Table 1: Chiral excipients frequently used in the controlled-release formulations of salbutamol.

Excipient	*Aqueous Solubility*	*Application*	*Controlled- release Mechanism*
Hydroxypropyl methylcellulose	Slowly soluble in water	Sustained release dosage	Diffusion and erosion
Egg albumin	Freely soluble in water	Sustained release dosage	Diffusion
γ-cyclodextrin	1 in 4.4 part of water at 20°C	Dissolution rate modifiers	Erosion
Sulfobutyl-β-cyclodextrin	1 in 2 part of water at 20°C	Dissolution rate modifiers	Erosion
Dimethyl-β-cyclodextrin	1 in 1.7 part of water at 25°C	Dissolution rate modifiers	Erosion

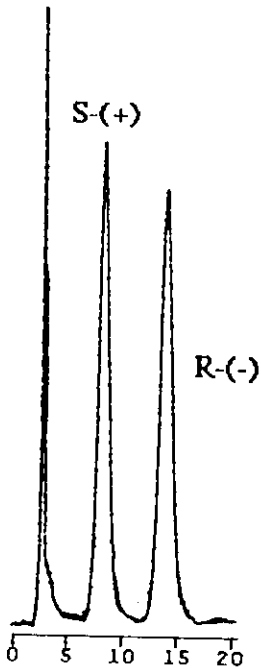


Fig. 1 Typical chromatogram of R- and S-salbutamol.

