu and water is exposed to sunlight, water is split up into H_2 and O_2 . But due to the nitrogenase like activity of Jeewanu, the produced hydrogen is utilized in the fixation of nitrogen.

The hydrogen produced by the splitting of water is also utilized in the reduction of inorganic carbon.

Khare prepared boron molybdenum Jeewanu in 1989 which showed significant water splitting.

NaCl is a common constituent of the living cells, so an attempt to study its effect on the pH and blue colour intensity of the PEM of the BMJ24 Jeewanu is done in this paper.

KEYWORDS: Jeewanu, pH, BMJ24, PEM, NaCl, blue colour intensity, autopoietic, eukaryotes, exposure, Mineral solution, sunlight

I. INTRODUCTION

The present form of cell as we see it today has undergone evolution of 3.2 billions of years. According to Bahadur and Ranganayaki the earliest living cells was very simple in structure and were full of the properties of biological order. [1] To tackle the problem of origin of life, it is essential to know how this earliest cells were synthesized under natural conditions. The molecular or the Chemical Evolution Theory given by Haldane [2] and Oparin [3] is the basis of the modern approach to the problem of 'Origin of life'. Bahadur in 1967 suggested that the way in which the systems organize themselves with properties of biological order is very important feature of the study of origin of life. [4] The problem of origin of life is investigated basically in order to find out the natural condition under which the replicating, self-sustaining systems were produced. [5,6]

The origin of life can be approached the best way if life and the living systems are considered in the light of functional properties. [7]

It was observed that when a mixture of Jeewanu and water is exposed to sunlight, water is split up into H_2 and O_2 . But due to the nitrogenase like activity of the autopoietic eukaryotes Jeewanu, the produced hydrogen is utilized in the fixation of nitrogen. Kumar in 1981 estimated the fixed nitrogen of the exposed mixture and thus confirmed the fixation of nitrogen by Jeewanu chemically. [8] It was shown by Smith et al that the hydrogen produced by the splitting of water is also utilized in the reduction of inorganic carbon. [9] They observed that on exposure to light from a mercury lamp, the aqueous mixture of Jeewanu, $NaHCO_3$ and water shows the appearance of ^{14}C in the organic material.

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Yogesh Khare in 1989 prepared boron molybdenum Jeewanu and reported that addition of sodium borate in the PEM in which Jeewanu are prepared, decreased the size of the Jeewanu and increased their number. [10] It has further been observed that the BMJ Jeewanu shows significant water splitting. The functional properties of the autopoietic eukaryotes, Jeewanu, are affected by the presence of the transitional metal ions like Ti, Zn, La or Co in the PEM. [11] Effect of variation in the concentration of mineral solution, formaldehyde and ammonium molybdate on pH and colour intensity of the PEM of 1.531211 SMJ38 Jeewanu before and after exposure to sunlight was studied by Srivastava, D. [12] - [16]

Effect of irradiation of 1.5312211SMJ29 Silicon Molybdenum Jeewanu PEM with clinical mercury lamp and sunlight on the morphology, blue colour intensity and the pH of the PEM of the silicon molybdenum Jeewanu was studied by Srivastava. [17]

Effect of addition of Methanol and Ammonium Molybdate to (0+15):30:10:20:10:10 SMJ8 Jeewanu on the morphology, pH and colour intensity of the PEM of the Jeewanu both before and after Exposure to Sunlight up to a Total of 32 Hours was studied by Srivastava, D. [18,19]

Sodium chloride is widely distributed in nature. About 2.8% sodium chloride is found dissolved in sea water and it is a common constituent of the living cells. Blood contains 350-550 mg of sodium chloride per 100 ml. Sodium chloride regulates the osmotic pressure of the body fluids. It participates in a number of reactions resulting in the formation of HCl in the stomach.

In the present paper, the effect of addition of sodium chloride on the pH and the blue colour intensity caused by the formation of Mo^{4+} in the PEM of BMJ24 has been investigated..

II. RELATED WORK

According to Bahadur and Ranganayaki the earliest living cells was very simple in structure and were full of the properties of biological order.

The molecular or the Chemical Evolution Theory given by Haldane in 1929 and Oparin in 1924 is the basis of the modern approach to the problem of 'Origin of life'.

