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A Comparative Study on the Impact of Ctab and Triton X 100 on Solubilisation of Antidiabetic Drugs Usingaqueous Medium at Different Temperatures

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***Abstract*:** *Surfactants have gottremendous use in the solubilization of various substances which are otherwise immiscible in common solvent like water. This property of surfactants is also used to reduce the harmful sideeffects of many drugs to different organs like liver and kidney. In this paper a comparative study is made to find the effect of cationic surfactant (CTAB) and nonionic surfactant (Triton X 100) on micellar solubilisation of some antidiabetic drugs. The effect of increasing temperatureon solubilisation is also measured.*
Keywords*: CMC, CTAB, surfactants etc.*

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I. Introduction

Poor aqueous solubility is a major obstacle in the development of therapeutic agents. Some of the approaches to enhance poor solubility of drugs include the use of co-solvents **(M.A.Etmanetal.2001 andS.H.Yalkowskyet al.1999).**Selection of salt form **(A.B.Neilsen et al. 2005 and P.M.Bhatt et al. 2005).**Preparation of solid dispersions **(NeelamSeedhar and MamtaKanojia. 2008).** Micellarsolubilisation is a widely used alternative for the dissolution of poorly soluble drugs. **(C.O.Rangelet al.2005).**Depending upon the hydrophobicity the drug can be solubilized in the inner core of micelle, on the surface of micelle or at an intermediate location in the palisade layer. Thus by knowing the structure and properties of micelles the solubility of poorly soluble drugs can be enhanced.

II. Materials And Methods

Different sparingly soluble antidiabetic drugs were purchased from Himedia laboratories Pvt. Ltd. Mumbai. Surfactants and chemicals were of AR and Merck grade. CMC of CTAB and Triton X 100 at different temperatures was measured by using conductivity meter .A graph is plotted between the molar concentration and conductivity of the solution. A break point in the graph corresponding to molar concentration gives the value of CMC of the solution .Effect of antidiabetic drugs on the micellar solution of CTAB and Triton X 100 in aqueous medium was also measured conductometrically.

Chemicals used:

a) CTAB – Cetyltrimethyl ammonium bromide b) Triton X 100c) KCl
e) Antidiabetic drugs like – Januvia 100mg, Metformin 100 mg, Glynase and glimepiride.

Apparatus:

1) Conductivity meter: (Digital direct reading systronics type) used for conductivity measurements .This conductivity meter should be calibrated with KCl solution of appropriate concentration range.
2)Thermostat: For maintaining the temperature settings constant throughout the experiment a thermostat set at 300^0C to 450^0C with automatic temperature control 0.10C at the required temperature is used.
Preparation of solutions: A stock solution of CTAB and Triton X 100 were preparedseperately by direct weighing and dissolving in DDW. The concentration of the surfactant was progressively increased by successive additions of aliquots of stock solution of concentration several times larger than their CMC. Then these solutions were used for further investigation.

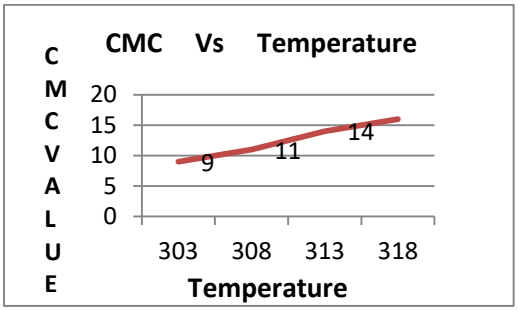
Results:

The critical micelle concentration of CTAB at different temperatures is shown in the following data given in table 1.1 below

S.No.	Temperature in Kelvin	CMC value x 10^{-4} (Moles/lit.)
1	303	9
2	308	11
3	313	14

(Table 1.1)

The effect of temperature on the CMC value of CTAB is clearly shown by the graph 1.1 below



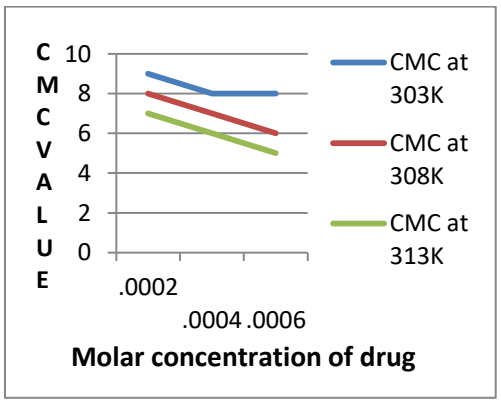
(Graph 1.1)