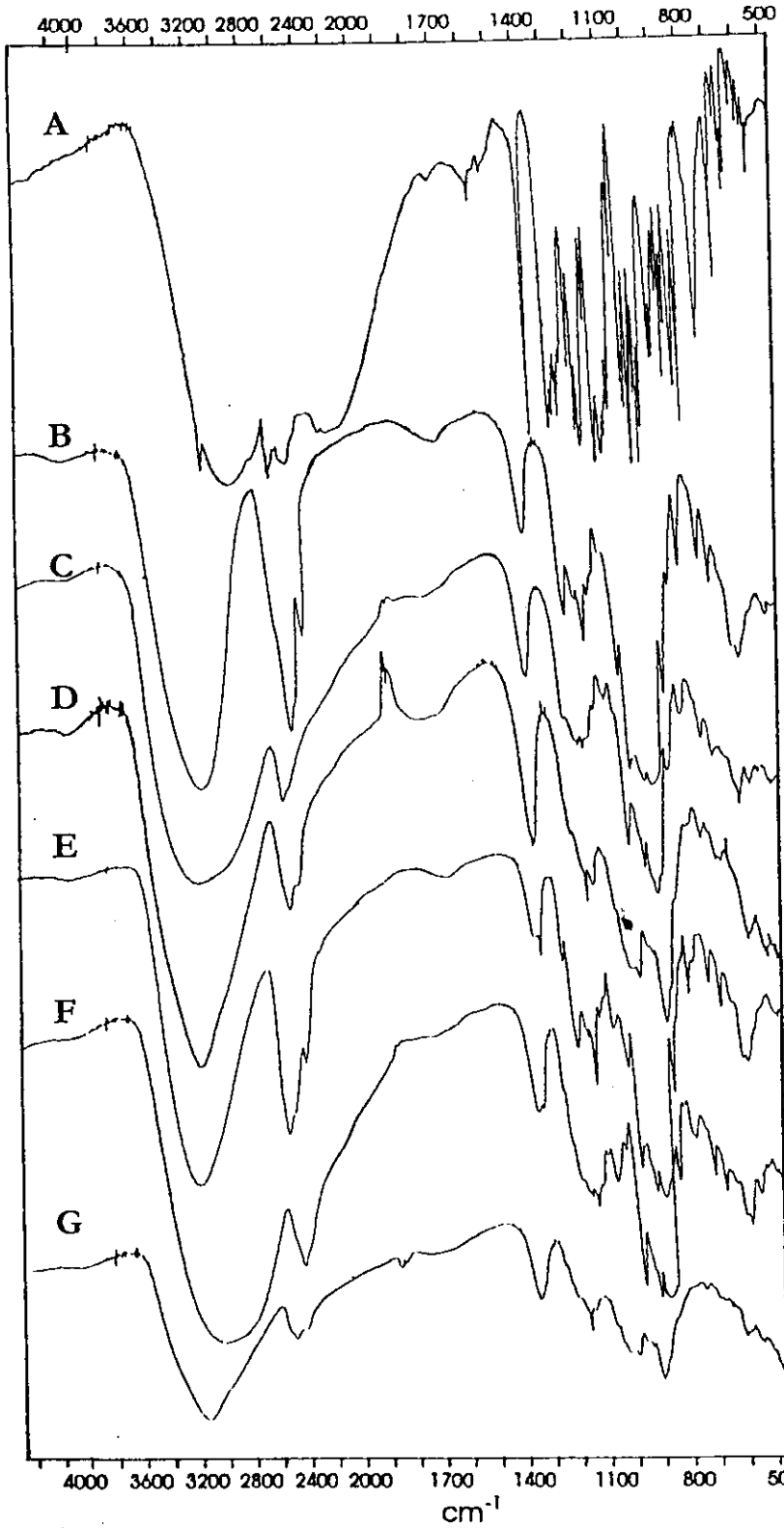


Fig. 2 FTIR spectra of **(A)** freeze-dried salbutamol **(B)** freeze-dried DM-β-CD **(C)** freeze-dried γ-CD **(D)** freeze-dried SBE-β-CD **(E)** freeze-dried complex of racemic salbutamal with DM-β-CD **(F)** freeze-dried complex of racemic salbutamal with γ-CD **(G)** freeze-dried complex of racemic salbutamal SBE-β-CD.

