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EVAPORATION SUPPRESSION USING CHEMICALS AND OILS

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ABSTRACT:
Across all the world fresh water is considered as most valued natural resource, as it is essential to sustain the cycle of life. Evaporation is one of the primary environmental processes that can reduce the amount of quality water available for use in industrial, agricultural and household applications. The extremely high rate of Evaporation from water surfaces day by day is reducing the optimal utilization of water reservoirs. The work presented in this study aims to investing the use of Chemical films as well as oils as Evapo Suppressants for reduction of evaporation from USWB class A evaporation pans so as to save water which is evaporated. Various techniques that professionals can use to estimate evaporation rate from shallow water bodies. The natural evaporation loss taking place from pan evaporimeter of alcohols and oils were observed and compared. The important meteorological factors affecting the natural evaporation rate such as Temperature, Relative Humidity, Wind Velocity, Sunshine Hours, etc. were taken from Indian Metrological Department (IMD) Solapur branch, and also observed during studies.
In set 1 chemical such as cetyl and steryl alcohols were selected to reduce the evaporation during the study period in Solapur region with four US Class-A evaporation pans. Different concentrations of Cetyl and Stearyl alcohols were used in different pans. First pan EP1 was filled with Cetyl alcohol, second pan (EP2) was filled with stearyl alcohol, third pan (EP3) was filled with combination of cetyl alcohol and steryl alcohol (EP3), and fourth pan filled with water only to measure evaporation rate.
In set 2 oils such as Mustard oil and til oil were selected to reduce the evaporation during the study period in Solapur region with four US Class-A evaporation pans. Different concentrations of Mustard oil and til oil were used in different pans. First pan EP1 was filled with Mustard oil, second pan (EP2) was filled with Til oil, third pan (EP3) was filled with combination of Mustard oil and til oil (EP3), and fourth pan filled with water only to measure evaporation rate.

KEYWORDS: **Cetyl alcohol, Stearyl alcohol, Mustard oil, Til oil, class A pan, evaporation reduction, evaporation suppression.**

INTRODUCTION:
Water is one of the important and essential requirements of the human beings, animals, vegetation, irrigation, industry, domestic municipal water supply, navigation and agriculture. Therefore management of water available to us is an important concern. India being developing country is still struggling to satisfy the urban and rural demand of water in general and demand of water to the poor farmer in specific. Farmers who are deprived of the water right of irrigation through canal, practice harvesting rainwater in the farm pond and use it for irrigation.
Climate has changed its datum due to human interference with the nature. This shift of climatic datum has created a problem for Indian farmer particularly in areas where rainfall is scanty. India
Experiences 150 to 250 cm variation of annual average evaporation from water bodies over most of the parts of the country. Indian agriculture relies on a large volume of stored water, Due to large variation in precipitation with respect to time and space in our country, it is necessary that water available at the time and place of plenty be stored for utilization at the time and place of scarcity. Indian farmers are practicing rain water harvesting in the form of farm ponds. Due to greenhouse gas emissions there is rise in temperature which is responsible for heavy loss of water through evaporation process. Minimization of evaporation is a key factor in guaranteeing the availability of water in the future. Minimization of evaporation at low cost is challenge to developing country like India. This necessitates the use of cost effective technique of evaporation loss reduction. Annual loss of water from storages through evaporation can potentially exceed 40 per cent of water stored.
Chemical substances such as Cetyl and Stearyl alcohols and oil such as mustard oil, til oil can be sprayed periodically on water surface to reduce evaporation. After a detailed review of the available evaporation reduction methods, surface water cover technique was selected using Cetyl and Stearyl alcohol, mustard oil and

til oil to form a thin monomolecular film over water surface to reduce evaporation. This method has several advantages over other methods. It is economically feasible due to low cost of substances and easily available. It mixes with water easily and when added to large water surface; it forms a thin invisible film that reduces evaporation considerably. It decomposes easily and doesn't dissolve in water

There are several methods to measure evaporation from free water surfaces. In this study class A evaporation pan is used.

MATERIALS AND METHODOLOGY:

The study has been carried out in Solapur city. The Solapur city lies between 17°41'08" – 17°36'50"N latitude and 75°53'35"- 75°56'7"E latitude. It is situated on southeast side of Maharashtra. The region relies heavily on monsoon rains for irrigation purposes. In this project Class A evaporation pan is used to measure evaporation rate. The experimentation is carried out on six class A evaporation pans which are installed on the wooden platform. The pan is made up of unpainted Galvanized Iron material. Evaporation rate is measured as well as Various materials are used to reduce evaporation rate. Wire mesh is provided on the top of the pans as a cover to prevent birds or animals from drinking water. A stainless steel scale and a glass scale is also attached on the sides of the pans to measure water level. The chemical is used in powder as well as in crystalline form. The oil used in liquid form. Meteorological Observations like temperature, wind direction, wind velocity were taken from Indian Metrological Department (IMD) Solapur branch, and also observed during studies.

EVAPORATION RATE AND REDUCTION IN EVBAPORATION RATE IS MEASURED AT EVERY ONE HOUR FROM 10:00AM TO 6:00PM. DAILY EVAPORATION AND REDUCTION IN EVAPORATION RATE IS MEASURED AT MORNING BETWEEN 8:00AM TO 9:00AM

Set 1:

The amount of chemical films (Cetyl and Stearyl alcohols) added to the three class A Evaporation pans for the duration of 24 days.(10-02-2017 - 05-03-2017) Also pan number 4 (Ep4) is reserved to measure evaporation rate only. In pan EP1 Cetyl alcohol is added from 10 mg/day to 5 gm/day. In Pan 2 EP2 stearyl alcohol is added from 10 mg/day to 5 gm/day. In pan 3 EP3 combinations of cetyl alcohol and stearyl alcohol is added from 10 mg/day to 5 gm/day. During the duration of the study (10 February – 05 march 2017) cetyl alcohol and stearyl alcohol and combination of cetyl alcohol and stearyl alcohol in EP1, EP2, EP3 respectively is spread daily. The important meteorological factors affecting the natural vaporation rate such as Temperature, Relative Humidity, Wind Velocity, Sunshine Hours, etc. were taken from Indian Metrological Department (IMD) Solapur branch, and also observed during studies. The standard procedure was strictly followed and maintained during measurements of the readings for accuracy and consistency of the results throughout the duration of the study. All the pans were cleaned regularly to remove sediments from pans, if any.

