

CHAPTER III



RESULTS

1. The action of 0.25% and 0.5% solution of lidocaine hydrochloride (L) and bupivacaine hydrochloride (B) on artificial cell membranes composed of egg lecithin (Le), cholesterol (Cho), and bovine serum albumin (BSA), at various proportions of trough area (1:3:0, 2:2:0 and 3:1:0 area ratios) were shown by plotting surface pressure against surface area (trough area,%) of each system. The results were shown in Fig. 6-11 and Table IV.....

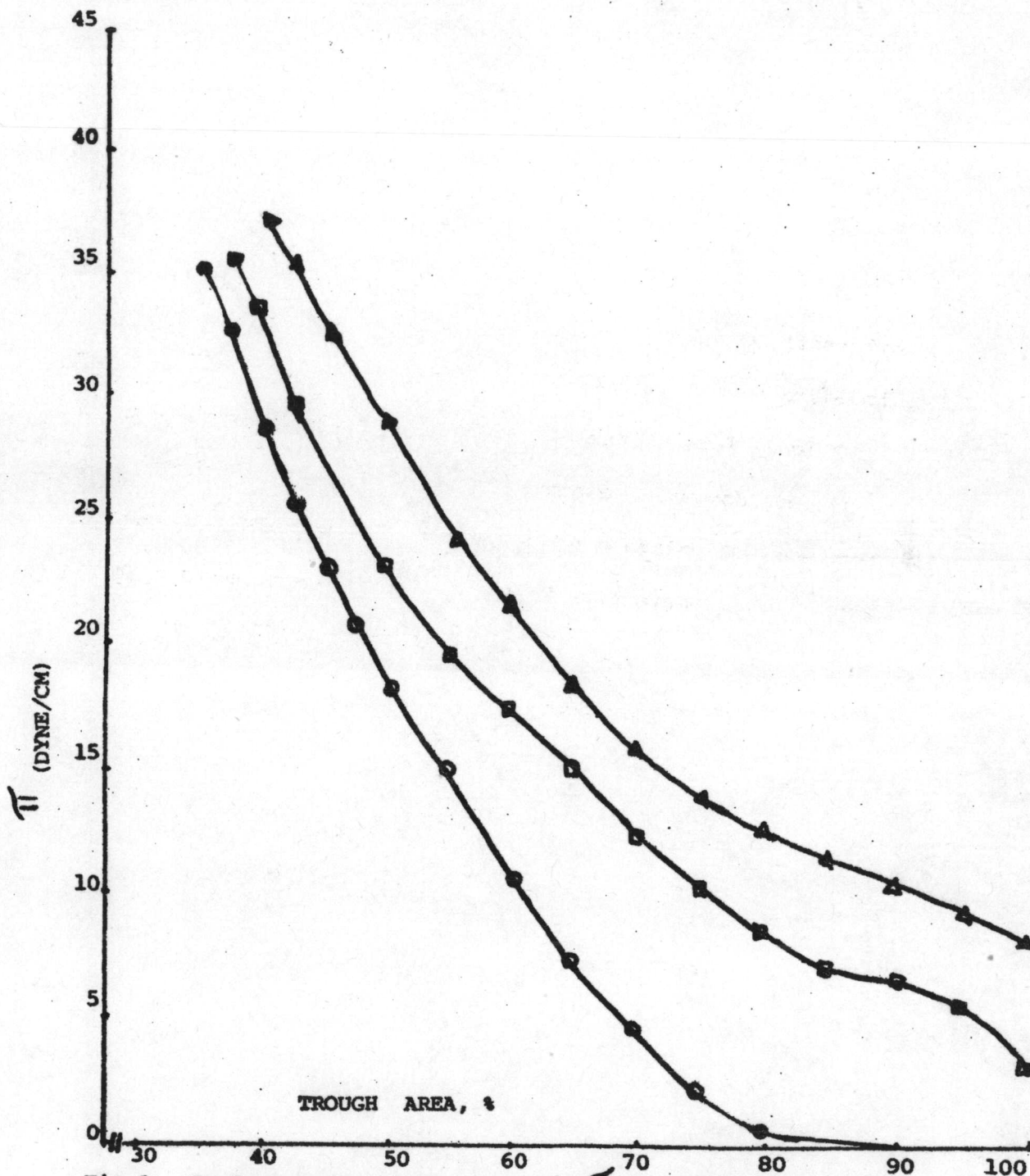


Fig.6 Surface pressure-surface area (π -A) curves of mixed egg lecithin-cholesterol-bovine serum albumin (1:3:0 area ratio) films on subphases at pH 5.9 containing no local anesthetic (O), 0.25% lidocaine hydrochloride (□), 0.25% bupivacaine hydrochloride (Δ).

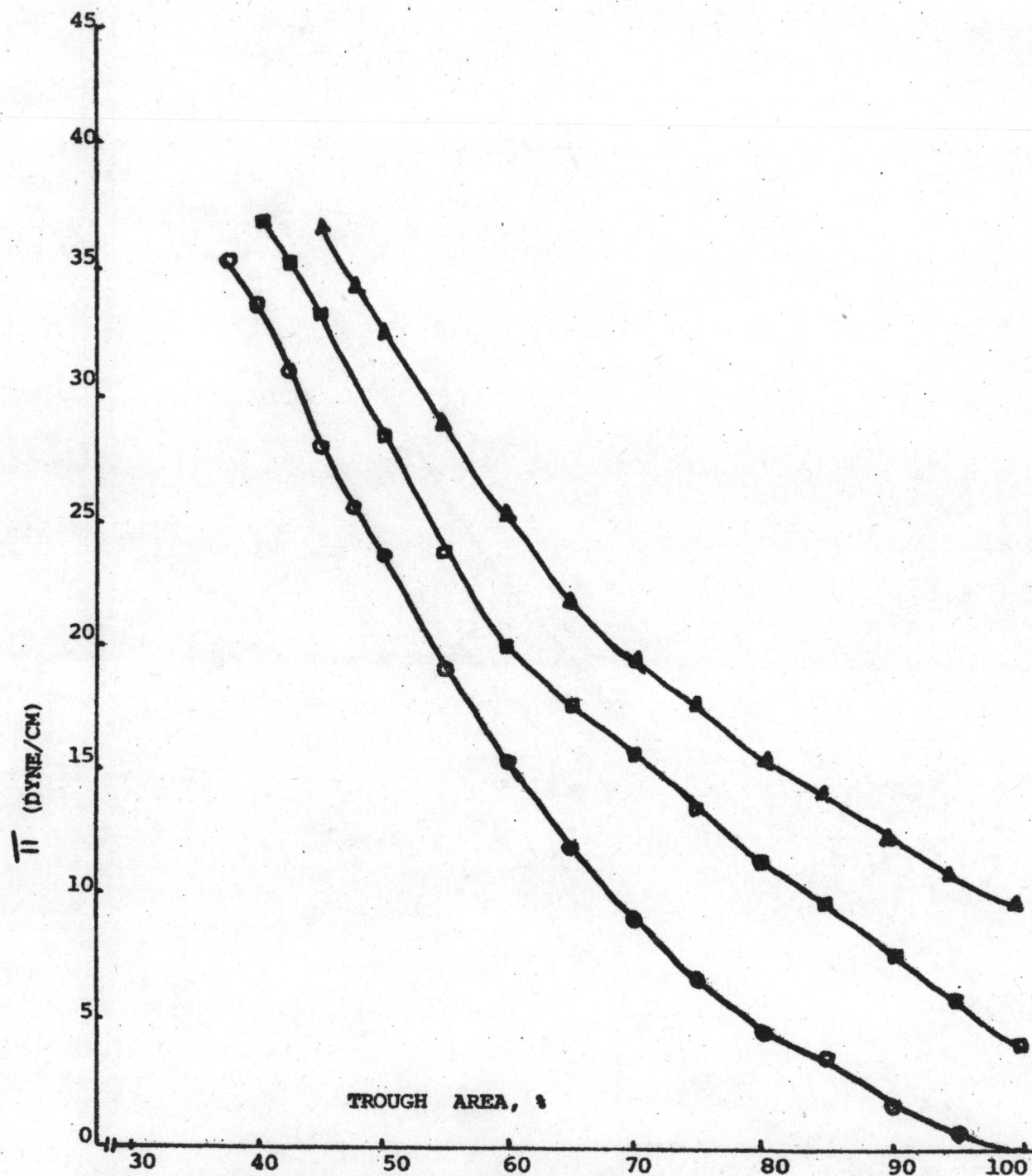


Fig.7 Surface pressure-surface area(π -A) curves of mixed egg lecithin-cholesterol-bovine serum albumin (2:2:0 area ratio) films on subphases at pH 5.9 containing no local anesthetic (○), 0.25% lidocaine hydrochloride (□), 0.25% bupivacaine hydrochloride (▲).

