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STUDIES OF CYCLODEXTRIN INCLUSION COMPLEXES
1- INCLUSION COMPLEXES BETWEEN α-AND B-CYCLODEXTRINS AND CHLORAMPHENICOL IN AQEUOUS SOLUTIONS.

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ABSTRACT

Chloramphenicol was found to form inclusion complexes with α-and B-cyclodextrine (α-CyD and B-CyD) in aqeuous solution. Phase solubility diagrams were obtained with B-CyD and found to be BS type curve. An apparent 1:1 complex formation constant (K_c) of $8077x10^4 M^{-1}$ was obtained for chloramphenicol in B-CyD.

For α-CyD the phase solubility diagrams indicate AL type curves. The complex stochiometric ratios were found to be 1:1 and 1:2 (guest: host). The apparent formation constants (K_c) for chloramphenicol in α-CyD were found to be $3017x10^4 M^{-1}$ and $957x10^4 M^{-1}$, for 1:1 and 1:2 stochiometric ratios respectively.

It was found that the aqueous solubility of chloramphenicol is enhanced by α- and B-CyD inclusion complexation than by the non-ionic surfactant solutions used in a previous study. The higher values obtained for the complex formation constants indicate a particularly good fitness of the chloramphenicol molecule within the B-and α-CyD cavities .

Microcrystalline solid inclusion complex of chloramphenicol and B-CyD 1:1 was isolated and investigated by I.R., in comparison to a physical mixture 1:1 to characterize the interaction arising between chloramphenicol and B-CyD within the complex.

The effect of certain water soluble carriers, in 5% w/v concentration on chloramphenicol complex-

ation in α-and B-CyD cavities was investigated. The aim of adding such additives is to reduce the concentration of the CyDs used in formulating chloramphenicol in solution. It was found that propylene glycol and P.E.G. 4000 assist chloramphenicol complexation in B-CyD, forming higher K_c values; 46221 x $10^4 M^{-1}$ and 39883 x $10^4 M^{-1}$ respectively, while glycerol deminishes chloramphenicol complexation in B-CyD.

In case of α-CyD, P.E.G 4000 and propylene glycol rise K_c and K_c' for chloramphenicol respectively and the reverse is true for glycerol.

INTRODUCTION

Cycloamyloses (also called cyclodextrins) are cyclic oligomers containing six or more D-glucose units linked 1-4; they are produced by the action of Bacillus macerans amylose on starch. The six unit substance is called cyclohexaamylose (α-CyD), the seven unit substance is called cycloheptamylose (*B*-CyD) and the eight unit substance is called cyclooctaamylose (γ-CyD). These molecules are torous or doughnut in shape. They possess central cavities of fixed shapes and sizes (5.2, 6.4 and 8.4 Å for the larger interance sides of α-, B-, and γ-CyD respectively[1]). Their hydrophobic cavities and hydrophillic faces (composed of hydroxyl groups) have led to considerable interest in their chemical properties and their pharmaceutical uses in formulations. The production, purification, modulation and chemistry of the cyclohexaamyloses have been reviewed[2-5]. Certain molecules, smaller than the cavity of a cycloedextrin can enter the cavity and there undergo non-covalent interaction with the atoms lining and rimming the cavity. The resulting intact asso-

ciation product is called an inclusion complex. The cyclodextrin is thus a host for the smaller (guest) molecule. The dimensions of the α-cyclodextrin cavity permit the inclusion of many mono- and disubstituted benzene derivatives. A 1:1 stochiometry is commonly observed (and often assumed in experimental studies), but it has now been well established that 1:2 complexes (i.e.,1 substrate: 2 cyclodextrins) or higher ratios may exist in some systems[6-10,14].

Cyclodextrins have received considerable attention because they are able to modify the physical and the chemical properties of drug molecules through inclusion complexation[11-13]. Such complexation may be utilized in pharmaceutical formulations to improve the aqueous solubility, dissolution rate, chemical stability and/or bioavailability of certain drugs[11,12.14-22]. Cyclodextrin-drug complexation also may affect drug volatility, dissolution rate, chemical reactivity, and thus can be the object of many application studies in medicinal field.

Chloramphenical, was solubilized previously by series of non-ionic surfactant solutions alone and in presence of certain organic and inorganic additives[23].

The present work reports the complexation of chloramphenicol in aqueous solutions of α- and B-CyDs, alone and in presence of certain organic additives including glycerol, propylene glycol and P.E.G. 4000 just to investigate the role of those additives in such a complexation. Finally, a comparison is made between the effect of non-ionic surfactant solutions[23] and CyDs in solubilizing chloramphenicol.

EXPERIMENTAL

Materials:

- α-CyD and B-CyD[a] were used without further purification.
- Chloramphenicol[b] was obtained commericially.
- Analytical grade polyethylene glycol 4000[c], propylene glycol[c] and glycerol[c] were used.

Equipment:

- Top to bottom rotating shaker, thermostatically controlled at 25 ± 0.5°C.
- Self-recording double beam,u.v. spectrophotometer. (Pye Unicam SP 1750).
- Double beam infra-red spectrophotometer (Pye-Unicam SP 1025).