Set 2:

The amount oils and Thermocol added to the five class A evaporation pans for the duration of 21 days(07-032017- 27-03-2017). Also pan number 6 (EP6) is reserved to measure evaporation rate only. In pan EP1 Mustard oil is added from 1ml/day to 20ml/day. In Pan 2 EP2 Til oil is added from 1 ml/day to 20 ml/day. In pan 3 EP3 combinations of Mustard oil and Til oil is added from 1 ml/day to 20ml/day. In pan 4 EP4 Thermocol sheet 10 mm thick is used as a floating cover. In pan no 5 EP5 Thermocol boards of 25 mm thick are used as a floating cover

During the duration of the study (07 march – 27march 2017) Mustard oil, til oil and combination of cetyl alcohol and stearyl alcohol. EP1, EP2, EP3 respectively is spread daily. As well as Thermocol sheet and Thermocol board is kept on the water surface as a floating cover .The important meteorological factors affecting the natural evaporation rate such as Temperature, Relative Humidity, Wind Velocity, Sunshine Hours, etc. were taken from Indian Metrological Department (IMD) Solapur branch, and also observed during studies. The standard procedure was strictly followed and maintained during measurements of the readings for accuracy and consistency of the results throughout the duration of the study. All the pans were cleaned regularly to remove sediments from pans, if any.

RESULT AND DISCUSSION:

The results of the study indicated that air temperature ranges from 17.9-40.8°C, while wind velocity ranges from 0.-8 km/hr. The relative humidity ranges from 11-78%. Similarly, the daily pan evaporation rates ranges from 5-12 mm/day.

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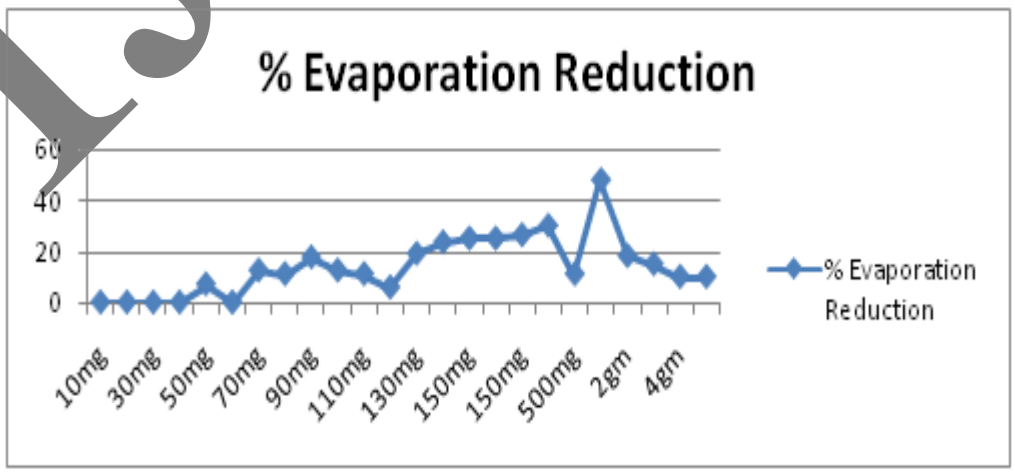
SUMMARY OF THE EXPERIMENT RESULTS - CHEMICAL WISE REDUCTION IN PERCENTAGE (SET 1)

1) CETYL ALCOHOL

TABLE 1

Sr. No.	Date	Evaporation (mm)	Quantity	Reduction in mm	% Reduction	Temperature In °c		Humidity in %		Wind velocity in km/h		Precipitation in mm
						Max	Min	Max	Min	Max	Min	
1	10-02-2017	7	10 mg	NIL	NIL	34.6	20.7	52	27	008	000	0.0
2	11-02-2017	7	20 mg	NIL	NIL	33.9	22.1	44	25	008	000	0.0
3	12-02-2017	7	30 mg	NIL	NIL	33.2	20.7	37	18	006	000	0.0
4	13-02-2017	7	40 mg	NIL	NIL	32.4	20.3	61	26	008	000	0.0
5	14-02-2017	7	50 mg	0.5	7.14	33	20.4	63	30	006	002	0.0
6	15-02-2017	7.75	60 mg	NIL	NIL	33.6	20.9	56	24	006	000	0.0
7	16-02-2017	8	70 mg	1	12.5	33.9	19.5	57	19	004	004	0.0
8	17-02-2017	9	80 mg	1	11.11	34.8	20.7	52	14	008	000	0.0
9	18-02-2017	8.5	90 mg	1.5	17.64	35.8	18.4	49	12	008	000	0.0
10	19-02-2017	8	100 mg	1	12.5	36.5	17.9	49	12	004	000	0.0
11	20-02-2017	9	110 mg	1	11.11	37	19.6	45	14	004	000	0.0
12	21-02-2017	8.5	120 mg	0.5	5.88	36.4	21.5	40	15	004	000	0.0
13	22-02-2017	10.5	130 mg	2	19.04	36.3	21.4	46	16	004	000	0.0
14	23-02-2017	8.5	140 mg	2	23.52	37.6	20.9	39	18	004	000	0.0
15	24-02-2017	10	150 mg	2.5	25	36.8	21.6	38	14	008	000	0.0
16	25-02-2017	10	150 mg	2.5	25	35.5	20.8	48	18	006	000	0.0
17	26-02-2017	9.5	150 mg	2.5	26.3	35.5	18.6	39	13	008	000	0.0
18	27-02-2017	10	300 mg	3	30	36.5	18.5	32	11	004	000	0.0
19	28-02-2017	11	500 mg	2	11.11	37	20.4	34	12	008	000	0.0
20	01-03-2017	11.5	1 gm	5.5	47.82	37.0	20.5	28	14	004	000	0.0
21	02-03-2017	11	2 gm	2	18.18	36.7	22.6	38	21	006	000	0.0
22	03-03-2017	10	3 gm	1.5	15	36.7	21.0	36	19	006	004	0.0
23	04-03-2017	10	4 gm	1	10	37.1	21.4	40	15	004	002	0.0
24	05-03-2017	10	5 gm	1	10	37.0	22.3	35	16	006	000	0.0

It has been observed by the study that the average reduction by cetyl alcohol was found to be 14.11% and Maximum Reduction in Evaporation rate is found to be 47.82% and Minimum Reduction in Evaporation rate is found to be NIL.