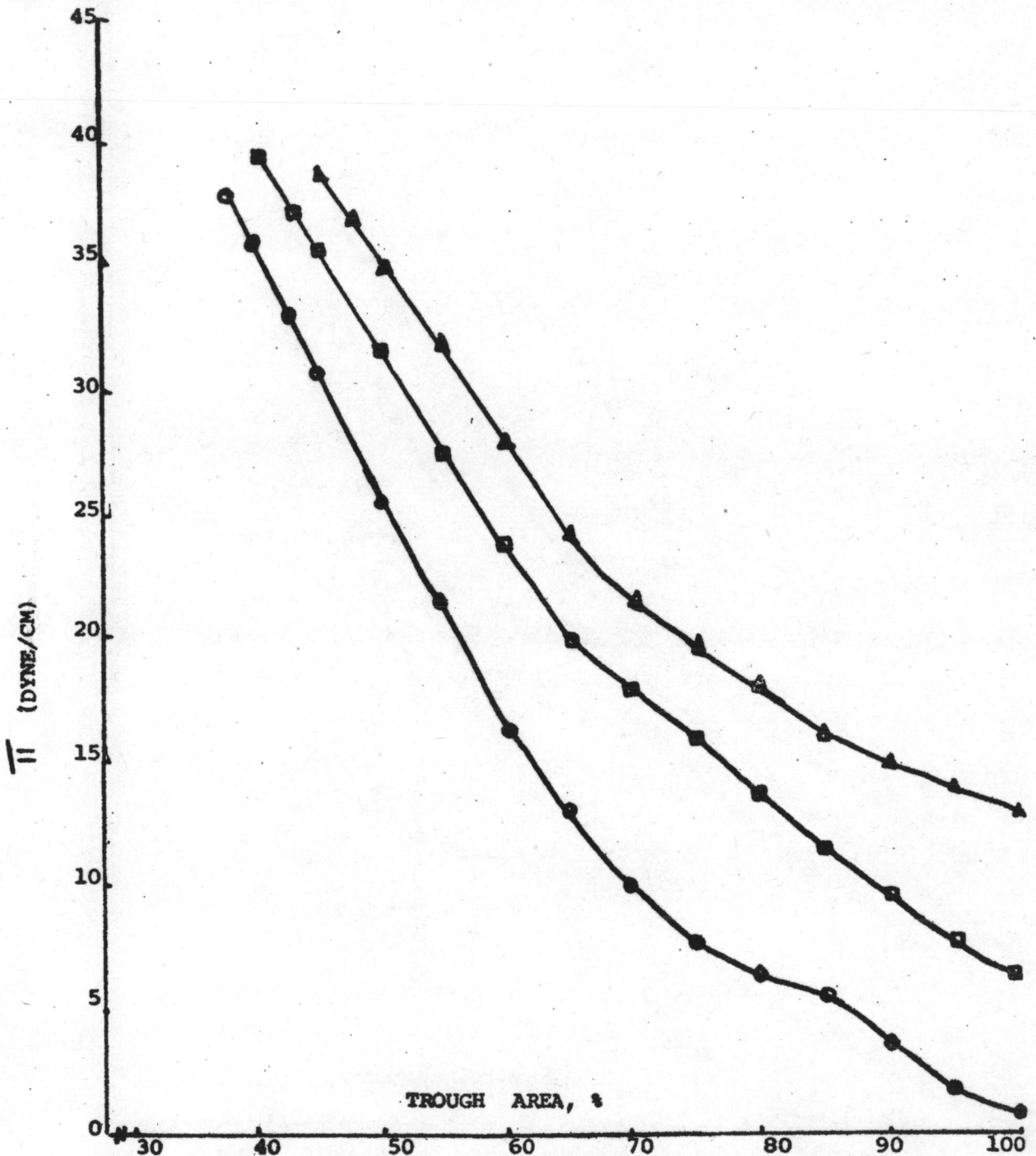


Fig.8 Surface pressure-surface area (Π -A) curves of mixed egg lecithin-cholesterol-bovine serum albumin (3:1:0 area ratio) films on subphases at pH 5.9 containing no local anesthetic: (○), 0.25% lidocaine hydrochloride (□), 0.25% bupivacaine hydrochloride (△).

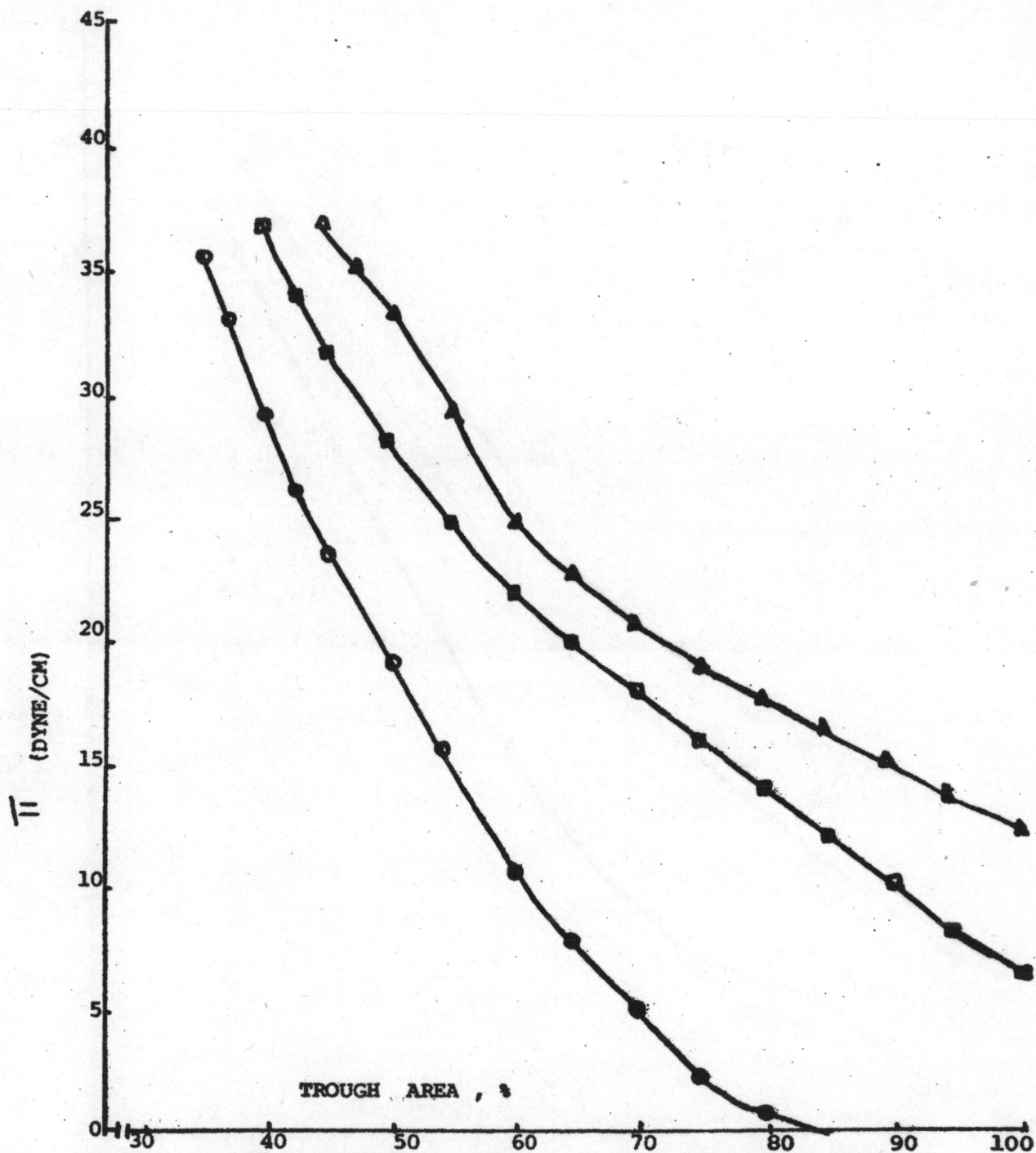


Fig.9 Surface pressure-surface area (π -A) curves of mixed egg lecithin-cholesterol-bovine serum albumin (1:3:0 area ratio) films on subphases at pH 5.9 containing no local anesthetic: (O), 0.5% lidocaine hydrochloride (□), 0.5% bupivacaine hydrochloride (▲).