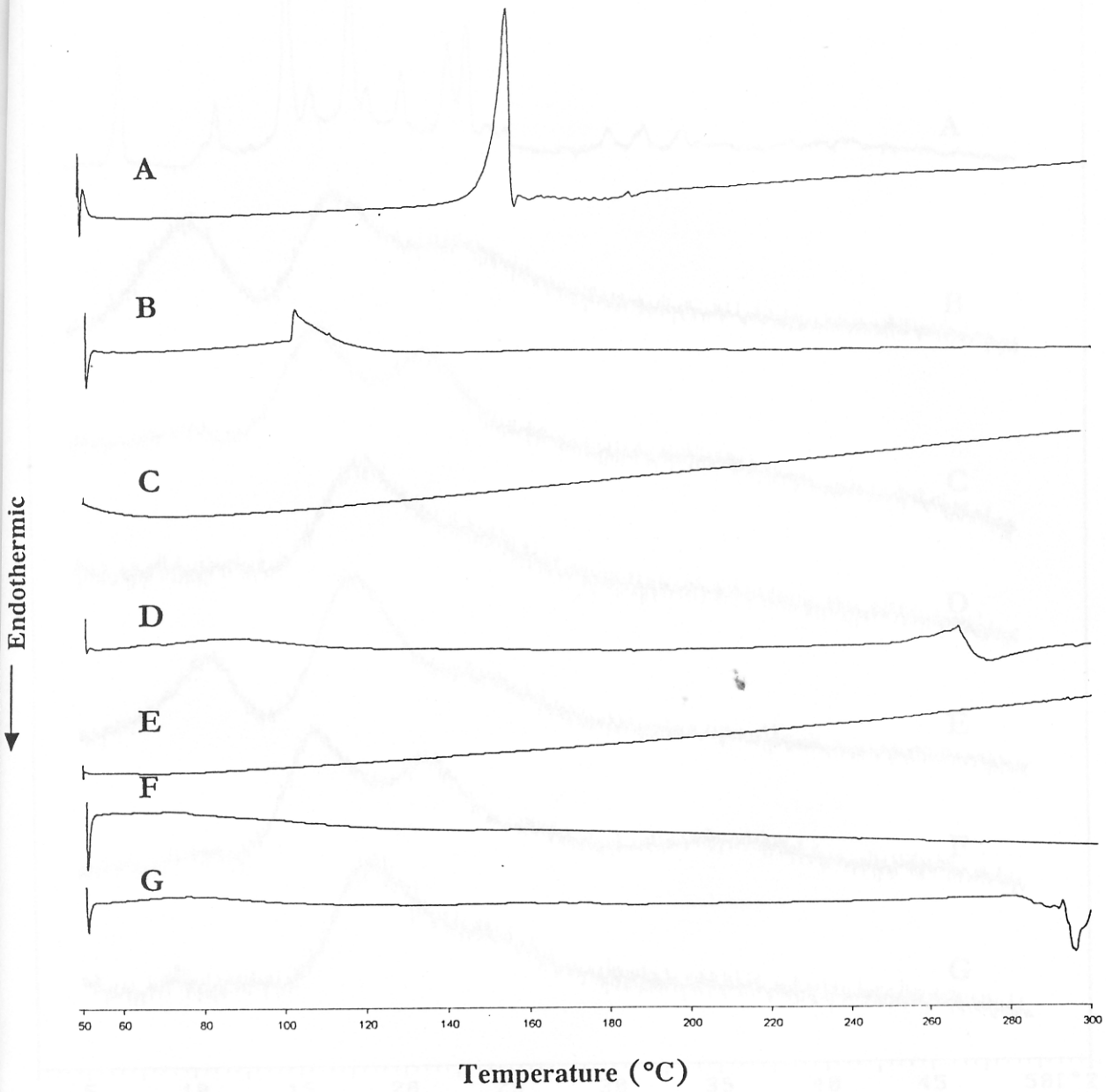


Fig. 3 DSC curves of **(A)** freeze-dried salbutamol **(B)** freeze-dried DM-β-CD **(C)** freeze-dried γ-CD **(D)** freeze-dried SBE-β-CD **(E)** freeze-dried complex of racemic salbutamal with DM-β-CD **(F)** freeze-dried complex of racemic salbutamal with γ-CD **(G)** freeze-dried complex of racemic salbutamal SBE-β-CD.