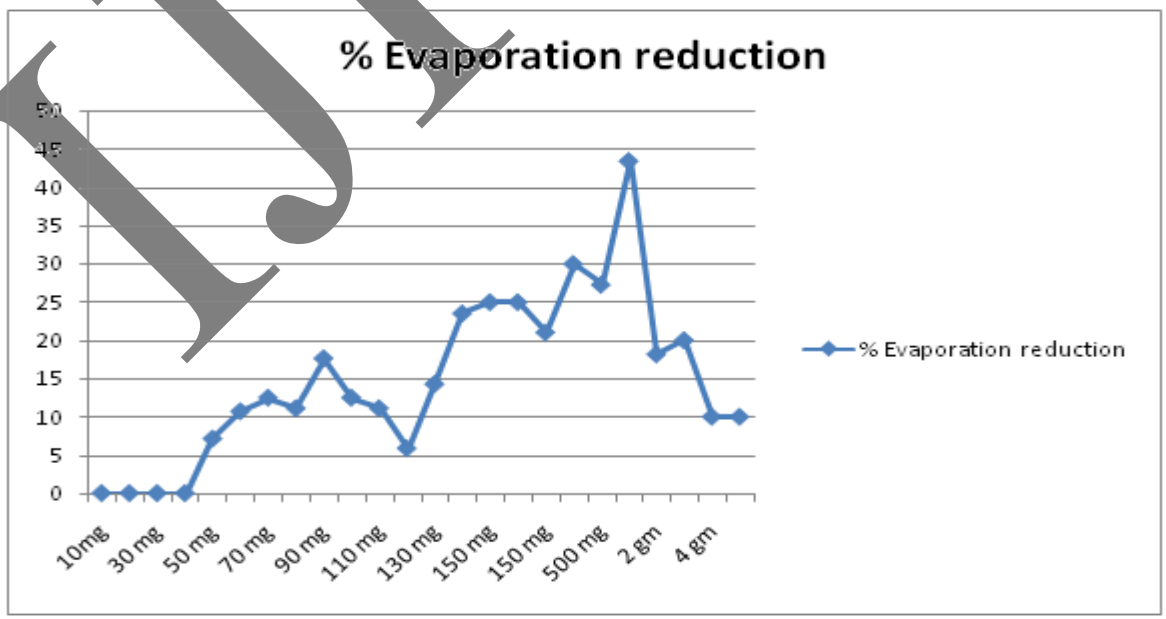


2) STEARYL ALCOHOL:

TABLE 2

Sr. No.	Date	Evaporation (mm)	Quantity	Reduction in mm	% Reduction	Temperature In °c		Humidity in %		Wind velocity in km/h		Precipitation in mm
						Max	Min	Max	Min	Max	Min	
1	10-02-2017	7	10 mg	NIL	NIL	34.6	20.7	52	27	008	000	0.0
2	11-02-2017	7	20 mg	NIL	NIL	33.9	22.1	44	25	008	000	0.0
3	12-02-2017	7	30 mg	NIL	NIL	33.2	20.7	37	18	006	000	0.0
4	13-02-2017	7	40 mg	NIL	NIL	32.4	20.3	61	26	008	000	0.0
5	14-02-2017	7	50 mg	0.5	7.14	33	20.4	63	30	006	002	0.0
6	15-02-2017	7.75	60 mg	0.75	10.71	33.6	20.9	56	24	006	000	0.0
7	16-02-2017	8	70 mg	1	12.5	33.9	19.5	57	19	004	004	0.0
8	17-02-2017	9	80 mg	1	11.11	34.8	20.7	52	14	008	000	0.0
9	18-02-2017	8.5	90 mg	1.5	17.64	35.8	18.4	49	12	008	000	0.0
10	19-02-2017	8	100 mg	1	12.5	36.5	17.9	49	12	004	000	0.0
11	20-02-2017	9	110 mg	1	11.11	37	19.6	45	14	004	000	0.0
12	21-02-2017	8.5	120 mg	0.5	5.88	36.4	21.5	40	15	004	000	0.0
13	22-02-2017	10.5	130 mg	1.5	14.28	36.3	21.4	46	16	004	000	0.0
14	23-02-2017	8.5	140 mg	2	23.52	37.6	20.9	39	18	004	000	0.0
15	24-02-2017	10	150 mg	2.5	25	36.8	21.6	38	14	008	000	0.0
16	25-02-2017	10	150 mg	2.5	25	35.5	20.8	48	18	006	000	0.0
17	26-02-2017	9.5	150 mg	2	21.05	35.5	18.6	39	13	008	000	0.0
18	27-02-2017	10	300 mg	3	30	36.5	18.5	32	11	004	000	0.0
19	28-02-2017	11	500 mg	3	27.27	37	20.4	34	12	008	000	0.0
20	01-03-2017	11.5	1 gm	5	43.47	37.0	20.5	28	14	004	000	0.0
21	02-03-2017	11	2 gm	2	18.18	36.7	22.6	38	21	006	000	0.0
22	03-03-2017	10	3 gm	2	20	36.7	21.0	36	19	006	004	0.0
23	04-03-2017	10	4 gm	1	10	37.1	21.4	40	15	004	002	0.0
24	05-03-2017	10	5 gm	1	10	37.0	22.3	35	16	006	000	0.0

It has been observed by the study that the average reduction by stearyl alcohol was found to be 14.86% and Maximum Reduction in Evaporation rate is found to be 43.47% and Minimum Reduction in Evaporation rate is found to be NIL.