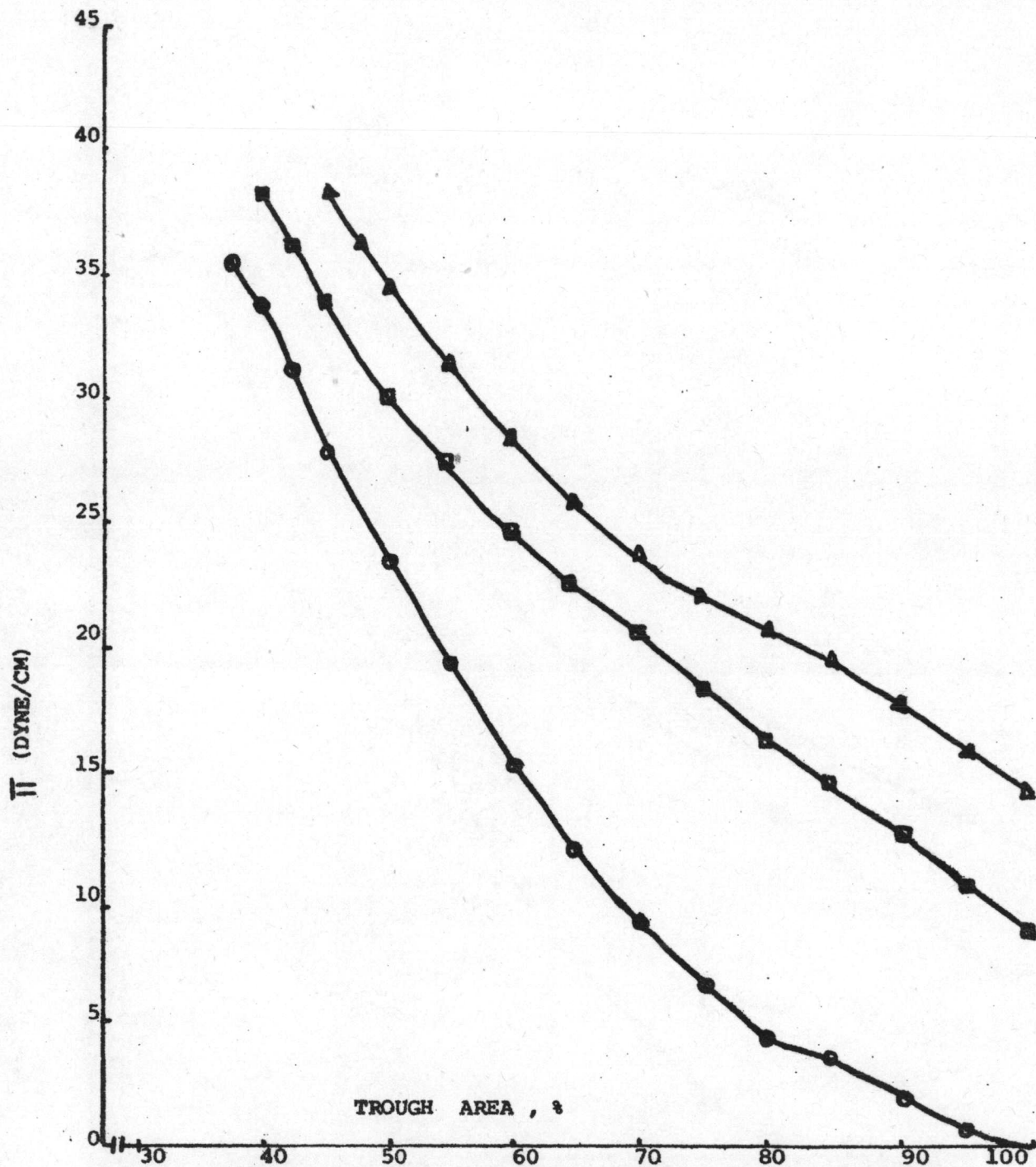


Fig.10 Surface pressure-surface area (Π -A) curves of mixed egg lecithin-cholesterol-bovine serum albumin (2:2:0 area ratio) films on subphases at pH 5.9 containing no local anesthetic (○), 0.5% lidocaine hydrochloride (□), 0.5% bupivacaine hydrochloride (▲).

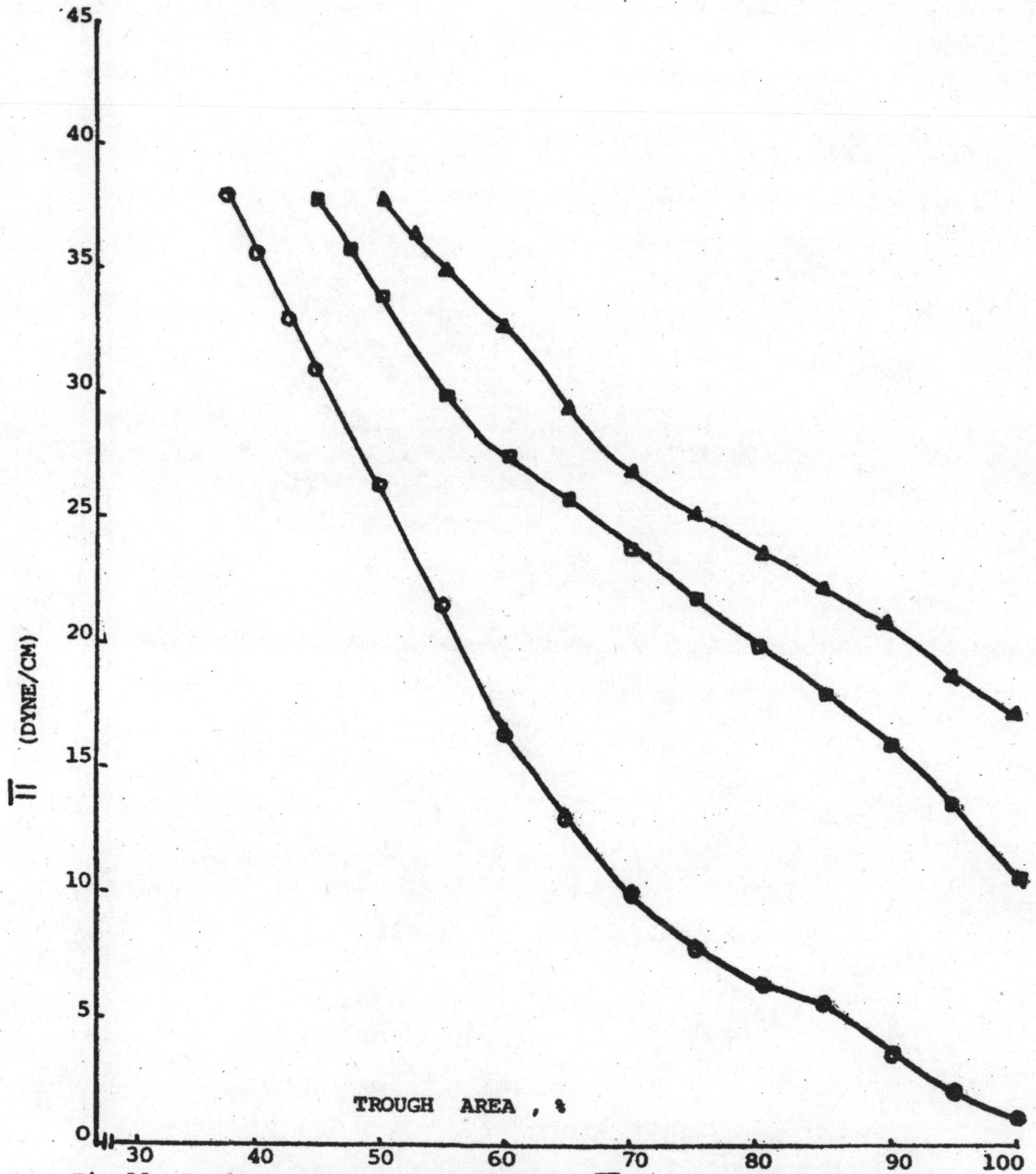


Fig.11 Surface pressure-surface area (Π -A) curves of mixed egg lecithin-cholesterol-bovine serum albumin (3:1:0 area ratio) films on subphases at pH 5.9 containing no local anesthetic (\circ), 0.5% lidocaine hydrochloride (\square), 0.5% bupivacaine hydrochloride (\triangle).

TABLE IV.

The conclusion of the results of lidocaine hydrochloride and bupivacaine hydrochloride action from the curves, at pH 5.9, on artificial cell membranes (Egg Le : Cho : BSA - 1:3:0, 2:2:0, 3:1:0).

Egg Le: Cho: BSA (area ratios)	Conc. of local anaesthetic (%)	T at 100% trough area (dyne/cm.)	T at film collapsing point (dyne/cm.)	% trough area at collapsing point	diff. of % trough area collapsing point
1:3:0	0 (standard)	0	35.35	35	0
	0.25%L	3.17	35.75	37.5	2.5
	0.25%B	8.12	37.23	40	5
	0.5%L	6.34	36.5	40	5
	0.5%B	12.28	36.43	45	10
2:2:0	0 (standard)	0	35.44	37.5	0
	0.25%L	4.35	37	40	2.5
	0.25%B	9.9	36.82	45	5.75
	0.5%L	8.71	38.41	40	2.5
	0.5%B	14.25	38.5	45	7.5
3:1:0	0 (standard)	0.99	37.82	37.5	0
	0.25%L	6.30	39.6	40	2.5
	0.25%B	12.75	38.61	45	7.5
	0.5%L	10.3	37.62	45.5	7.5
	0.5%B	16.83	37.25	50	12.5

2. The action of 0.25% and 0.5% solution of lidocaine hydrochloride (L) and bupivacaine hydrochloride (B) on artificial cell membranes composed of egg lecithin (Le), cholesterol (Cho), and bovine serum albumin (BSA), at various proportions of trough area (1:3:0, 2:2:0 and 3:1:0 area ratios), had been studied at pH 7.2 and shown by plotting surface pressure against surface area (trough area,%) of each system. The results were also shown in Fig. 12-17 and Table V.....