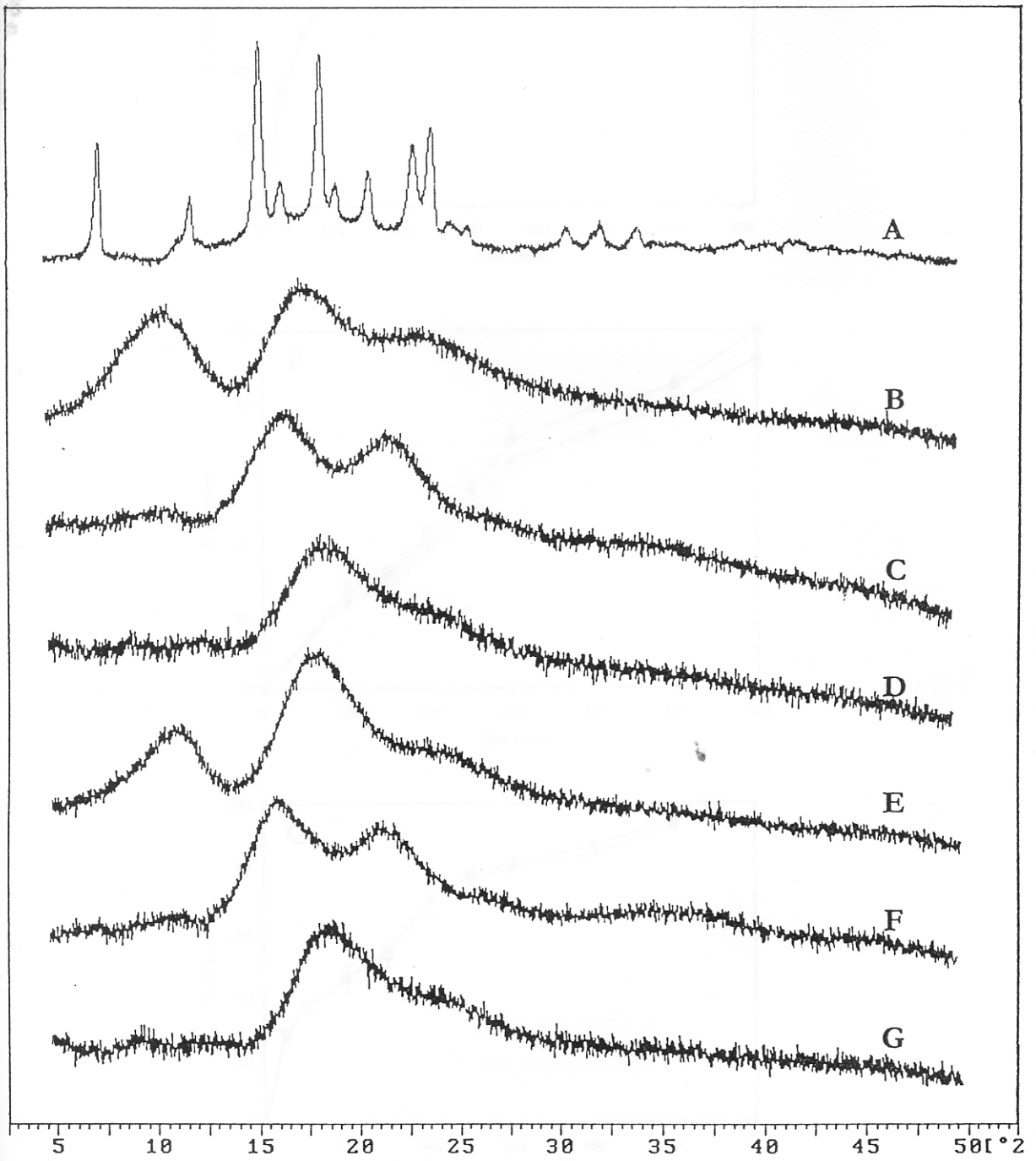


Fig. 4 X-ray powder diffraction patterns of **(A)** freeze-dried salbutamol **(B)** freeze-dried DM-β-CD **(C)** freeze-dried γ-CD **(D)** freeze-dried SBE-β-CD **(E)** freeze-dried complex of racemic salbutamal with DM-β-CD **(F)** freeze-dried complex of racemic salbutamal with γ-CD **(G)** freeze-dried complex of racemic salbutamal SBE-β-CD.

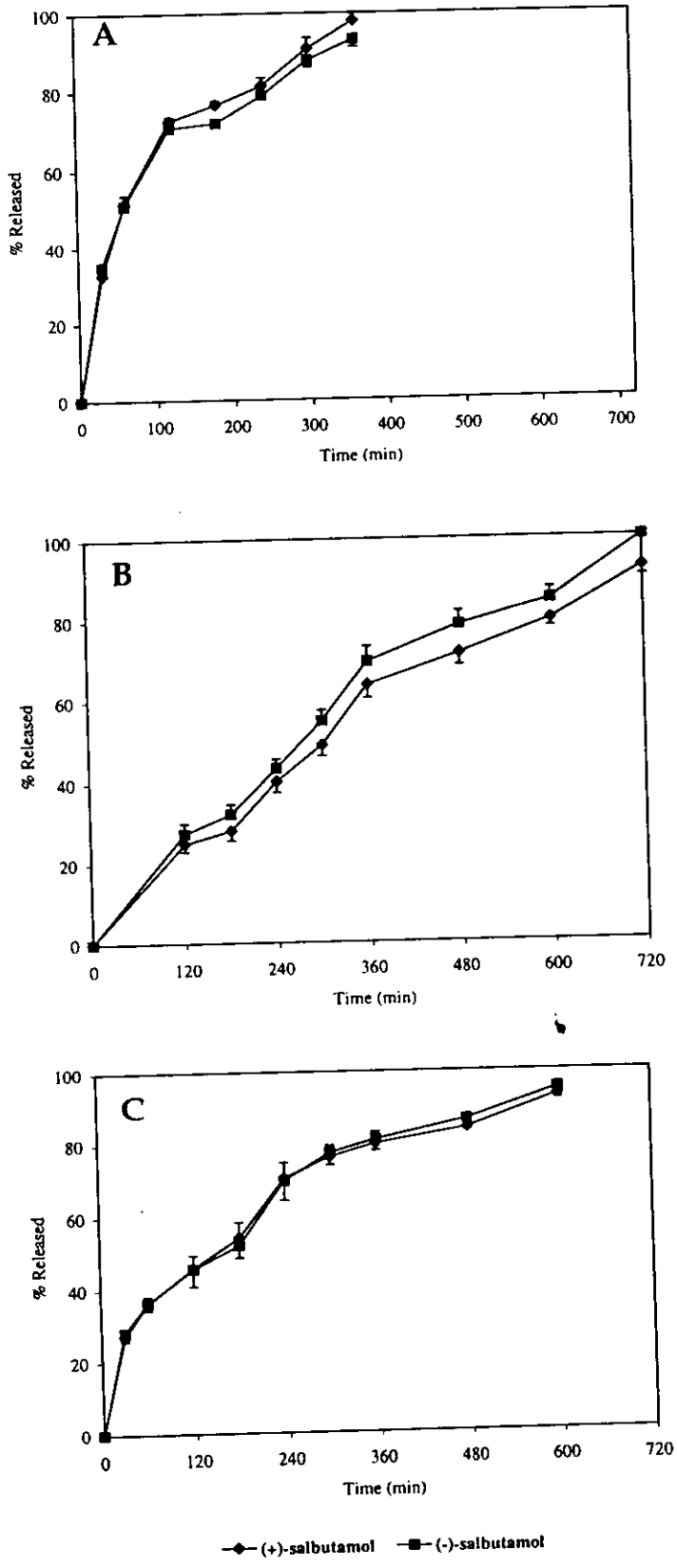


Fig. 5 Dissolution profiles for **(A)** DM-β-CD tablets **(B)** γ-CD tablets **(C)** SBE-β-CD tablets (mean ± SD, n=6).