Solubility Studies:

These were carried out according to Higuchi and Lach[24]. Excess amount of the guest molecule (Chloramphenicol) was added to different concentration (Moles/Liter) of aqueous α-CyD or B-CyD, alone or containing the organic additives (glycerol , PEG 4000 or propylene glycol) used in 5% W/V concentration in screw capped tubes which were then rotated on a mechanical spindle top to bottom at 25±0.5 °C.

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a- Sigma chemical company, USA
b- El-Nasr chemical Co. Egypt.
c- BDH, Poole, England.

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After solubility equilibrium was ascertained (about 5 days), an aliquot was centrifuged and pippetted through a cotton filter. A 0.5 or 0.2 ml aliquot of the sample solution was diluted with distilled water and analyzed spectrophotometerically for its chloramphenicol content at 278 nm against a blank having the same concentration of the additives , in the dilution range used.

The concentrations of chloramphenicol were found (from straight Beer's plot) and calculated in moles/Liter. It was found that neither the presence of CyDs nor presence of additives, in the dilution range used, interfered with the spectrophotometric assay of chloramphenicol, Fig.1.

The apparent formation constant, K_c was calculated from the initial straight line portion of the phase solubility diagram according to the following equation:[1,12,25-30].

$$K_c = \frac{\text{Slope}}{\text{intercept (1-slope)}}$$

This indicates that the complex stochiometric ratio is 1:1 (guest. host), as in B-CyD inclusion complexes.[1,21,25-30]

From the second straight line portion of the phase solubility diagram for α-CyD, another K_c' is computed in accord with the formation of 1:2 complex.

Preparation of B-CyD- chloramphenicol solid complex:

Solid complex of chloramphenicol with B-CyD was prepared using conditions derived from the descending part of the solubility diagram (an arrow in Fig. (2)). 2.27 gm B-CyD (0.1 M) and 0.645 gm chloramphenicol in 20 ml distilled water were sealed in a flask and shaken top to pottom for one week at 25 ± 0.5 C.

The complex which precipitated as a white microcrystalline powder was separated, washed twice with chloroform to remove any excess chloramphenicol, filtered and dried. This powder corresponded to 1:1 chlorompheniсol-B-CyD complex which has a molecular weight of 1458.1.

Infra-Red investigation for the chloramphenicol B-CyD complex:

The I.R. of the 1:1 CH-B-CyD complex was measured as a potassium bromide disc. For comparison the I.R. spectrum of a physical mixture of chlaramphenicol-B-CyD, 1:1 was carried out using the same procedure . The scanning is shown in Fig. (4).

RESULTS AND DISCUSSION

Figure 2 shows the equilibrium solubility diagram obtained for chloramphenicol with B-CyD in water alone or in the presence of 5%w/v aqueous solution of either glycerol, PEG 4000 and propylene

glycol. The plots, specially for chloramphenicol in B-CyD alone, show a typical Bs- type solubility curve,[1,25,27,29,30.~ 32], with precipitation of microcrystalline complex at higher B-CyD concentrations(0.05 moles in B-CyD alone). Obviously, the formation of the microcrystalline solid causes a marked decrease of chloramphenicol in solution (an arrow in Fig. (2)), after which a relative increase of chloramphenicol in solution increases, as B-CyD concentrations increase further. The stochiometry of this complex was analyzed and it was found to be a 1:1 complex in agreement with the previous findings[12,14,17,27,29,33].

The apparent formation constant (K_c) for the complex was determined from the initial straight line portion of the solubility diagram according to the previously mentioned equation[1,21,25,30] and was found to be 8077 x $10^4 M^{-1}$, Table 1 . It is of interest to note the high values of the complex formation constants in aqueous media, indicating a particularly good fitness of the chloramphenicol molecule with the B-CyD cavity[30]. It is noticed from Fig. (2) that the maximum solubility of B-CyD alone in distilled water is 0.01

The aim of formulating B-CyD in 5%w/v glycerol, P.E.G.4000 and prophylene glycol is to reduce the concentration of B-CyD needed to attain the therapeutic dose of chloramphenicol in eye or ear drops, as the CyD is quite expensive.

Fig. (2) and Table 2 show the effect of varying the concentrations of B-CyD in 5% w/v of the different additives used. It was found that incorporating B-CyD in 5% w/v glycerol decreases the efficiency of the former toward chloramphenicol complexation. This may be attributed to the competition of glycerol for chloromphenicol in the B-CyD cavity as glycerol contains relatively longer hydrocarbon chain (3CH) which decreases the quantity of chloramphenicol fitted to B-CyD cavity. Glycerol also favours the formation of chloramphenicol-B-CyD solid complex at lower concentrations of B-CyD (0.04 mole).

Glycerol in the used concentration decreases the solubility of B-CyD in water from 0.1 to 0.03 moles. This lowered solubility of B-CyD may be attributed to the incorporation of the hydrocarbon chain of glycerol in B-CyD cavity rendering the latter more hydrophobic, less water soluble.

The K_C value for chloramphenicol in B-CyD decreases in the presence of glycerol to nearly half its value, (Table 2).