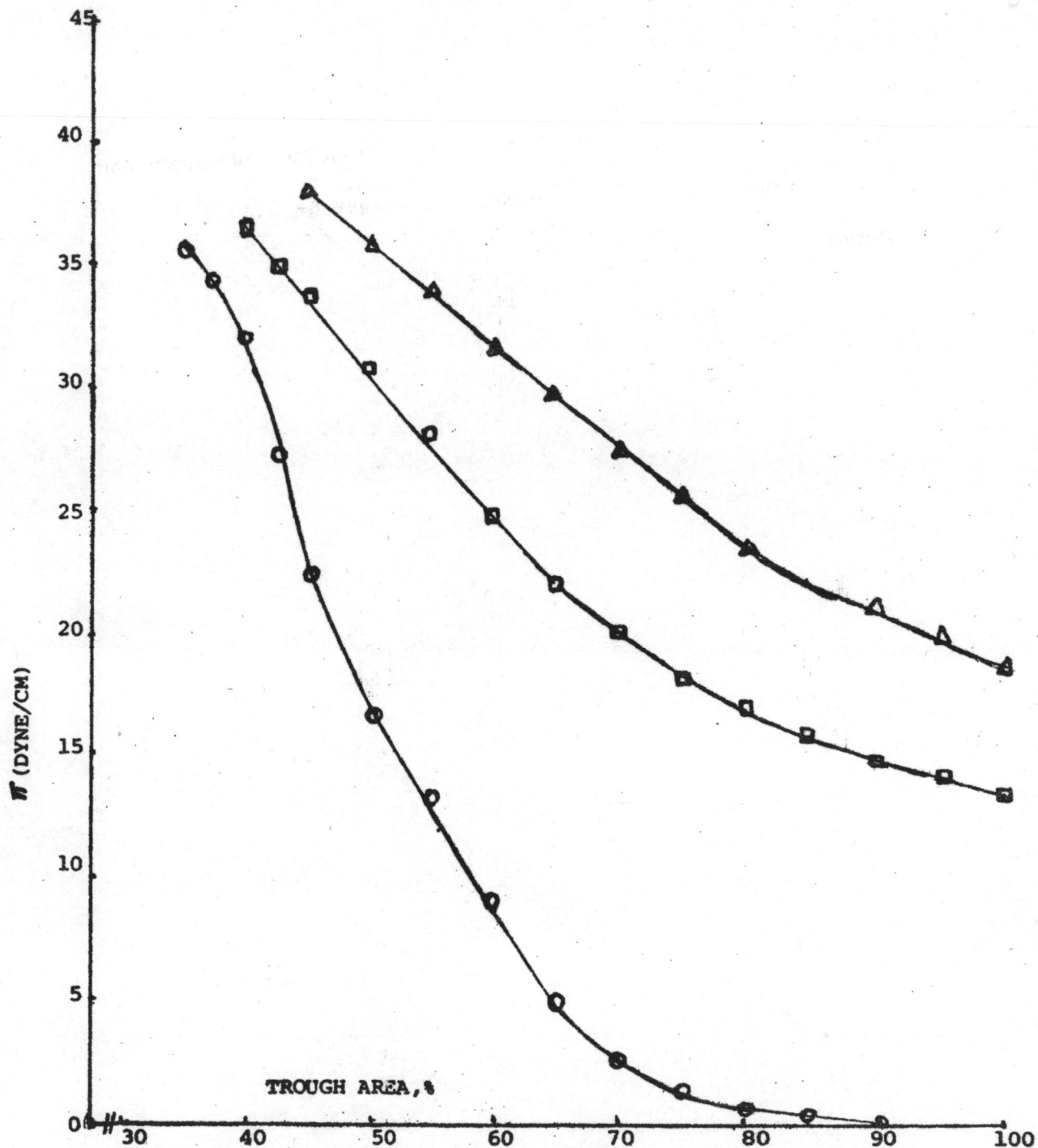


Fig.12 Surface pressure-surface area (π -A) curves of mixed egg lecithin-cholesterol-bovine serum albumin (1:3:0 area ratio) films on subphases at pH 7.2 containing no local anaesthetic (●), 0.25% lidocaine hydrochloride (◻), 0.25% bupivacaine hydrochloride (▲).

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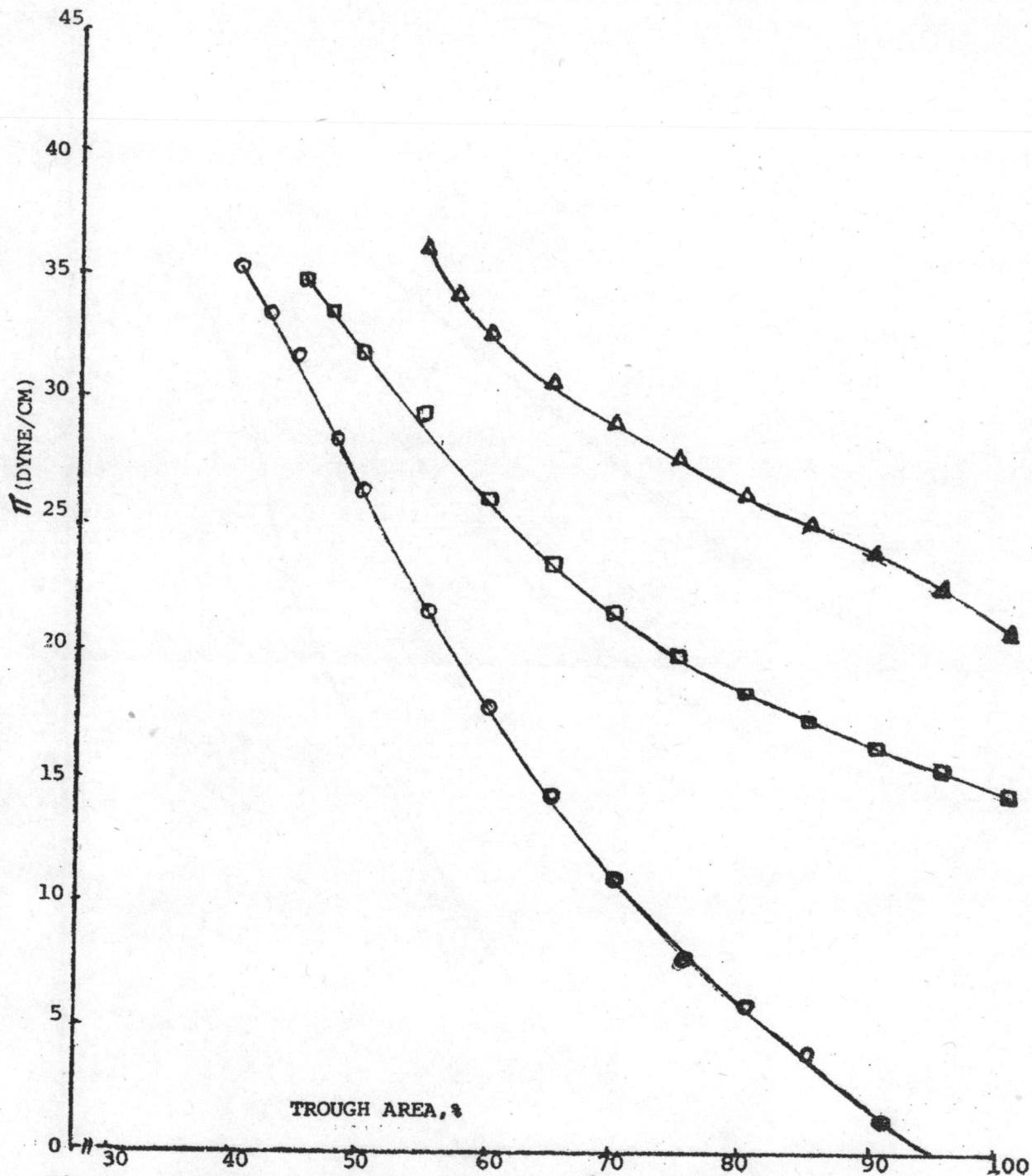


Fig.13 Surface pressure-surface area (π -A) curves of mixed egg lecithin-cholesterol-bovine serum albumin (2:2:0 area ratio) films on subphases at pH 7.2 containing no local anaesthetic (○), 0.25% lidocaine hydrochloride, (□), 0.25% bupivacaine hydrochloride (▲).