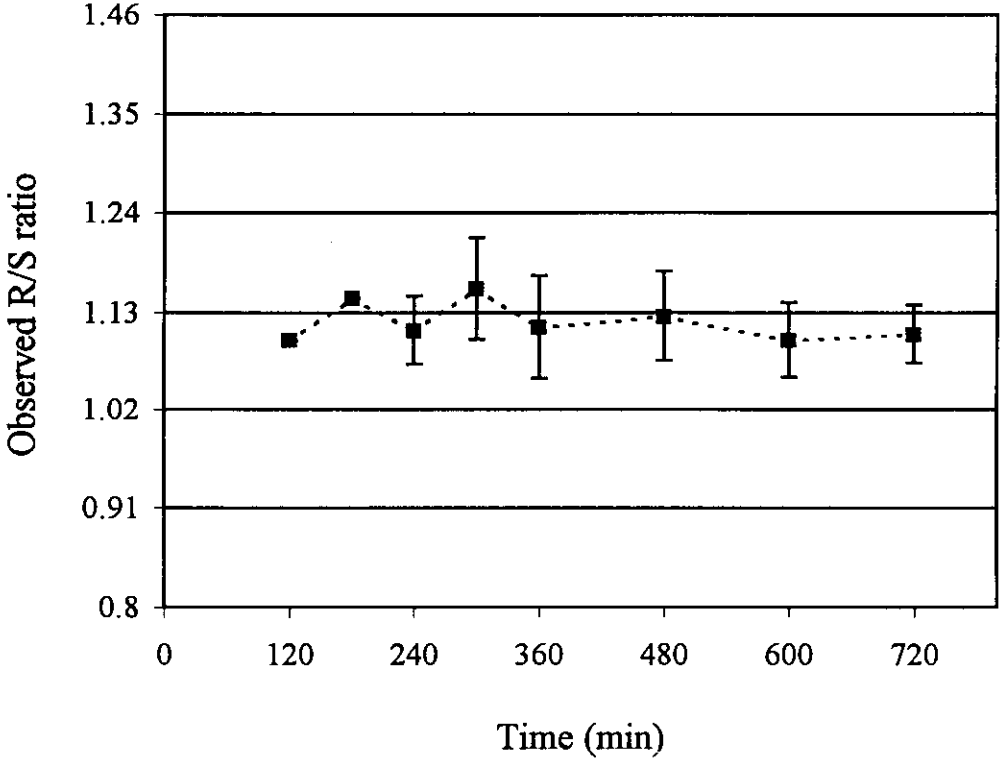


Fig. 6 R/S ratio of salbutamol released from γ-CD tablets (mean ± SD, n=6).