According to Bahadur and Ranganayaki the origin of life can be approached the best way if life and the living systems are considered in the light of functional properties.

Kumar in 1982 confirmed the fixation of nitrogen by Jeewanu chemically. In 1981, Smith et al showed that the hydrogen produced by the splitting of water is also utilized in the reduction of inorganic carbon.

Khare prepared boron molybdenum Jeewanu in 1989 which showed significant water splitting.

Effect of variation in the concentration of mineral solution, formaldehyde and ammonium molybdate on pH and colour intensity of the PEM of 1.531211 SMJ38 Jeewanu before and after exposure to sunlight was studied by Srivastava, D.

Effect of irradiation of 1.5312211SMJ29 Silicon Molybdenum Jeewanu PEM with clinical mercury lamp and sunlight on the morphology, blue colour intensity and the pH of the PEM of the silicon molybdenum Jeewanu was studied by Srivastava in 1991.

III. EXPERIMENTAL RESULTS

The following solutions were prepared:

- 1) 4% (w/v) ammonium molybdate
- 2) 3% (w/v) diammonium hydrogen phosphate
- 3) Mineral solution: This was prepared by dissolving 20.0 mg each of potassium sulphate, calcium acetate, magnesium sulphate, zinc sulphate, manganese sulphate and 10.0 mg of copper sulphate in 80 ml of 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 10.0 ml of distilled water. To this, 0.1 ml of $6\text{NH}_2\text{SO}_4$ was added to avoid hydrolysis. Both solutions were mixed. The total volume of the mineral solution was made to 100 ml by adding distilled water.

- 4) 36% formaldehyde

- 5) 3% (w/v) sodium chloride solution,

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6) 5% (w/v) sodium borate solution

Each solution, except formaldehyde, was sterilized in an autoclave at 15 lbs for 15 minutes.

Four clean, dry and sterilized corning conical flasks of 250 ml capacity were taken and labeled from 1 to 4.

To each flask, 15 ml of ammonium molybdate, 30 ml of diammonium hydrogen phosphate, 10 ml mineral solution, 20 ml of 36% formaldehyde and 10 ml of sodium borate were added. Then, to flask 2 and 4, 10 ml sodium chloride was also added. The total volume of flask 1 and 3 was 85 ml each and the total volume of the flask 2 and 4 was 95 ml each.

In a test tube, alkaline pyrogallol solution was prepared by mixing 0.15 ml of 30% aqueous solution of sodium hydroxide and 0.15 ml of 20 % aqueous solution of pyrogallol. This pyrogallol solution was divided into two test tubes and one test tube was kept in each of the two flasks labelled 3 and 4 in a standing position taking care that the alkaline pyrogallol and the mixture of the flask do not get mixed up.

The flask number 1 and 2 were cotton plugged while flask number 3 and 4 were tightly plugged with rubber cork. Each flask was shaken carefully and exposed to sunlight for a total of 24 hours giving 4 hours exposure daily. In the mixture of flask 1 and 2 the Jeewanu were prepared under oxygenic conditions (PUOC) and in the mixtures of flask 3 and 4 the Jeewanu were prepared under anoxygenic conditions (PUAC). After 4 hours, 8 hours, 12 hours, 16 hours, 20 hours and 24 hours of exposure, the pH and the colorimetric readings of flask 1 and 2 were recorded. Then, after this, contents of each flask was filtered, dried and weighed and the yield was recorded.

OBSERVATION:

TABLE – 1

Effect of sodium chloride on the amount of solid material formed in the four PEM.

S.N.	Type of PEM of BMJ24	Amount of solid material formed in the PEM in g
1	PEM without NaCl (PUOC)	0.7702
2	PEM with NaCl (PUOC)	0.7734
3	PEM without NaCl (PUAC)	0.6890
4	PEM with NaCl (PUAC)	0.6390

TABLE – 2

Effect of addition of NaCl to the PEM on the blue colour intensity of the PEM of BMJ24 Jeewanu (PUOC) with increasing period of exposure.