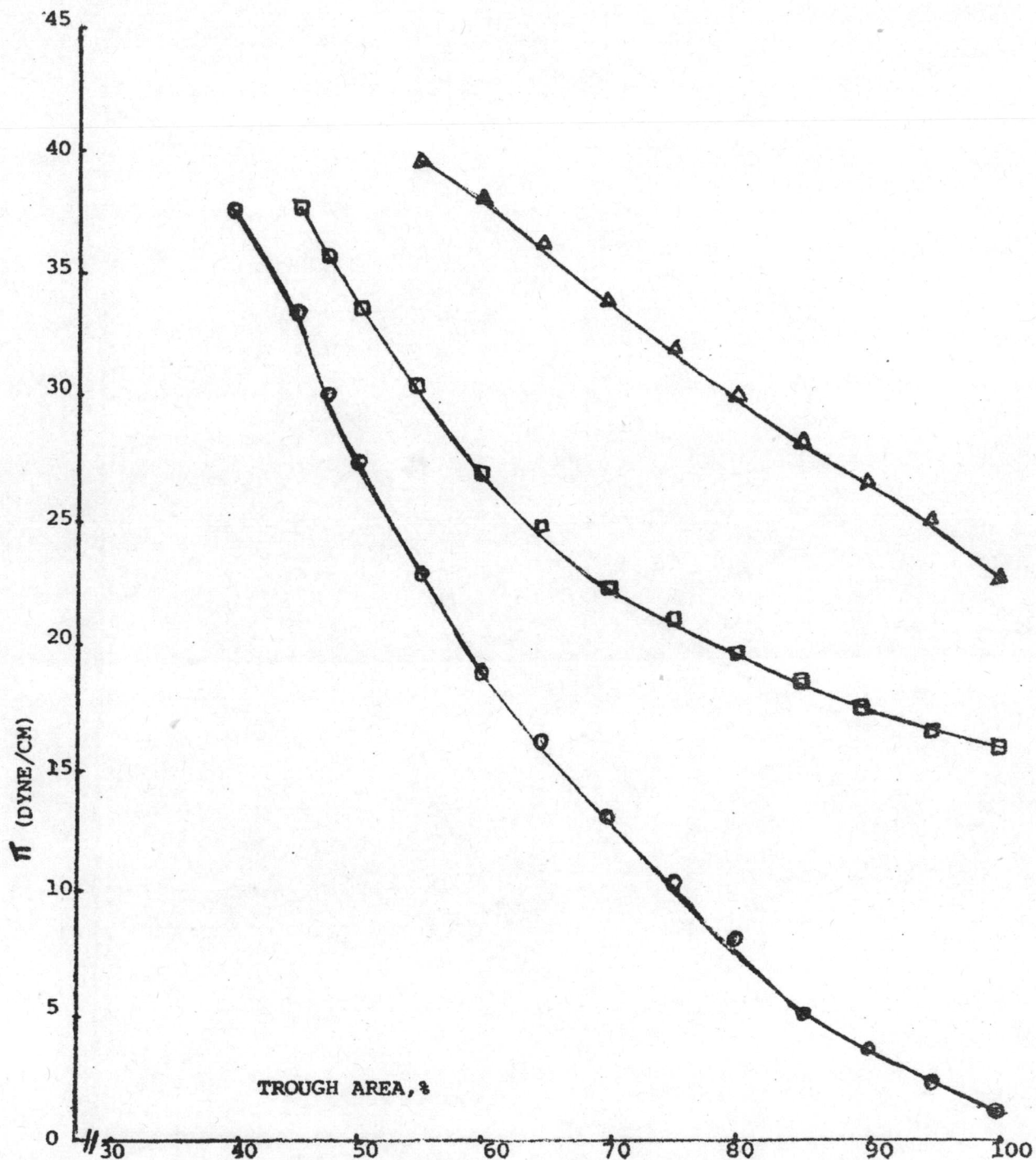


Fig.14 . Surface pressure-surface area (π -A) curves of mixed egg lecithin-cholesterol-bovine serum albumin (3:1:0 area ratio) films on subphases at pH 7.2 containing no local anaesthetic (●), 0.25% lidocaine hydrochloride (◻), 0.25% bupivacaine hydrochloride (▲).

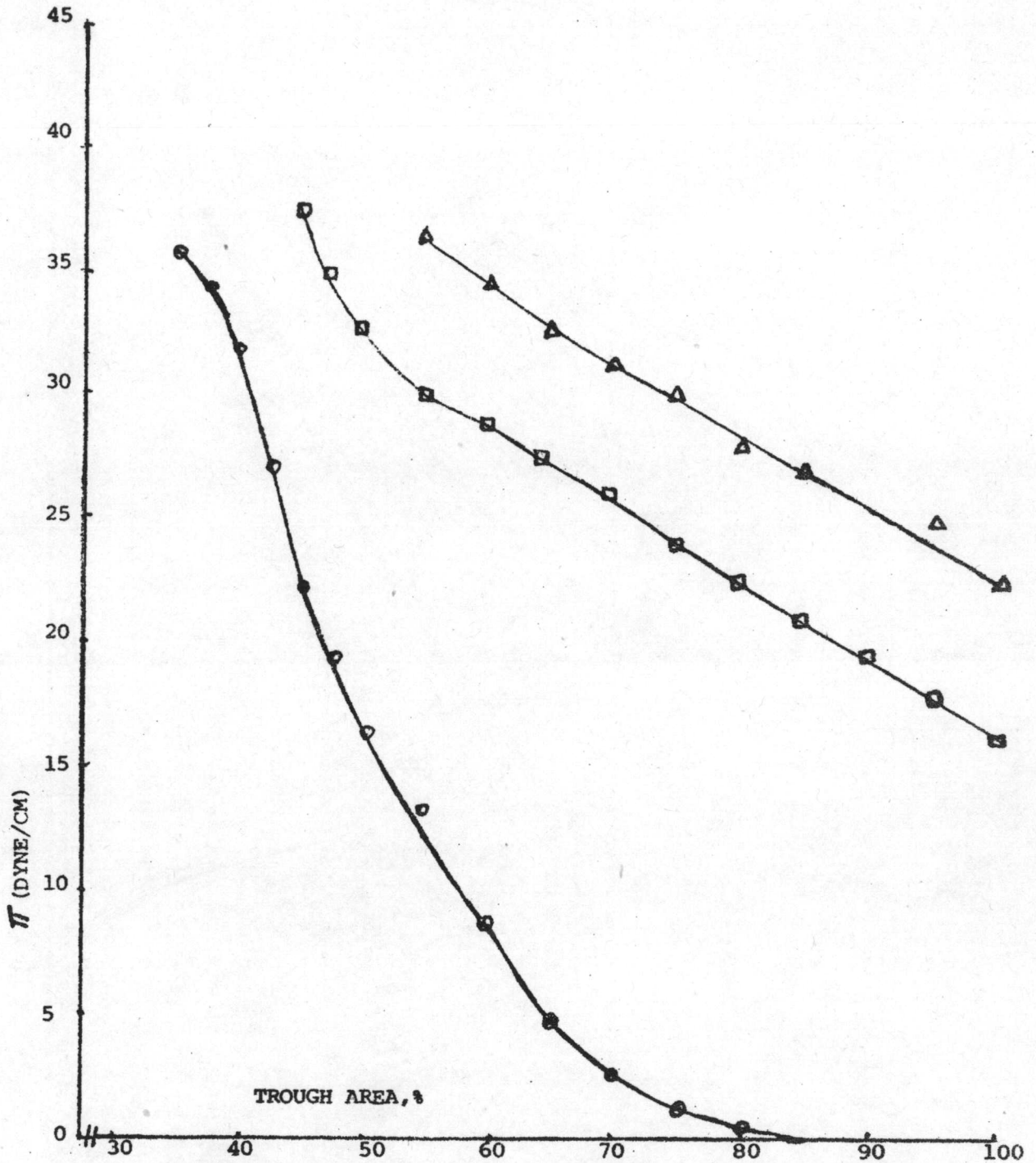


Fig.15 Surface pressure-surface area ($\bar{\pi}$ -A) curves of mixed egg lecithin-cholesterol-bovine serum albumin (1:3:0 area ratio) films on subphases at pH 7.2 containing no local anaesthetic (O), 0.5% lidocaine hydrochloride (□), 0.5% bupivacaine hydrochloride (Δ).