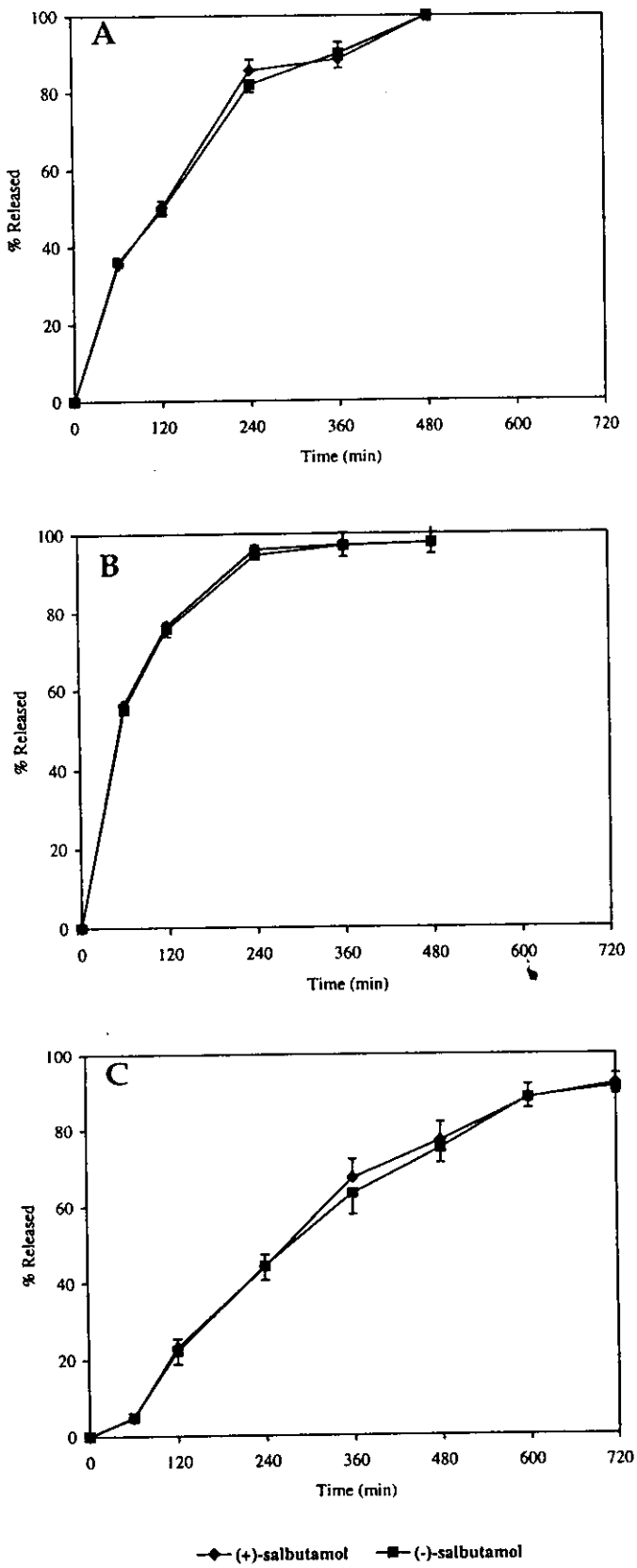


Fig.7 Dissolution profiles for **(A)** HPMC tablets **(B)** egg albumin tablets **(C)** controlled-release tablets Volmax® (mean ± SD, n=6).