Period of exposure in hours	Colorimetric readings	
	PEM without NaCl Flask (1)	PEM with NaCl Flask (2)
0	008	006
4	300	137
8	600	220
12	480	220
16	350	200
20	570	250
24	300	335

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TABLE – 3

Effect of addition of NaCl on the pH of the PEM of BMJ24 Jeewanu (PUOC) with increasing period of exposure

Period of exposure in hours	pH of the PEM	
	PEM without NaCl Flask (1)	PEM with NaCl Flask (2)
0	3.95	4.10
4	3.38	3.42
8	3.18	3.23
12	3.12	3.14
16	3.12	3.17
20	3.14	3.14
24	3.14	3.15

TABLE – 4

Effect of addition of NaCl to the PEM of BMJ24 Jeewanu on the number of the particles (SA/view) with increasing period of exposure.

Period of exposure in hours	Number of the particles (SA/view)			
	PUOC		PUAC	
	PEM without NaCl	PEM with NaCl	PEM without NaCl	PEM with NaCl
0	No particle formation	No particle formation	No particle formation	
4	27.2±1.24	52.8±0.96		
8	53.8±1.35	47.6±1.28		
12	1005.±42.23	52.4±0.81		
16	2003.4±1.80	61.0±0.54		
20	1003.8±1.28	200.2±2.10		
24	903.4±1.40	105.8±1.68	205.6±1.04	58.0±2.01

TABLE – 5

Effect of addition of NaCl to the PEM of BMJ24 Jeewanu on the size of the particles in μ (SA/view) with increasing period of exposure

Period of exposure in hours	Size of the particles in μ (SA/view)			
	PUOC		PUAC	
	PEM without NaCl	PEM with NaCl	PEM without NaCl	PEM with NaCl
0	No particle formation	No particle formation	No particle formation	
4	0.50±0.006	0.50±0.004		
8	0.50±0.010	0.50±0.043		
12	0.25±0.200	2.00±0.048		
16	0.50±0.008	2.50±0.004		
20	0.25±0.140	2.50±0.025		
24	0.25±0.201	2.00±0.081	2.00±0.053	1.00±0.063

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IV. CONCLUSION

The observations show that the intensity of the blue colour of the PEM of 1.531201 BMJ24 Boron Molybdenum Jeewanu which did not have sodium chloride in it, was more than the intensity of the blue colour of the PEM of 1.531211 BMJ24 which contained sodium chloride in its PEM indicating that presence of NaCl hinders the reduction of Mo^{6+} to Mo^{4+} . In both the cases, up to 8 hours of exposure, an increase in the absorbance was observed, after that up to 16 hours of exposure, there was a decrease in the blue colour intensity. After this, the colorimetric readings increased in both the cases up to 20 hours. But after that, the PEM without NaCl showed a decrease in the absorbance while the PEM having NaCl added to it showed further increase in the absorbance. However, it was observed that in both the cases, the absorbance after 24 hours of exposure was higher than the absorbance before exposure due to the reduction of Mo^{6+} to Mo^{4+} in the PEM of 1.531201 BMJ24 without NaCl and 1.531211 BMJ24 with NaCl.

When sodium chloride was added to the PEM of 1.531211 BMJ24, the initial pH of the PEM increased, and remained more than the pH of the PEM without NaCl throughout the exposure period of 20 hours. However, after 20 hours of exposure, the pH of the PEM with and without NaCl almost became equal. It was further observed that with increase in the exposure period, pH decreased up to 12 hours rapidly and then became almost constant in both the cases.

Motion of the smaller particles was observed in the PEM having NaCl in it throughout the period of exposure. This was true for both 1.531211 BMJ24 (PUOC) and (PUAC) particles. Maximum size of the particles was observed in the 1.531211 BMJ24 (PUOC) with NaCl, which was $3\ \mu$ after 16 hours and 20 hours of exposure.

The yield of the particles was also more in the PEM of 1.531201 BMJ24 in which no NaCl was added.

Thus, the overall inference is that when sodium chloride was present in the PEM of 1.531211 BMJ24 Boron Molybdenum Jeewanu, absorbance of the PEM decreased but the pH of the PEM increased. The number of the particles decreased but average size of the particles increased. The yield also decreased. The yield of the particles decreased because fewer particles were formed on adding NaCl and due to the same reason blue colour intensity also decreased. Probably increase in pH has some influence on the average size of the particles which increased as the pH of the PEM increased.

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