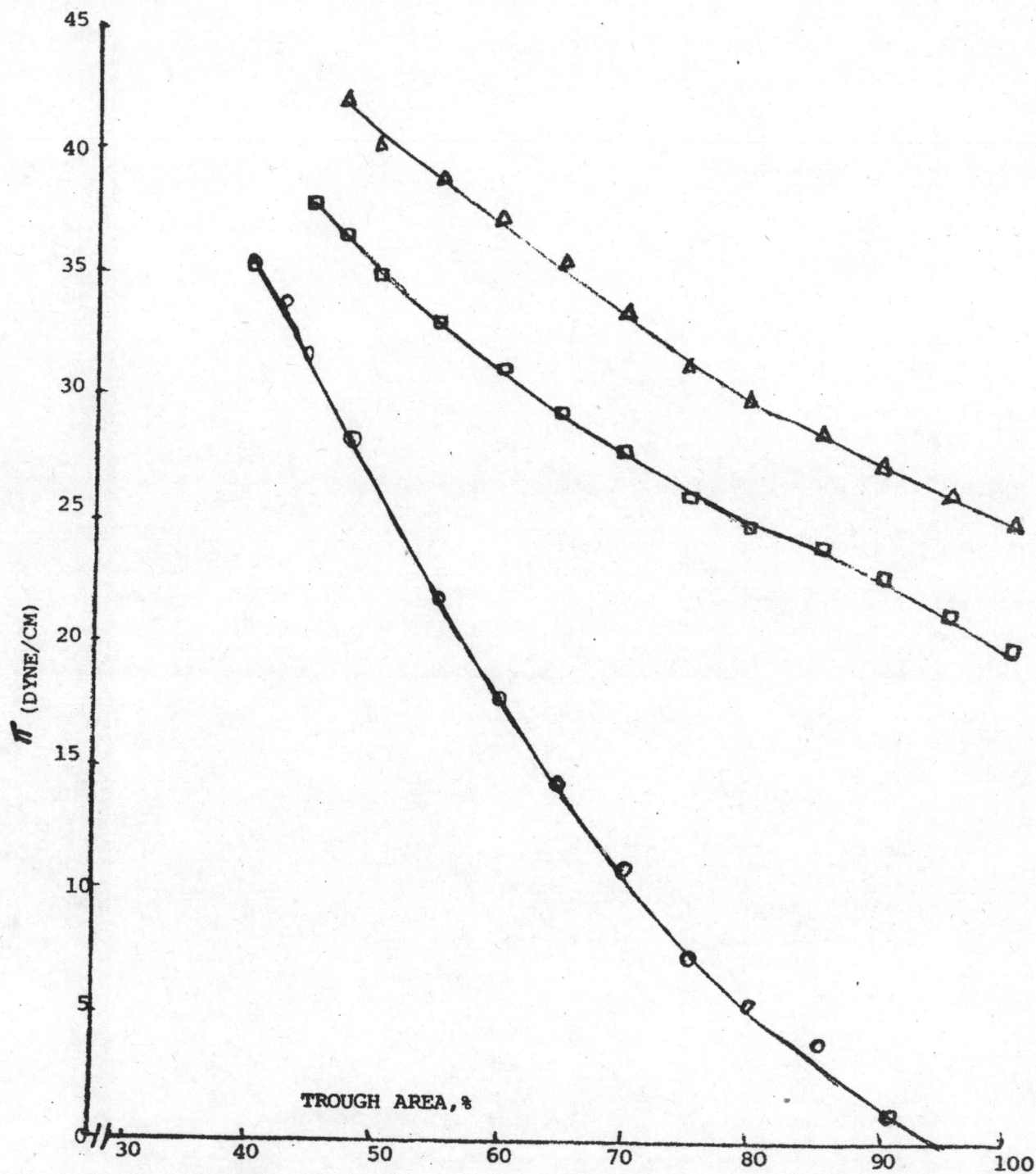


Fig.16 Surface pressure-surface area (π -A) curves of mixed egg lecithin-cholesterol-bovine serum albumin (2:2:0 area ratio) films on subphases at pH 7.2 containing no local anaesthetic (O), 0.5% lidocaine hydrochloride (□), 0.5% bupivacaine hydrochloride (▲).

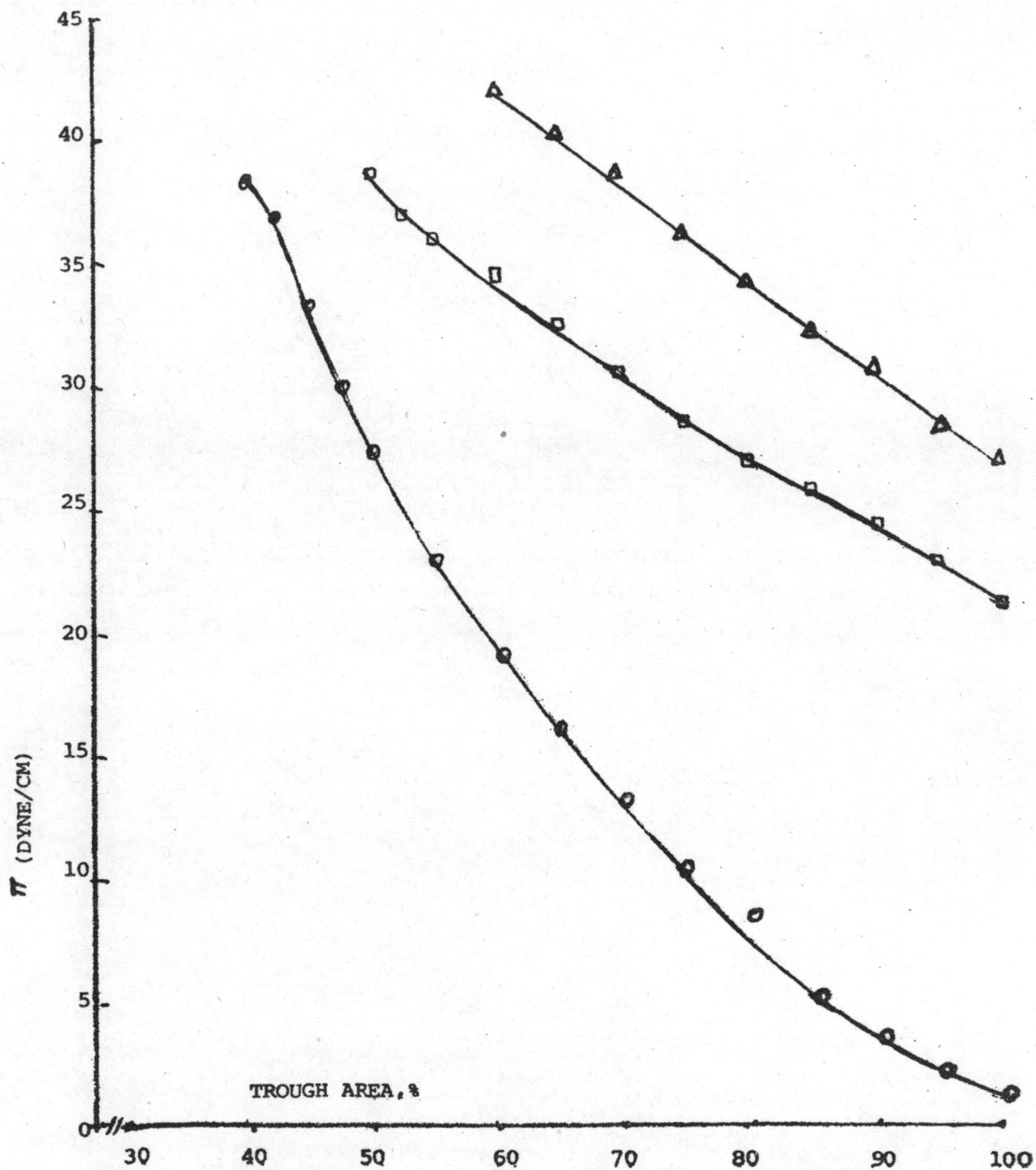


Fig.17 Surface pressure-surface area (π -A) curves of mixed egg lecithin-cholesterol-bovine serum albumin (3:1:0 area ratio) films on subphases at pH 7.2 containing no local anaesthetic (O), 0.5% lidocaine hydrochloride (□), 0.5% bupivacaine hydrochloride (Δ).

TABLE V.

The conclusion of the results of lidocaine hydrochloride and bupivacaine hydrochloride action from the curves, at pH 7.2, on artificial cell membranes (Egg Le : Cho : BSA - 1:3:0, 2:2:0, 3:1:0).

Egg Le: Cho: BSA (area ratios)	Conc. of local anaesthetic (%)	T at 100% trough area (dyne/cm.)	T at film collapsing point (dyne/cm.)	% trough area at collapsing point	diff. of % trough area collapsing point
1:3:0	0 (standard)	0	35.64	35	0
	0.25%L	13.25	36.43	40	5
	0.25%B	18.61	38.00	45	10
	0.5%L	15.23	38.8	42.5	7.5
	0.5%B	22.5	36.5	55	20
2:2:0	0 (standard)	0	35.25	40	0
	0.25%L	14.45	35	45	7.5
	0.25%B	20.5	36.25	55	15
	0.5%L	19.8	37.62	45	5
	0.5%B	24.55	42	47.5	7.5
3:1:0	0 (standard)	1.18	37.51	40	0
	0.25%L	15.86	37.51	45	5
	0.25%B	22.5	39.5	55	15
	0.5%L	21.38	38.42	50	10
	0.5%B	26.73	42	60	20

3. The action of the 0.25% and 0.5% solution of lidocaine hydrochloride (L), and bupivacaine hydrochloride (B), at pH 5.9, on artificial cell membranes composed of egg lecithin (Egg Le), cholesterol (Cho), and bovine serum albumin (BSA) at various proportions of trough area (1:3:4, 2:2:4 and 3:1:4, area ratio) had been shown in Fig. 18-23 and Table VI....