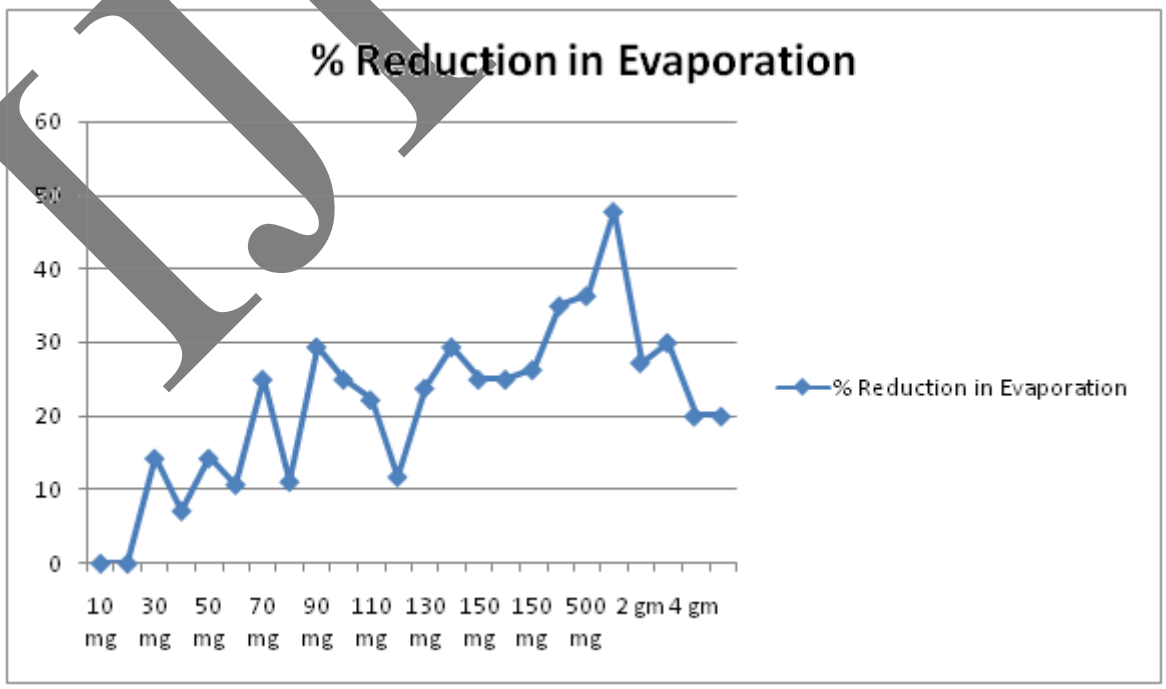


3) COMBINATION OF CETYL AND STEARYL ALCOHOL:

TABLE 3

Sr. No.	Date	Evaporation (mm)	Quantity	Reduction in mm	% Reduction	Temperature In °c		Humidity in %		Wind velocity in km/h		Precipitation in mm
						Max	Min	Max	Min	Max	Min	
1	10-02-2017	7	10 mg	NIL	NIL	34.6	20.7	52	27	008	000	0.0
2	11-02-2017	7	20 mg	NIL	NIL	33.9	22.1	44	25	008	000	0.0
3	12-02-2017	7	30 mg	1mm	14.28	33.2	20.7	37	18	006	000	0.0
4	13-02-2017	7	40 mg	0.5	7.14	32.4	20.3	61	26	008	000	0.0
5	14-02-2017	7	50 mg	1	14.28	33	20.4	63	30	006	002	0.0
6	15-02-2017	7.75	60 mg	0.75	10.71	33.6	20.9	56	24	006	000	0.0
7	16-02-2017	8	70 mg	2	25	33.9	19.5	57	19	004	004	0.0
8	17-02-2017	9	80 mg	1	11.11	34.8	20.7	52	14	008	000	0.0
9	18-02-2017	8.5	90 mg	2.5	29.41	35.8	18.4	49	12	008	000	0.0
10	19-02-2017	8	100 mg	2	25	36.5	17.9	49	12	004	000	0.0
11	20-02-2017	9	110 mg	2	22.22	37	19.6	45	14	004	000	0.0
12	21-02-2017	8.5	120 mg	1	11.76	36.4	21.5	40	15	004	000	0.0
13	22-02-2017	10.5	130 mg	2.5	23.80	36.3	21.4	46	16	004	000	0.0
14	23-02-2017	8.5	140 mg	2.5	29.41	37.6	20.9	39	18	004	000	0.0
15	24-02-2017	10	150 mg	2.5	25	36.8	21.6	38	14	008	000	0.0
16	25-02-2017	10	150 mg	2.5	25	35.5	20.8	48	18	006	000	0.0
17	26-02-2017	9.5	150 mg	2.5	26.31	35.5	18.6	39	13	008	000	0.0
18	27-02-2017	10	300 mg	3.5	35	36.5	18.5	32	11	004	000	0.0
19	28-02-2017	11	500 mg	4	36.36	37	20.4	34	12	008	000	0.0
20	01-03-2017	11.5	1 gm	5.5	47.82	37.0	20.5	28	14	004	000	0.0
21	02-03-2017	11	2 gm	3.5	27.27	36.7	22.6	38	21	006	000	0.0
22	03-03-2017	10	3 gm	3	30	36.7	21.0	36	19	006	004	0.0
23	04-03-2017	10	4 gm	2	20	37.1	21.4	40	15	004	002	0.0
24	05-03-2017	10	5 gm	2	20	37.0	22.3	35	16	006	000	0.0

It has been observed by the study that the average reduction by combination of cetyl alcohol and stearyl alcohol was found to be 21.53% and Maximum Reduction in Evaporation rate is found to be 47.82% and Minimum Reduction in Evaporation rate is found to be NIL.