Also the solubility of chloramphenicol (mole/mole) in B-CyD decreases relatively in B-CyD containing glycerol than in B-CyD alone. Comparing the effect of 5%w/v of both P.E.G.4000 and propylene glycol on the complexation of chloramphenicol in B-CyD, (Fig.2 and Table 2) it is obvious that both of the two additives cause marked

increase in the concentration of chloramphenicol complexed in the aqeuous phase compared to B-CyD alone. The K_C values for chloramphenicol in B-CyD containing 5% w/v propylene glycol and P.E.G.4000 are $46221 \times 10^4 M^{-1}$ and $39883 \times 10^4 M^{-1}$ respectively. Thus the K_C value increases 6 and 5 times in B-CyD containing those two additives than B-CyD alone.This may be attributed to the effect of the glycol group (CHOH) in strengthing the physical interaction (hydrogen bond formation) between chlorampherico1 and B-CyD rendering the complex formation more easier, leading to more stable complexes and thus higher K_C values. This idea of incorporating such additives is useful and can be utilized successfully in attaining higher concentrations of chloramphenicol in lower B-CyD concentrations.

The presence of propylene glycol and PEG 4000 in solution containing B-CyD promotes the solid complex formation between chloramphenicol and B-CyD even at lower concentration than in B-CyD alone. The presence of propylene glycol and PEG 4000 reduces the solubility of B-CyD alone.

The effect of α-CyD, alone and in presence of the investigated additives, on the aqueous complexation of chloramphenicol is shown in Fig. (3) and Table (2). In this case, the solubility of chloramphenicol increases linearly as a function of α-CyD concentration.The solubility curve can be classified as

AL type [27,31]. In this type of solubility curves no solid complexes are formed between the guest and the host[1,25,27,31].

The absence of solid complex between α-CyD and chloramphenicol in the α-CyD soluble range (0.05-0.4 moles, Fig. (3)), indicates that the small cavity size of α-CyD apparently allows little penetration of the chloramphenicol molecule.

The stochiometry of the complex formed between chloramphenicol and α-CyD is found to be 1:1 and 1:2[1,25,27,31] as observed from the solubility curves for chloramphenicol (Fig.2) where two slopes in each case exist. The constants K_c and K_c' for both complexs are calculated from the first and second slopes respectively.

The formation of the 1:2 complex seems logic, as at higher α-CyD concentrations the molecules become crowdeded and each chloramphenciol molecule can interact with two α-CyD molecules[27,31]. It was also noticed that K_c' for chloramphenicol in αCyD is always smaller than K_c at each concentration level studied. This may be attributed to the strongly bound chloramphenicol molecule to one α-CyD cavity at lower α-CyD concentrations resulting in a higher K_c value compared to the loosly bound chloramphenicol molecule between two cavities of α-CyD at higher concentrations resulting in smaller K_c' value.

Comparing the complexing efficiency of α-CyD and B-CyD, alone or in presence of the additives, it is clear that B-CyD is more effective than α-CyD in bringing chloramphenicol into solution, Fig. (2,3) and Table 2 . This is understandable since B-CyD has wider cavity than the α-CyD .The dimensions of chloramphenicol may thus fit better to the B-CyD cavity. Hence the apparent formation constant for the complex of chloramphenicol in α-CyD is nearly 0.37 that formed in B-CyD. The same is true in the presence of different additives with the two CyDs investigated.

The effect of additives studied on the complexation of chloramphenicol with α-CyD is shown in Fig. (3) and Table 1. The additives do not change the picture of chloramphenicol complexation in α-CyD but they generally inhibit α-CyD solubility in water. Glycerol decreases the efficiency of α-CyD to bring chloramphenicol to solution . Thus, the K_C for chloramphenicol decreases from 3017×10^4 to 3004×10^4 in the presence of glycerol. On the contrary, P.E.G 4000 and propylene glycol increase the apparent formation constants to $6557 \times 10^4 M^{-1}$ respectively. On this basis the concentration of α-CyD needed to bring the therapeutic dose of chloramphenicol into solution can be reduced by incorporating these two additives. However, P.E.G 4000 at this concentration level also reduces the solubility of α-CyD itself as it forms a white gelly like paste. The same explaination offered in case of B-CyD is also valid for the

effect of these additives on chloramphenicol complexation with α-CyD.

Fig.(4) represents the I.R. spectrum of the 1:1 chloramphenicol B-CyD complex and that of 1:1 physical mixture of this complex. Since chloramphenicol and B-CyD can exhibit intramolecular hydrogen bonding, no shift takes place for the carbonyl group in the complex formation by the formation of intermolecular hydrogen bonding. The only difference which can anticipate intermolecular hydrogen bond formation between B-CyD and chloramphenicol is the increase in the intensity of hydrogen bond absorption in the complex than in the physical mixture in the range of 3400 cm^{-1}. This increase in the intensity of the hydrogen bond formed in the complex than the physical mixture indicates that the intermolecular hydrogen bond formed between chloramphenicol and B-CyD is stronger than the intramolecular hydrogen bond taki ng place in each molecule alone.

Tables 2 and 3 include a comparison between the efficiency of the surfactant solutions, alone or combined with certain additives toward chloramphenicol solubilization and the studied CyD solutions. Sodium lauryl sulphate and cetrimide are investigated only for comparison. It is evident that among all the solution investigated to solubilize chloramphenicol, B-CyD in 5%w/v propylene glycol is most efficient followed by B-CyD in 5%w/v PEG 4000.