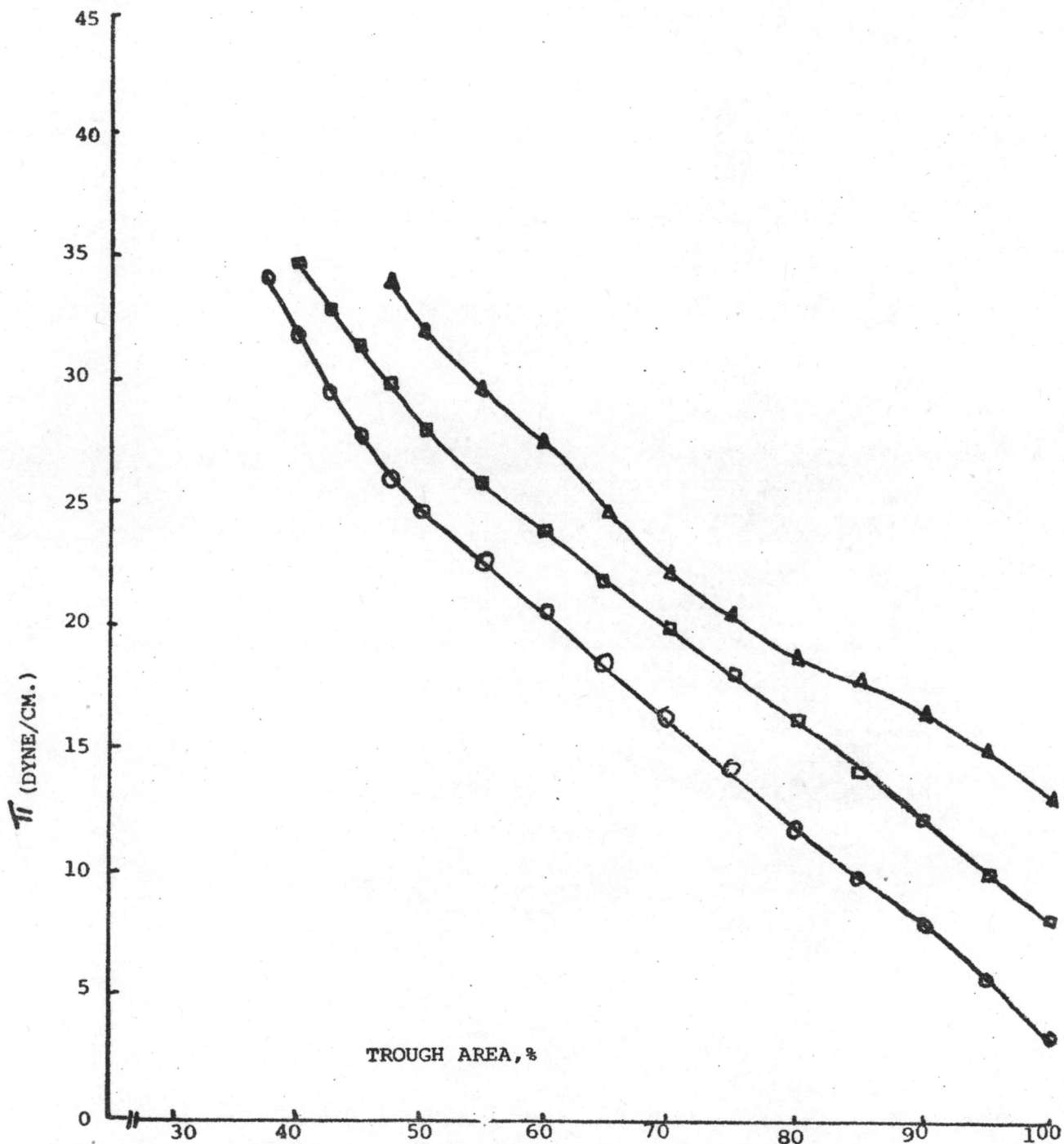
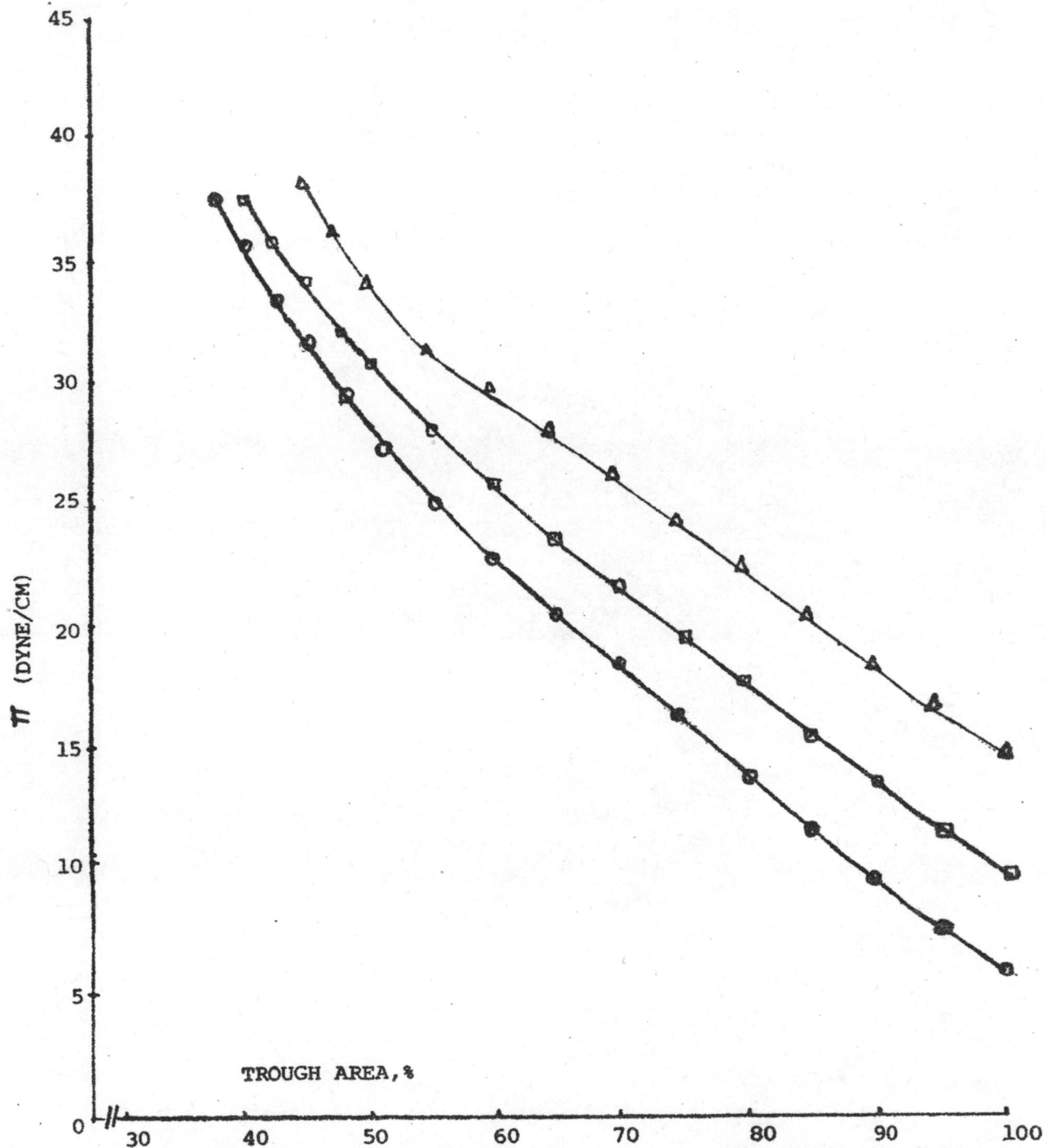


Fig. 18 Surface pressure-surface area (π -A) curves of mixed egg lecithin-cholesterol-bovine serum albumin (1:3:4 area ratio) films on subphases at pH 5.9 containing no local anaesthetic (○), 0.25% lidocaine hydrochloride (◻), 0.25% bupivacaine hydrochloride (△).



Fig,19 Surface pressure-surface area (π -A) curves of mixed egg lecithin-cholesterol-bovine serum albumin (2:2:4 area ratio) films on subphases at pH 5.9 containing no local anaesthetic (O), 0.25% lidocaine hydrochloride (□), 0.25% bupivacaine hydrochloride (Δ).

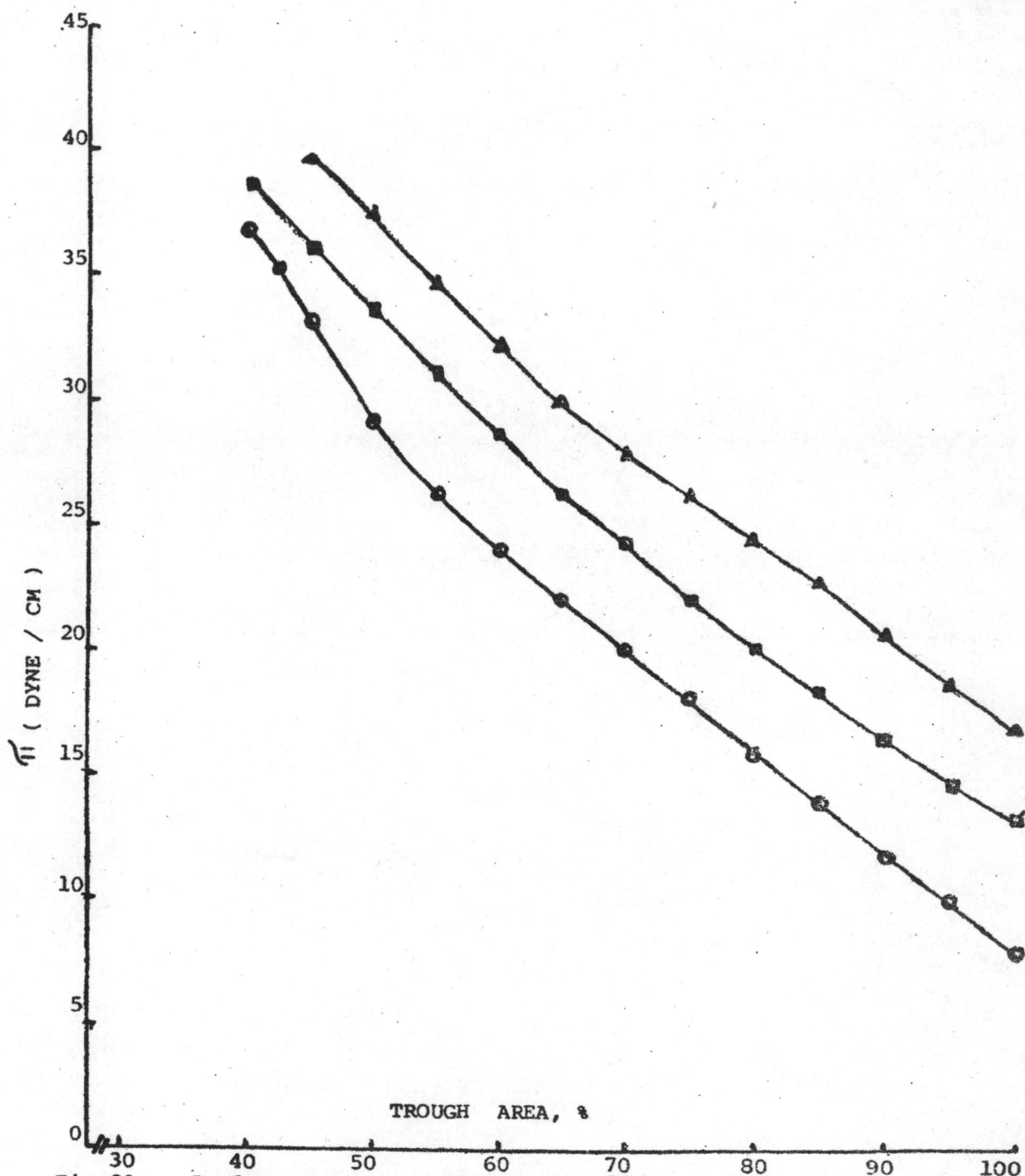


Fig.20 Surface pressure-surface area (π -A) curves of mixed egg lecithin-cholesterol-bovine serum albumin (3:1:4 area ratio) films on subphases at pH 5.9 containing no local anesthetic (\circ), 0.25% lidocaine hydrochloride (\square), 0.25% bupivacaine hydrochloride (Δ).