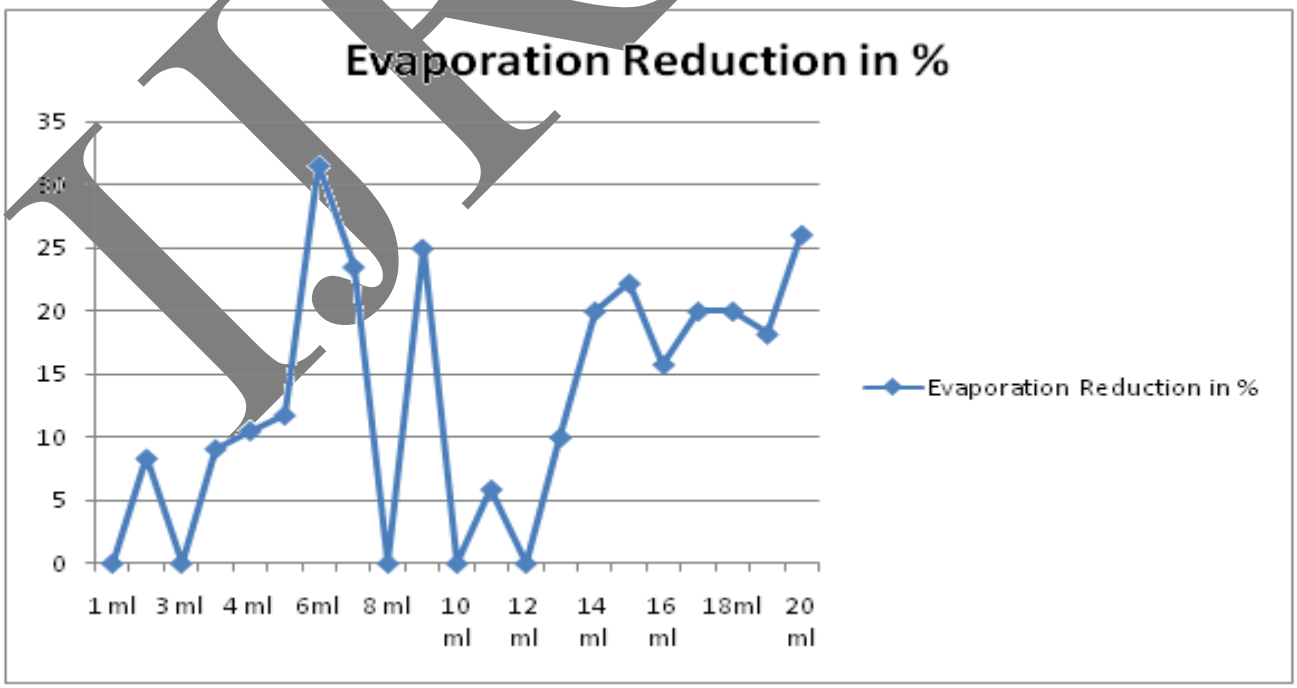
SUMMARY OF THE EXPERIMENT RESULTS – OIL WISE REDUCTION IN PERCENTAGE (SET 2)

1) MUSTARD OIL:

TABLE 4

Sr. No.	Date	Evaporation (mm)	Quantity	Reduction in mm	% Reduction	Temperature In °c		Humidity in %		Wind velocity in km/h		Precipitation in mm
						Max	Min	Max	Min	Max	Min	
1	07-03-2017	11	1 ml	NIL	NIL	36.3	22.5	42	13	006	000	0.0
2	08-03-2017	12	2 ml	1	8.33	35.6	22.0	42	13	006	000	0.0
3	09-03-2017	9	3 ml	NIL	NIL	35.3	21.2	38	17	006	002	0.0
4	10-03-2017	11	3 ml	1	9.09	34.5	22.3	40	11	010	004	0.0
5	11-03-2017	9.5	4 ml	1	10.52	31.8	19.5	65	15	006	000	0.0
6	12-03-2017	8.5	5 ml	1	11.76	33.7	18.9	35	13	004	000	0.0
7	13-03-2017	9.5	6ml	3	31.57	35.2	18.9	44	12	004	000	0.0
8	14-03-2017	8.5	7 ml	2	23.52	36.2	19.6	36	26	006	000	0.0
9	15-03-2017	5	8 ml	NIL	NIL	36.4	22.5	78	34	006	004	8.6
10	16-03-2017	8	9 ml	2	25	33.2	21.9	83	41	004	000	2.0
11	17-03-2017	8	10 ml	NIL	NIL	35.5	22.5	56	16	006	000	0.0
12	18-03-2017	8.5	11 ml	0.5	5.88	35.7	20.8	41	20	006	000	0.0
13	19-03-2017	9	12 ml	NIL	NIL	37.5	23.3	47	23	006	000	0.0
14	20-03-2017	10	13 ml	1	10	35.6	22.1	42	19	006	000	0.0
15	21-03-2017	10	14 ml	2	20	37.3	22.0	39	13	006	000	0.0
16	22-03-2017	9	15 ml	2	22.22	37.7	22.7	37	16	004	000	0.0
17	23-03-2017	9.5	16 ml	1.5	15.78	38.6	22.7	34	16	004	000	0.0
18	24-03-2017	10	17 ml	2	20	39.5	26.6	31	19	004	000	0.0
19	25-03-2017	10	18ml	2	20	39.1	28.7	30	19	004	000	0.0
20	26-03-2017	11	19 ml	2	18.18	40.5	26.0	38	13	004	000	0.0
21	27-03-2017	11.5	20 ml	3	26.08	40.8	26.0	32	16	006	000	0.0

It has been observed by the study that the average reduction by Mustard oil was found to be 13.23% and Maximum Reduction in Evaporation rate is found to be 31.57% and Minimum Reduction in Evaporation rate is found to be NIL.