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As B-CyD has the advantage of being naturally produced, easily tolerated in the body and less irritant than the non-ionic surfactant solutions, its use as a solubilizing agent for chloramphenicol can be recommended. However, further studies on the stability as well as availability for chloramphenicol from these solubilized systems is needed.

Table 1 - Apparent Complex Formation Constants for Chloramphenicol (CH) with B- and α-CyDS in Different Solvents.(x)

Complex	Solvent (w/v)	Molar Ratio	K_c	K_c'	Solubility of CH in 1 CyDS, M/M	Coefficient of Determination
CH-B-CyD	water	1:1	8077	--	0.5	0.98
CH-B-CyD	5% Glycerol	1:1	4860	--	0.37	0.99
CH-B-CyD	5%P.E.G.4000	1:1	39883	--	0.828	0.98
CH-B-CyD	5% Propylene glycol	1:1	46221	--	0.848	0.99
CH-α-CyD	water	1:1	3017	--	0.272	1.0
		1:2	--	957	0.106	0.92
CH-α-CyD	5%glycerol	1:1	3004	--	0.266	0.99
		1:2	--	1070	0.114	0.99
CH-α-CyD	5%P.E.G4000	1:1	6557	--	0.442	0.97
CH-α-CyD	5% Propylene glycol	1:1	3365	--	0.289	0.99
		1:2	--	1088	0.116	0.94

(x) Calculated according to Higuchi and Connors[31].

Table 2 - Effect of Different Organic Additives on the Solubilization of Chloramphenicol

Solubilizer[x]	Solubility mg CH/gm Solubilizer
Polysorbate 20	75.4
Polysorbate 40	81.6
Polysorbate 60	76.2
Polysorbate 80	87.5
Eumulgin C1000	97.7
Eumulgin C1500	82.5
Myrj 52	63.4
Myrj 53	54.4
Myrj 59	34.7
Sodium lauryl sulphate	135.0
Cetrimide	338.6
P.E.G4000	13.3
P.E.G 600	8.0
B-CyD	142.3
α-CyD	90.3

[x] Except for α- and B-CyD, the data are quoted from ref 23.

Table 3 - Effect of Mixtures of Different Organic Additives on the Solubilization of Chloramphenicol

Solubilizer containing the additive[x]	Solubility mg CH/gm solubilizer
Polysorbate 20 in 5% w/v propylene glycol	67.3
Polysorbate 80 in 5% w/v propylene glycol	86.8
Eumulgin C1000 in 5% w/v Propylene glycol	108.8
Eumulgin C1500 in 5% w/v propylene glycol	90.4
Myrj 52 in 5% w/v propylene glycol	68.5
Myrj 59 in 5% w/v propylene glycol	40.9
B-CyD in 5% w/v glycerol	105.3
B-CyD in 5% w/v P.E.G 4000	235.7
B-CyD in 5% w/v propylene glycol	241.4
α-CyD in 5% w/v glycerol	88.3
α-CyD in 5% w/v P.E.G 4000	146.8
α-CyD in 5% w/v propylene glycol	96.0

[x] Except for α- and B-CyD, data obtained from Ref 23.