The effect of antidiabetic drugs on the CMC of CTAB in (moles/lit) at different temperatures is shown in the data given in table (1.2) below

Molar conc. of antidiabetic drug x10 -3	CMC at 303K in	CMC at 308K	CMC at 313K
2	$9x\ 10^{-4}$	$8x10^{-4}$	$7x\ 10^{-4}$
4	$8x\ 10^{-4}$	$7x\ 10^{-4}$	$6x\ 10^{-4}$
6	$8x\ 10^{-4}$	$6x\ 10^{-4}$	$5x\ 10^{-4}$

(Table 1.2)

Following graph (1.2) below shows the effect of antidiabetic drugs on the CMC of CTABat different temperatures



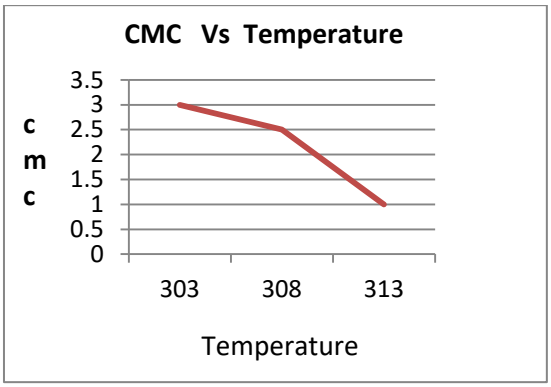
(Graph 1.2)

Variation of CMC value of nonionic surfactant Triton X 100 at different temperatures is shown in table 1.3

S.No.	Temperature in Kelvin	CMC value x 10^{-4} (Moles/lit.)
1	303	3
2	308	2.5
3	313	1
4	318	Not clear

(Table 1.3)

Effect of temperature on the CMC value of nonionic surfactant Triton X 100 is given in graph (1.3)



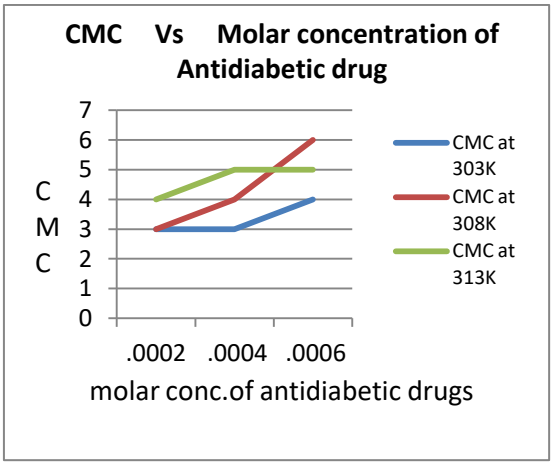
(Graph 1.3)

Variation in the CMC (moles/lit) value of nonionic surfactant Triton X 100 resulting from the addition of antidiabetic drug is shown in table (1.4)

Molar conc. of drugx10 $^{-3}$	CMC at 303K	CMC at 308K	CMC at 313K
2	$3x10^{-3}$	$3 x10^{-3}$	$4 x10^{-3}$
4	$3 x10^{-3}$	$4 x10^{-3}$	$5 x10^{-3}$
6	$4 x10^{-3}$	$6 x10^{-3}$	$5 x10^{-3}$

(Table 1.4)

Variation in the CMC value of Triton X 100 due to the presence of antidiabetic drug in Triton X 100 aqueous medium is shown in the graph 1.4 below



(graph 1.4)

This study was done at different temperatures ranging from 303K to 323K keeping a difference of 5K in each case using various antidiabetic drugs like glynase, metformin, Januvia and glimiperide tablets and the result was similar in every case i.e a lower cmc value of Triton X 100 at a low temperature and a lower CMC value of CTAB at a moderate temperature. Good results were obtained at temperatures 303K, 308K, and 313K. But no results were observed above313K.

III. Conclusions

A lower CMC value of Triton X 100 at a low temperature and similar results with CTAB reveals that a low temperature below 318K favours the solubilisation of antidiabetic drugs in these surfactants. Thus at this desired temperature if we add a desired amount of surfactant during the manufacture of these drugs then the side effects causedby their immiscibility can be greatly reduced.

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