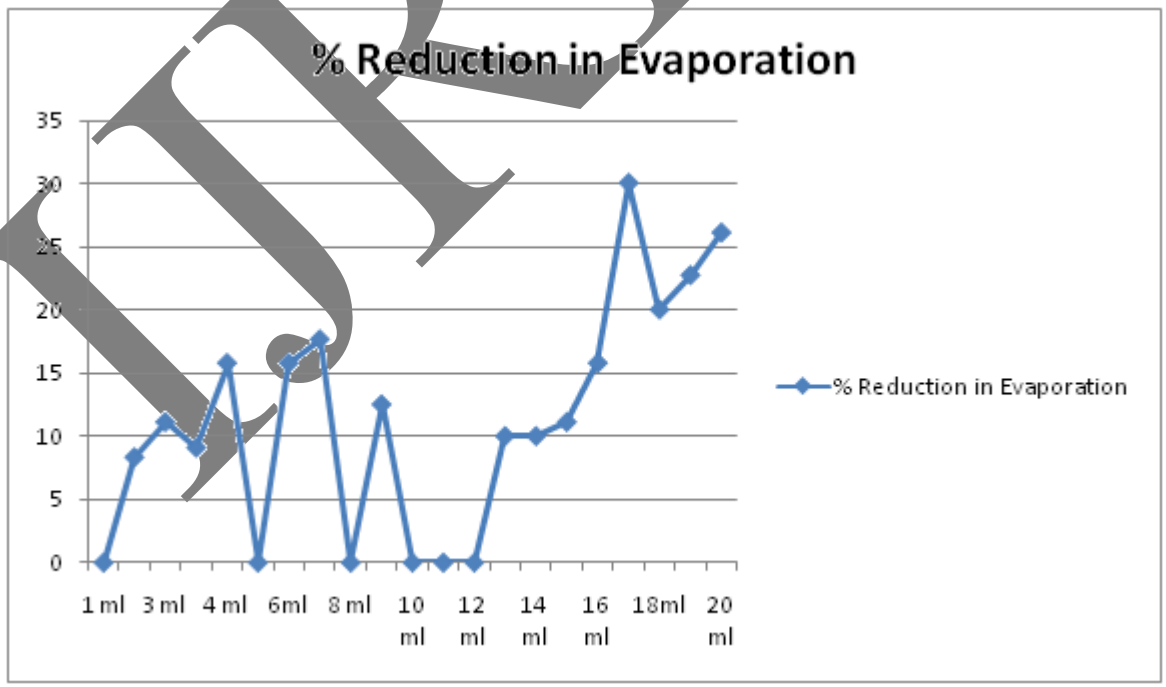


2) TIL OIL:

TABLE 5

Sr. No.	Date	Evaporation (mm)	Quantity	Reduction in mm	% Reduction	Temperature In °c		Humidity in %		Wind velocity in km/h		Precipitation in mm
						Max	Min	Max	Min	Max	Min	
1	07-03-2017	11	1 ml	NIL	NIL	36.3	22.5	42	13	006	000	0.0
2	08-03-2017	12	2 ml	1	8.33	35.6	22.0	42	13	006	000	0.0
3	09-03-2017	9	3 ml	1	11.11	35.3	21.2	38	17	006	002	0.0
4	10-03-2017	11	3 ml	1	9.09	34.5	22.3	40	11	010	004	0.0
5	11-03-2017	9.5	4 ml	1.5	15.78	31.8	19.5	65	15	006	000	0.0
6	12-03-2017	8.5	5 ml	NIL	NIL	33.7	18.9	35	13	004	000	0.0
7	13-03-2017	9.5	6ml	1.5	15.78	35.2	18.9	44	12	004	000	0.0
8	14-03-2017	8.5	7 ml	1.5	17.64	36.2	19.6	36	26	006	000	0.0
9	15-03-2017	5	8 ml	NIL	NIL	36.4	22.5	78	34	006	004	8.6
10	16-03-2017	8	9 ml	1	12.5	33.2	21.9	83	41	004	000	2.0
11	17-03-2017	8	10 ml	NIL	NIL	35.5	22.5	56	16	006	000	0.0
12	18-03-2017	8.5	11 ml	NIL	NIL	35.7	20.8	41	20	006	000	0.0
13	19-03-2017	9	12 ml	NIL	NIL	37.5	23.3	47	23	006	000	0.0
14	20-03-2017	10	13 ml	1	10	35.6	22.1	42	19	006	000	0.0
15	21-03-2017	10	14 ml	1	10	37.3	22.0	39	13	006	000	0.0
16	22-03-2017	9	15 ml	1	11.11	37.7	22.7	37	16	004	000	0.0
17	23-03-2017	9.5	16 ml	1.5	15.78	38.6	22.7	34	16	004	000	0.0
18	24-03-2017	10	17 ml	3	30	39.5	26.6	31	19	004	000	0.0
19	25-03-2017	10	18ml	2	20	39.1	28.7	30	19	004	000	0.0
20	26-03-2017	11	19 ml	2.5	22.72	40.5	26.0	38	13	004	000	0.0
21	27-03-2017	11.5	20 ml	3	26.08	40.8	26.0	32	16	006	000	0.0

It has been observed by the study that the average reduction by Til oil was found to be 11.23% and Maximum Reduction in Evaporation rate is found to be 30% and Minimum Reduction in Evaporation rate is found to be NIL.