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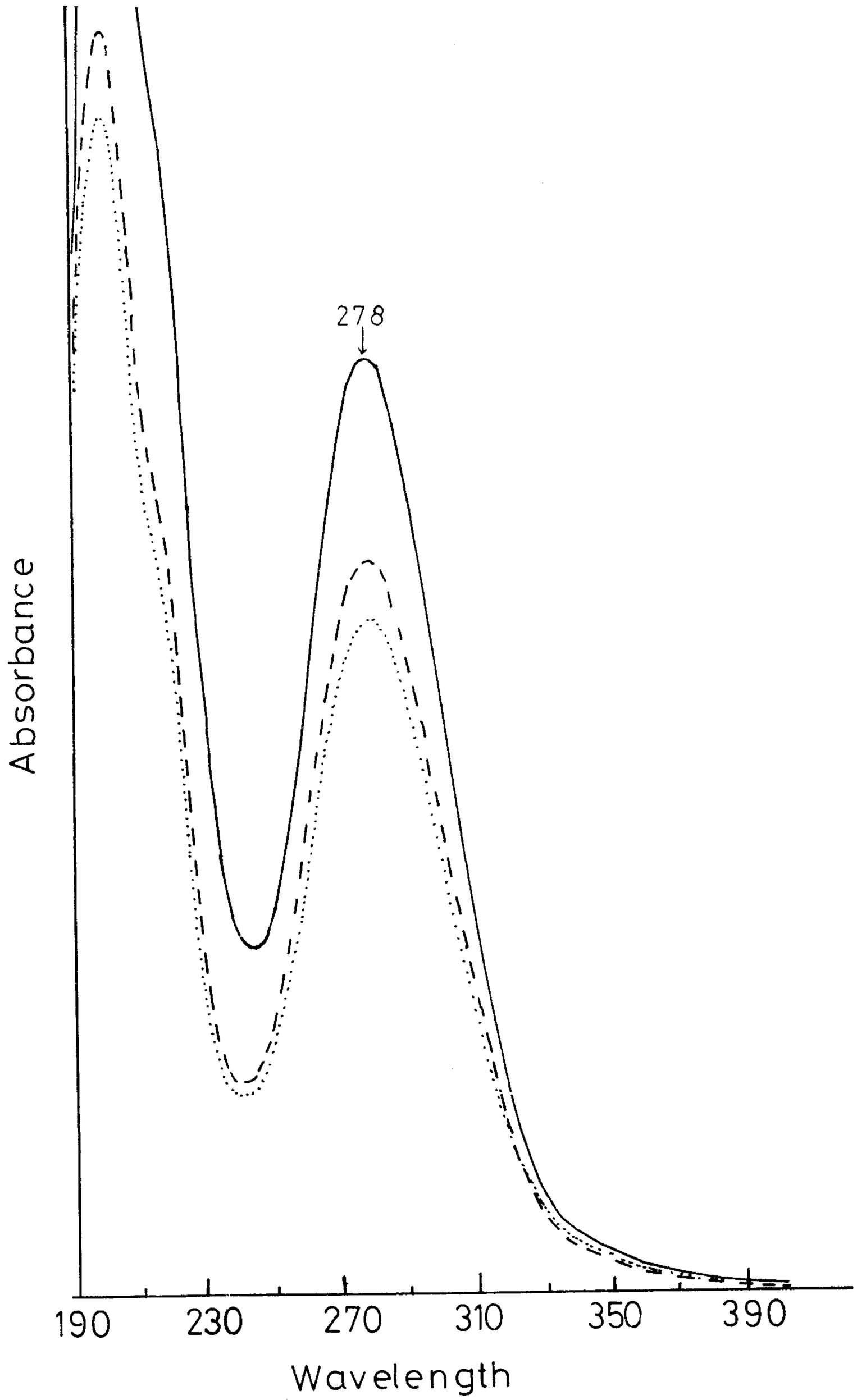

Fig. 1. Ultraviolet Spectra of Chloramphenicol in Different Solvent Media

Key- in distilled water (.....), 5% w/v P.E.G. 4000 containing 0.09 mole of α-CyD (----), and 5% w/v propylene glycol containing 0.o9 mole of B-CyD (——).