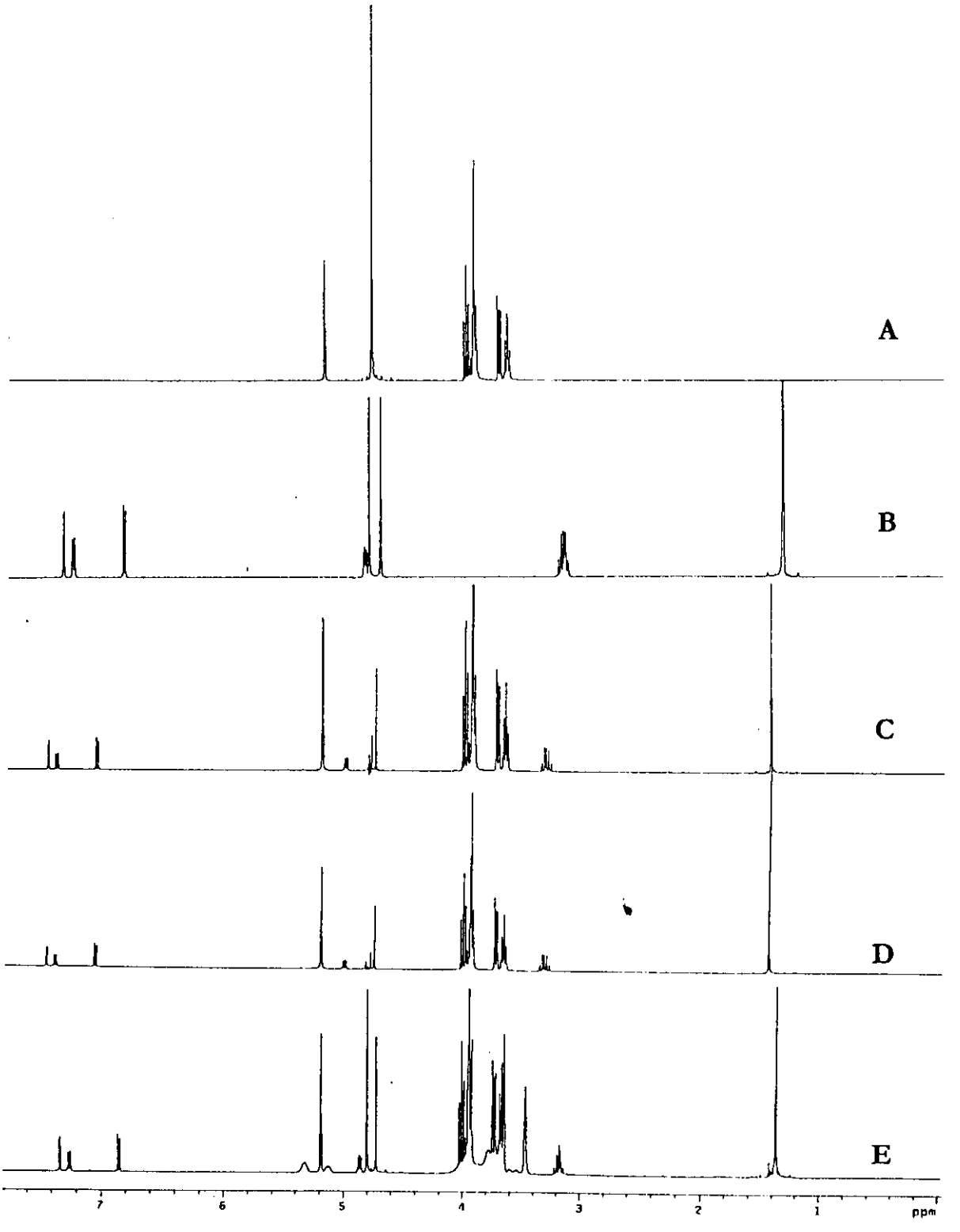
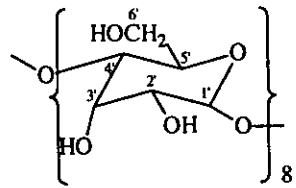
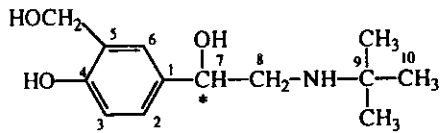


Fig. 8 ^{1}H-NMR spectra of **(A)** salbutamol alone **(B)** free γ-CD **(C)** complex of S-salbutamol **(D)** complex of R-salbutamol **(E)** complex of racemic salbutamol.

Table 1 Change in chemical shifts (δ) of some protons in the complex of salbutamol and γ-CD.



(A)



(B)

Complex (1:1)	[a] $\Delta\delta_{\gamma\text{-CD}}$ (Hz)						[b] $\Delta\delta_{salb.}$ (Hz)						
	$\delta_{5,197}$ *H-1′*	$\delta_{3,740}$ *H-2′*	$\delta_{4,997}$ *H-3′*	$\delta_{3,672}$ *H-4′*	$\delta_{3,934}$ *H-5′*	$\delta_{3,971}$ *H-6′*	$\delta_{7,331}$ *H-6*	$\delta_{7,251}$ *H-3*	$\delta_{6,843}$ *H-2*	$\delta_{4,605}$ *H-7*	$\delta_{3,155}$ *H-8*	$\delta_{3,121}$ *H-8*	$\delta_{1,240}$ *H-10*
R-salb/γ-CD	- 2.0	- 2.0	- 2.5	- 1.5	- 2.5	- 2.0	+ 65.5	+ 70.0	+ 116.5	+ 84.0	+ 88.5	+ 82.0	+ 5.0
S-salb/γ-CD	- 2.0	- 2.0	- 3.5	- 2.5	- 3.5	- 2.0	+ 70.0	+ 70.0	+ 116.5	+ 83.5	+ 88.0	+ 82.0	+ 5.0
RS-salb/γ-CD	- 5.0	- 4.0	- 6.5	- 4.0	- 7.0	- 4.5	+ 13.0	+ 15.0	+ 24.5	+ 15.0	+ 6.5	+ 6.5	+ 2.0

[a] $\Delta\delta_{\gamma\text{-CD}} = \delta_{salbutamol/\gamma\text{-CD}} - \delta_{\gamma\text{-CD}}$

[b] $\Delta\delta_{salb.} = \delta_{salbutamol/\gamma\text{-CD}} - \delta_{salbutamol}$

(A) = γ-CD

(B) = salbutamol