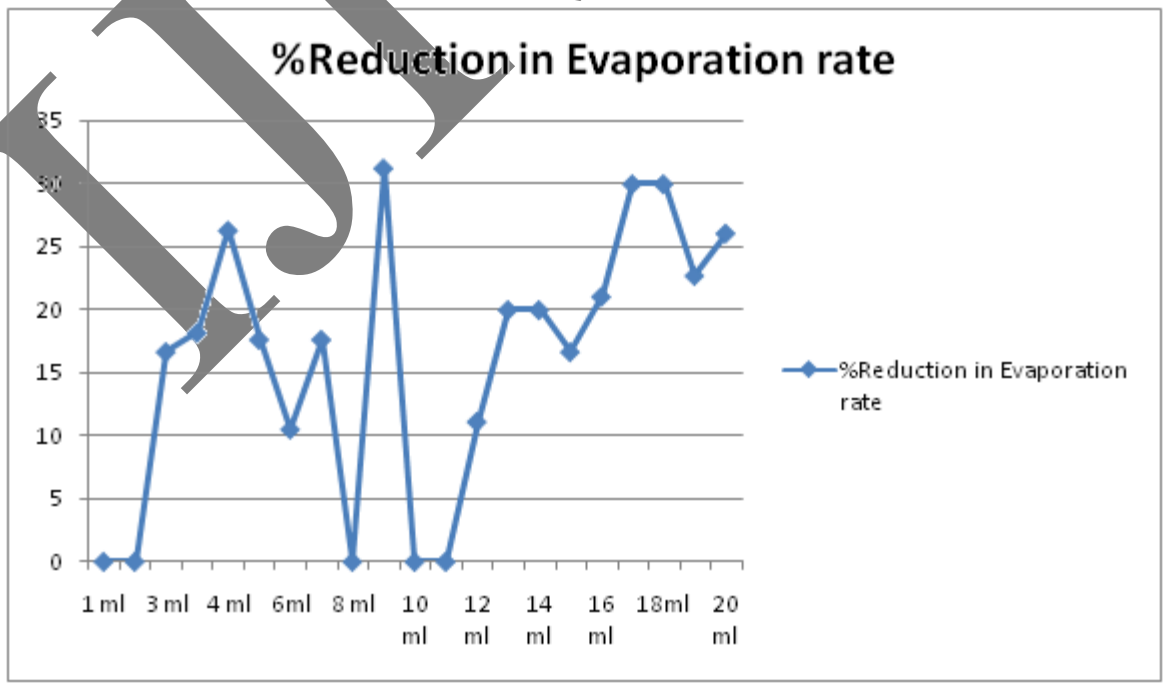


3) COMBINATION OF MUSTARD OIL AND TIL OIL:

TABLE 6

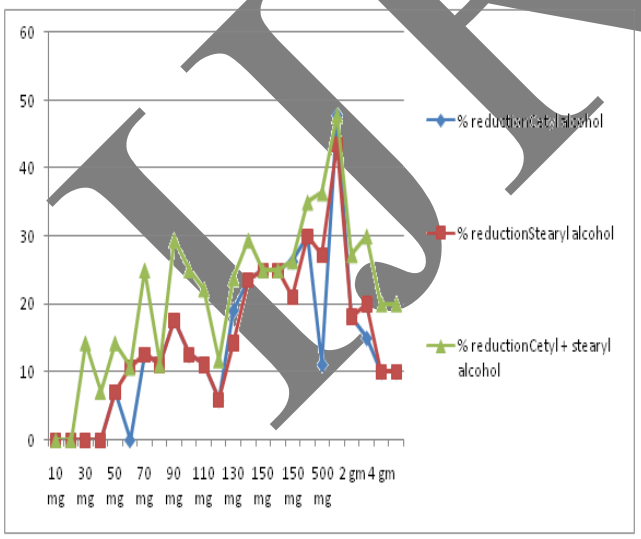
Sr. No.	Date	Evaporation (mm)	Quantity	Reduction in mm	% Reduction	Temperature In °c		Humidity in %		Wind velocity in km/h		Precipitation in mm
						Max	Min	Max	Min	Max	Min	
1	07-03-2017	11	1 ml	NIL	NIL	36.3	22.5	42	13	006	000	0.0
2	08-03-2017	12	2 ml	NIL	NIL	35.6	22.0	42	13	006	000	0.0
3	09-03-2017	9	3 ml	1.5	16.66	35.3	21.2	38	17	006	002	0.0
4	10-03-2017	11	3 ml	2	18.18	34.5	22.3	40	11	010	004	0.0
5	11-03-2017	9.5	4 ml	2.5	26.31	31.8	19.5	65	15	006	000	0.0
6	12-03-2017	8.5	5 ml	1.5	17.64	33.7	18.9	35	13	004	000	0.0
7	13-03-2017	9.5	6ml	1	10.52	35.2	18.9	44	12	004	000	0.0
8	14-03-2017	8.5	7 ml	1.5	17.64	36.2	19.6	36	26	006	000	0.0
9	15-03-2017	5	8 ml	NIL	NIL	36.4	22.5	78	34	006	004	8.6
10	16-03-2017	8	9 ml	2.5	31.25	33.2	21.9	83	41	004	000	2.0
11	17-03-2017	8	10 ml	NIL	NIL	35.5	22.5	56	16	006	000	0.0
12	18-03-2017	8.5	11 ml	NIL	NIL	35.7	20.8	41	20	006	000	0.0
13	19-03-2017	9	12 ml	1	11.11	37.5	23.3	47	23	006	000	0.0
14	20-03-2017	10	13 ml	2	20	35.6	22.1	42	19	006	000	0.0
15	21-03-2017	10	14 ml	2	20	37.3	22.0	39	13	006	000	0.0
16	22-03-2017	9	15 ml	1.5	16.66	37.7	22.7	37	16	004	000	0.0
17	23-03-2017	9.5	16 ml	2	21.05	38.6	22.7	34	16	004	000	0.0
18	24-03-2017	10	17 ml	3	30	39.5	26.6	31	19	004	000	0.0
19	25-03-2017	10	18ml	3	30	39.1	28.7	30	19	004	000	0.0
20	26-03-2017	11	19 ml	2.5	22.72	40.5	26.0	38	13	004	000	0.0
21	27-03-2017	11.5	20 ml	3	26.08	40.8	26.0	32	16	006	000	0.0

It has been observed by the study that the average reduction by combination of mustard oil and til oil was found to be 15.99% and Maximum Reduction in Evaporation rate is found to be 30% and Minimum Reduction in Evaporation rate is found to be NIL.



COMPARISON OF SET 1:

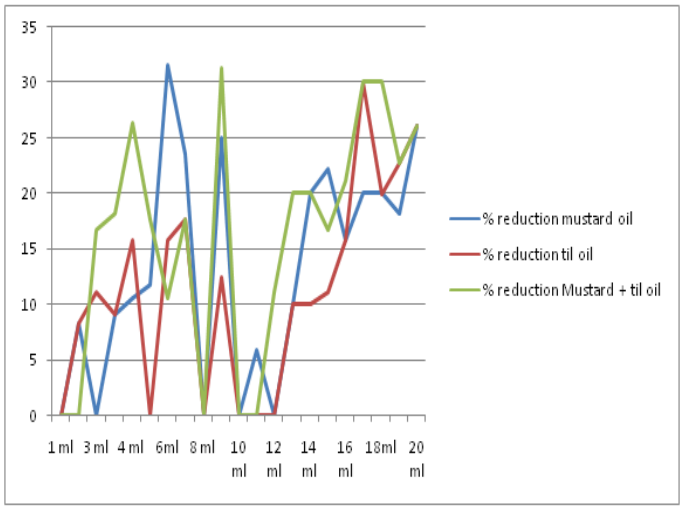
Quantity	Cetyl alcohol (% reduction)	Stearyl alcohol (% reduction)	Cetyl + stearyl alcohol (% reduction)
10 mg	NIL	NIL	NIL
20 mg	NIL	NIL	NIL
30 mg	NIL	NIL	14.28
40 mg	NIL	NIL	7.14
50 mg	7.14	7.14	14.28
60 mg	NIL	10.71	10.71
70 mg	12.5	12.5	25
80 mg	11.11	11.11	11.11
90 mg	17.64	17.64	29.41
100 mg	12.5	12.5	25
110 mg	11.11	11.11	22.22
120 mg	5.88	5.88	11.76
130 mg	19.04	14.28	23.80
140 mg	23.52	23.52	29.41
150 mg	25	25	25
150 mg	25	25	25
150 mg	26.3	21.05	26.31
300 mg	30	30	35
500 mg	11.11	27.27	36.36
1 gm	47.82	43.47	47.82
2 gm	18.18	18.18	27.27
3 gm	15	20	30
4 gm	10	10	20
5 gm	10	10	20



By comparison it has been observed that combination of cetyl alcohol and stearyl alcohol gives constant reduction as compared to cetyl alcohol and stearyl alcohol

COMAPRISON OF SET 2:

Quantity	Mustard oil (% reduction)	Til oil (% reduction)	Mustard + Til oil (% reduction)
1 ml	NIL	NIL	NIL
2 ml	8.33	8.33	NIL
3 ml	NIL	11.11	16.66
3 ml	9.09	9.09	18.18
4 ml	10.52	15.78	26.31
5 ml	11.76	NIL	17.64
6ml	31.57	15.78	10.52
7 ml	23.52	17.64	17.64
8 ml	NIL	NIL	NIL
9 ml	25	12.5	31.25
10 ml	NIL	NIL	NIL
11 ml	5.88	NIL	NIL
12 ml	NIL	NIL	11.11
13 ml	10	10	20
14 ml	20	10	20
15 ml	22.22	11.11	16.66
16 ml	15.78	15.78	21.05
17 ml	20	30	30
18ml	20	20	30
19 ml	18.18	22.72	22.72
20 ml	26.08	26.08	26.08



By comparison it has been observed that combination of mustard and til oil gives constant reduction as compared to mustard oil and til oil.

CONCLUSION:

'As the duration of rainy season and quantity of rainfall is reduced, the demand of water is day by day increasing due to increase in population and Industrialization therefore, the economic value also increases. Therefore the government should adopt the stages for storage and maximum utilization of rainwater. Protecting the stored water in water bodies (Dams, Reservoirs, lakes.) from evaporation remains an integral part of sustainable planning, especially during the summer hot months, when temperature is high and humidity is low, which leads to extremely high rate evaporation from water surfaces. Chemical films such as Cetyl and Stearyl alcohols are one of most feasible and cost effective evaporation retardants which reduces evaporation significantly. The present study has confirmed that a chemical film produces an invisible thin monomolecular film over water surface that significantly reduces evaporation. The experimental study was conducted to demonstrate the effectiveness of evaporation reduction on US weather class A pan. Different concentrations of 10 mg to 5 gms was reduced up to 47.82% as compared to without addition of chemical films. Therefore, these chemicals are highly feasible and cost effective to apply the present evaporation reduction technique on a large scale to a large number of reservoirs of the water loss through evaporation from water surfaces. Oil reduces evaporation up to 31.57% with different concentrations of 1 ml to 20 ml.

FUTURE SCOPE:

1) Evaporation suppression by using Thermocol sheets and boards
2) Evaporation suppression by using Shade net, tarpaulin, polythene sheet and Hilton.

REFERENCES:

1) R. Kumar, R. D. Singh and K. D. Sharma, *Water resources of India, Current* Science89(5), 2005, 794-811.
2) M. E. Jensen, *Estimating Evaporation from Water Surfaces, CSU/ARS Evapo transpiration Workshop*, Fort Collins, CO, 2010, 1-27.
3) W. J. Roberts, *Evaporation Suppression from Water Surfaces, American Geophysical Union*, 38(5), 1957, 740-744.
4) J. Walter, *The use of Monomolecular Films to Reduce Evaporation, International Union of Geodesy and Geophysics Assembly*, Berkely, California, 1963, 39-48.
5) E. H. Hobbs, *Evaporation Reduction by Monomolecular Films the Influence of Water Temperature and Application Rate on the Effectiveness of Cetyl Alcohol*, 17-19.
6) I. Craig, E. Schmidt and M. Scobie, *Evaporation Control using Covers – some realistic solutions for the irrigation industry National Centre for Engineering in Agriculture* (NCEA), University of Southern Queensland.
7) U. J. Kahalekar, H. S. Kumawat, *Evaporation suppression from water surfaces using chemical films,International Conference on Sustainable Innovative Techniques in Civil and Environmental Engineering*, SITCEE – 2013, New Delhi, India, 2013, 38-43.
8) Abdur Rahman, M. A. Zafor and Shantanu Kar, "*Analysis and Comparision of Surface Water Quality Parameters in and Around Dhaka City",* International Journal of Civil Engineering & Technology (IJCIET), Volume 3, Issue 2, 2012, pp. 7 - 15, ISSN Print: 0976 – 6308, ISSN Online: 0976 – 6316.
9) C. P. Pise and Dr. S. A. Halkude, *"Blend of Natural and Chemical Coagulant for Removal of Turbidity in Water"*, International Journal of Civil Engineering & Technology (IJCIET), Volume 3, Issue 2, 2012, pp. 188 - 197, ISSN Print: 0976 – 6308, ISSN Online: 0976 – 6316.
10) Beard JT and Gainer JL (1970), *influence of solar radiation reflection on water evaporation, journal of Geophysical research,* vol 15, no 27, p5155-5163
11) Cooley K.R. (1983), *Evaporation Reduction: Summary of long term work studies, Journal of irrigation and drainage engineering :* vol109, no 1, pp89-98