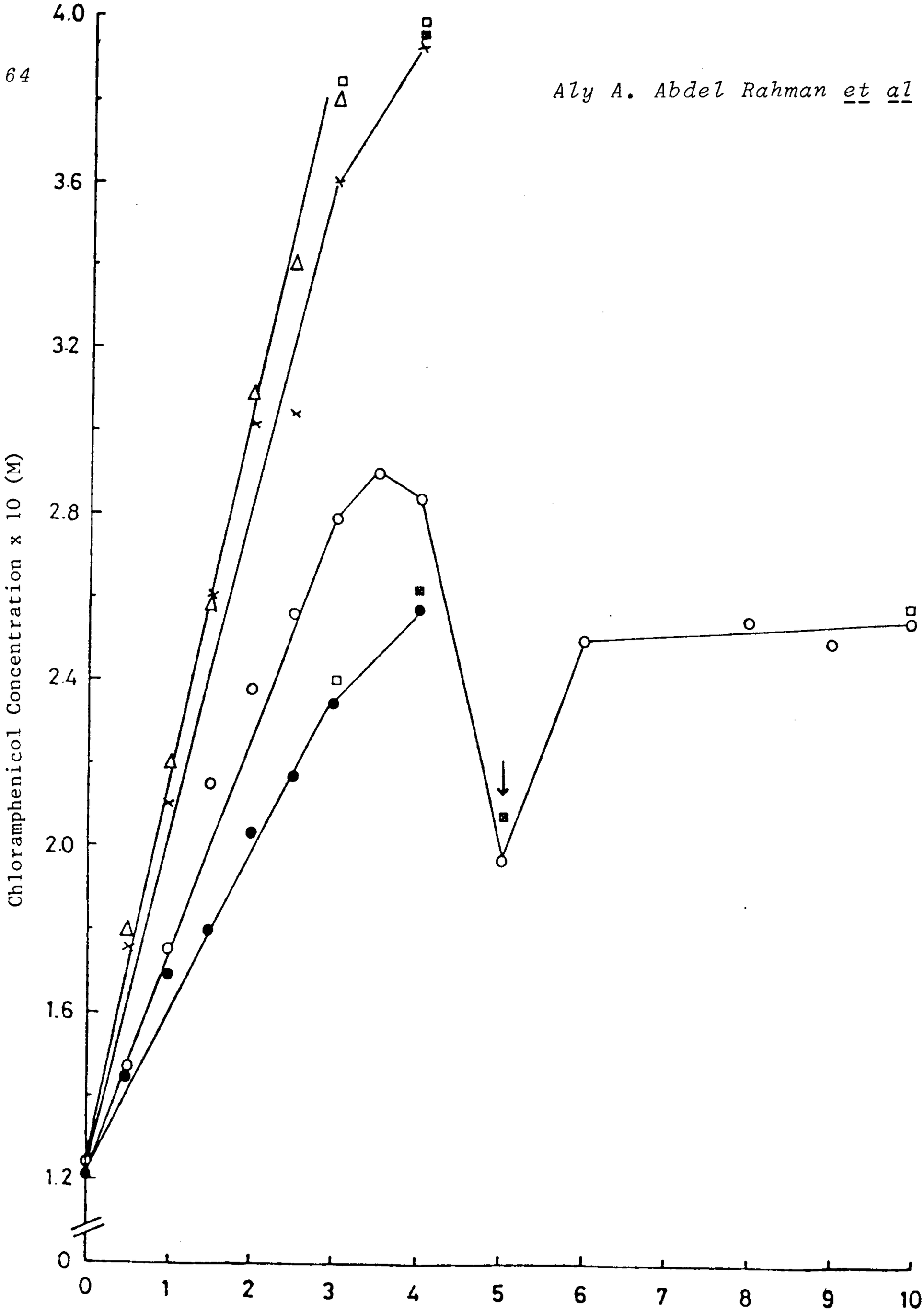

Fig. 2. Phase Solubility Diagram of Chloramphenicol B-cyclodextrin in Different Solvent Media.

Key- B-CYD in water (o), 5% w/v glycerol (●), 5% w/v P.E.G. 4000 (x) and in 5% w/v Propylene glycol (Δ), (⊠) Formation of chloramphenicol-B-cyclodextrin solid complex. (□) Maximum solubility of B-cyclodextrin.

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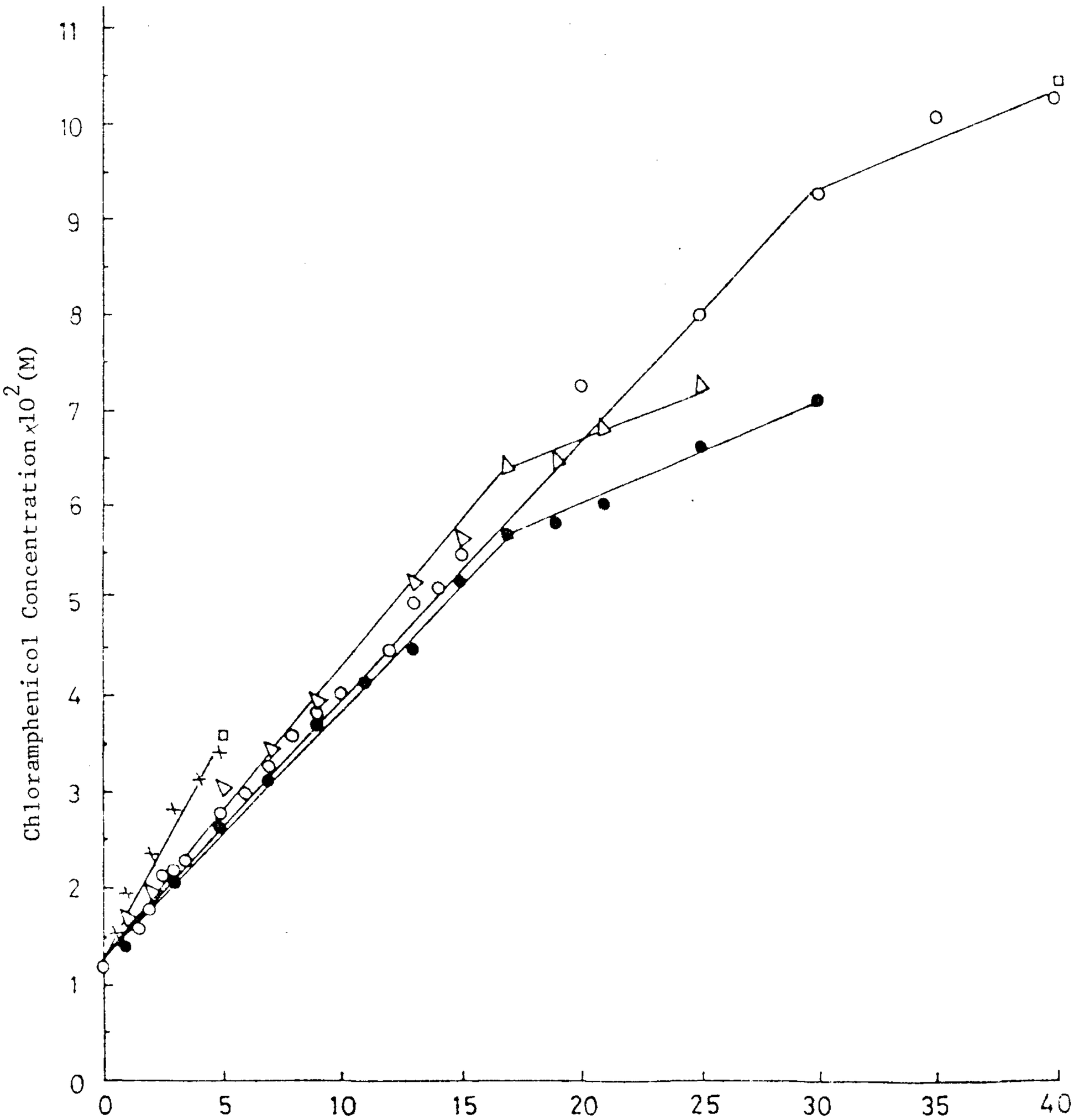

Fig. 3. Phase Solubility Diagram of Chloramphenicol - α-Cyclodextrin in Different Solvent Media.

Key- α-CyD in water (o), 5% w/v glycerol, (●), 5% w/v P.E.G. 4000 (x) and in 5% w/v propylene glycol (Δ) , (□) Maximum solubility of α-CyD.

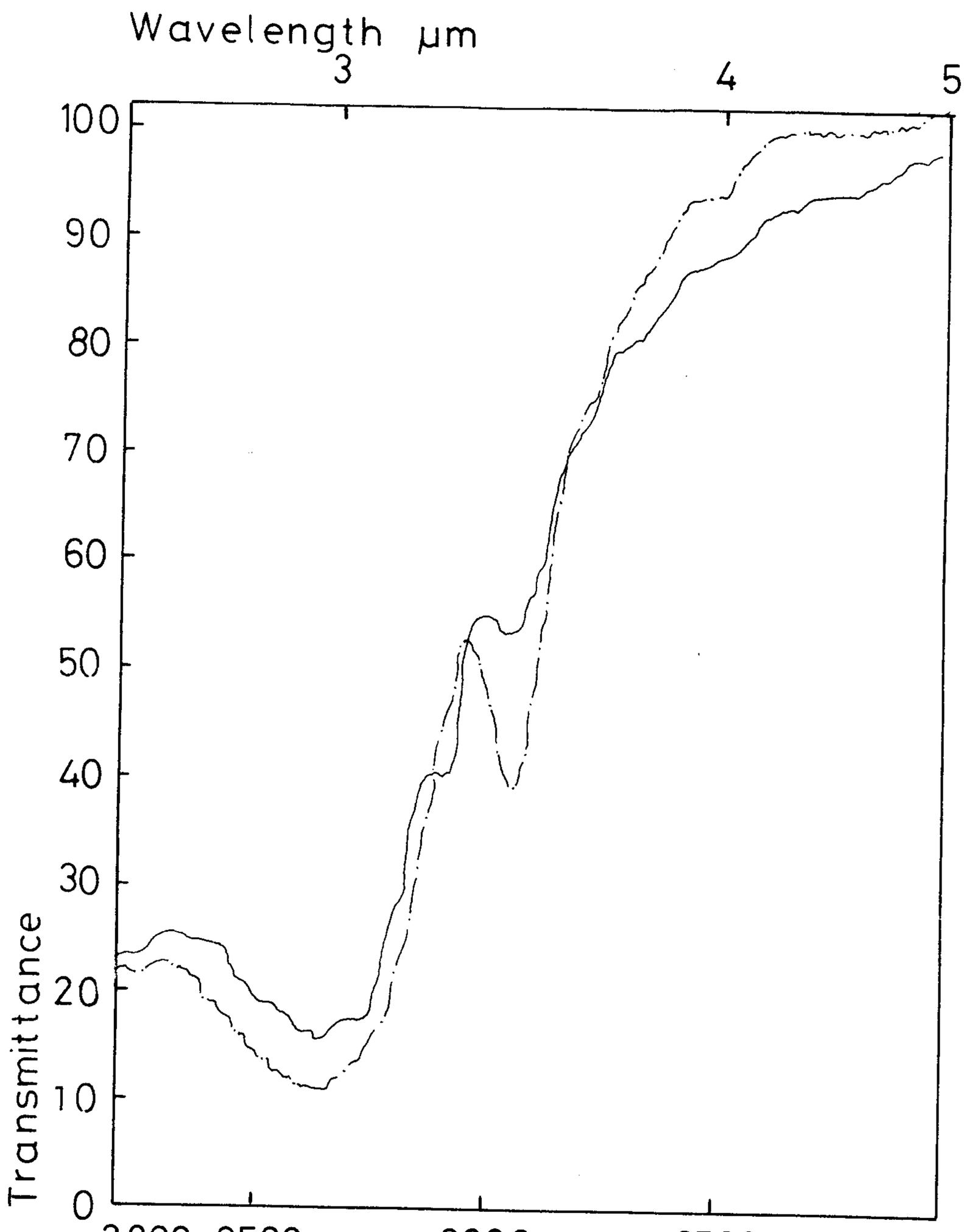

Fig. 4. I.R. Spectra of Chloramphenicol-B-CyD Solid Complex (—·—·—)
and Physical Mixture (1:1) of Chloramphenicol and B-CyD (———) .

REFERENCES

1) *M., Otagiri, T,Imai, F.,Hirayama and K.,Uekama, Acta Pharm.Suec., 20,11 (1983).*

2) *A.L.Thakkar and P.V.Demarco.J, Pharm.Sci., 60, 652 (1971).*

3) *J.A. Thoma and L.Stewart "Starch:Chemistry and Technology" Vol.1, R.L.Whistler and E.F.Paschall, Eds, Academic, New york.(1965), p,209.*

4) *S.G.Frank and M.J.Cho, J.Pharm. Sci., 67,1665(1978).*

5) *M.L. Bonder and M.Komiyama "Cyclodextrin Chemistry" Springer-Verlag, Berlin. (1978).*

6) *S.G.Frank and D.R. Kavaliunas, J.Pharm.Sci.,72, 1215 (1983).*

7) *Y.Nakai, K.Yamamoto, K.Terada,H.Horibe and K.Ozawa Chem. Pharm. Bull., 31,3745 (1983).*

8) *K.Uekama, F.Hirayama, A.Fujise, M.Otagiri, K.Inaba and H.Saito, J. Pharm. Sci., 73,382 (1984).*

9) *M.Fuzy, L.Szente, J., Szejtli and J.Harangi, Pharmazie, 39,558 (1984).*

10) *J.Szejtli "Cyclodextrins and their Inclusion complexes" Akademiai Kiado, Budapest,p.227, (1982).*

11) *M.Katal and A.Antal, Pharmazie, 39,856(1984).*

12) *M.Katal and M.Lukacs, ibid., 39,857 (1984).*

13) *L.Szente, M.Gal-Fuzy and J.Szejtli, Proc.lst.Sympos. on Cyclodextrins.Akademiai Kiado, Budapest 1982,34.*

14) *S.F Ilonahabon and J.Szejtli, Pharmazie,39,830(1984).*

15) *S.P.Jones, D.J.W.Grant, J.Hadgraft and G.D.Parr,Acta Pharm.,Tech. 30,215 (1984).*

16) *E.Fenyvesi, K.Takayama, J.Szejtli and T.Najai, Chem Pharm. Bull. 32,670 (1984).*

17) *E.Fenyvest, B.Antal, B.Zsadon and J.Szejtali, Pharmazie, 20,473 (1984).*

18) *E.Fenyvest, O.Shirakura, J.Szejtli and T.Najai, Chem Pharm. Bull. 32,665 (1984).*

19) T.Nakajima, M.Sunagawa, T.Hirohashi and K. Fujioka, Abstracts the 101st Annual Meeting of the Pharmaceutical Society of Japan, Kumo-moto, April 1981, p.625.

20) T.Nakajima, M.Sunagawa, H.Matsumura, T.Hiro-hashi, M.Natori, M.Natori, S.Aono, K.Fujioka and Y.Yamahira, Abstracts, the 3rd symposium on Medicinal Chemistry, Osaka, November 1981, p.13.

21) T.Nakajima, M.Sunagawa, T.Hirohashi and K.Fuji-oka, Chem. Pharm., Bull., 32, 383 (1984).

22) T.Nakajima, M.Sunagawa and T.Hirohashi, ibid., 32, 408 (1984).

23) A.A.Abdel Rahman, M.S.Thesis, Assiut Unversity, (1978).

24) T.Higuchi and J.L.Lach, J.Am. Pharm.Assoc. Sci., Ed., 459 (1954).

25) K.Uekama, F.Hirayama, K.Esaki and M.Inoue, Chem. Pharm.Bull., 27, 76 (1979).

26) A.B.Wong, S.F.Lin and K.A.Connors, J.Pharm.Sci., 72, 388 (1983).

27) K.Uekama, T.Fujinaga and M.Otagiri, Acta Pharm. Sues. 20, 287 (1983).

28) K.Uekama, S.Narisaw, F.Hirayama and M.Otagiri, Int, J. Pharm., 16, 327 (1983).

29) K.Uekama, Y.Uemura, T.Irie and M.Otagiri, Chem. Bull., 31, 3637 (1983).

30) F.M.Anderson and H.Bundgaard, Arch. Pharm.Chem. Sci.Ed. 12, 17 (1984).

31) T.Higuchi and K.A.Connors, Ad.Anal. Chem.Instr. 4, 117 (1965).

32) F.M.Anderson and H.Bundgaard, Arch. Pharm.Chem 11, 61 (1983).

33) K.Uekama, T.Fujinaga, F.Hirayama. M.Otagin and M.Yamasaki. Int.J. Pharm.. 10.1 (1982).

دراسة على متراكبات السيكلوديكسترين

١ ـ دراسة على متراكبات الفا وبيتا السيكلوديكترين مع الكلورامفنيكول

احمد ابو طالب ـ على عبد الظاهر عبد الرحمن ـ سيد اسماعيل محمد

كلية الصيدلة ـ جامعة اسيوط

وجد ان الكلورامفنيكول يكون متراكبا مع الفا وبيتا سيكلوديكسترين فاقت فى مقدرتها لتذويب الكلورامفنيكول منشطات السطح غير المتأينة التى استعملت فى دراسة سابقة .

وقد تم فصل المتراكبات المكونة من بيتا السيكلوديكسترين والكلورامفنيكول بنسبة ١:١ وقورنت مع مخلوط فيزيائى محضر ودرست كل منها بالتفصيل وذلك لفحص نوعية التفاعل بينهما .

كما تم دراسة تأثير بعض الاضافات مثل الجلسرول والبروبيلين جليكول وعديد ايثلين جليكول ٤٠٠٠ على مدى تكوين المتراكبات المكونة من العقار والسيكلودكسترينات المستخدمة فى الوسط المائى .

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