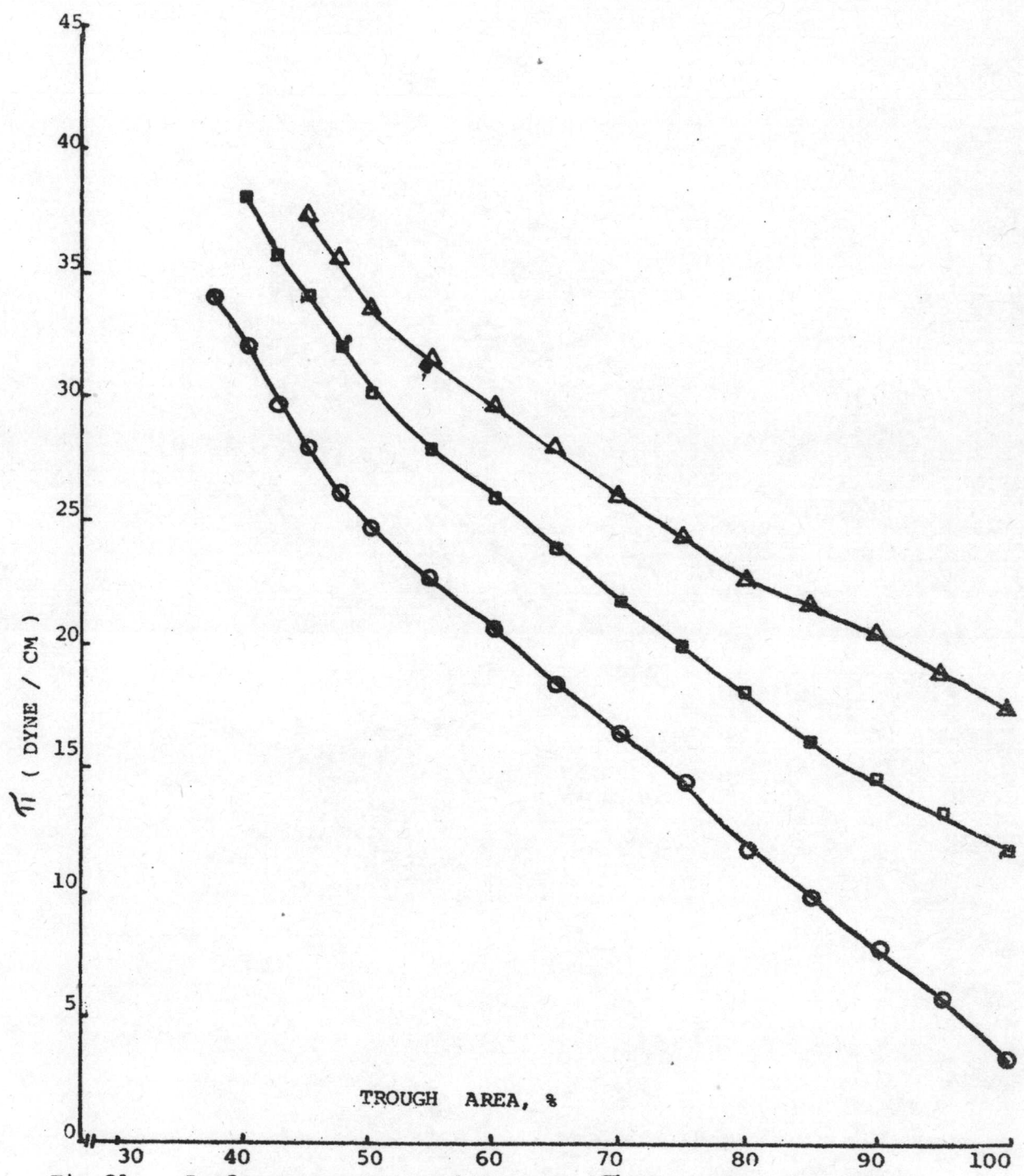


Fig.21 Surface pressure-surface area (π -A) curves of mixed egg lecithin-cholesterol-bovine serum albumin (1:3:4 area ratio) films on subphases at pH 5.9 containing no local anesthetic (○), 0.5% lidocaine hydrochloride (□), 0.5% bupivacaine hydrochloride (Δ).

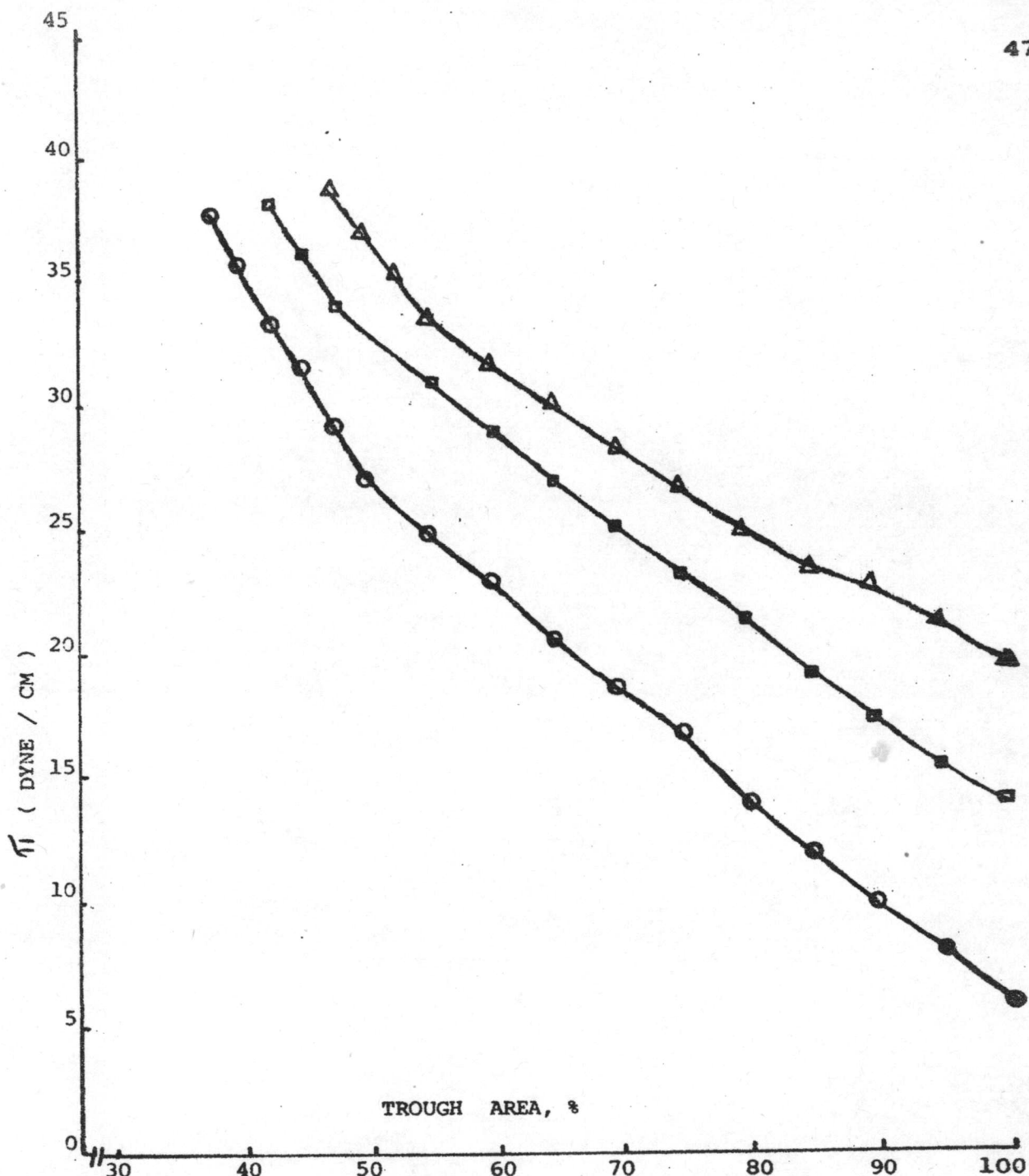


Fig.22 Surface pressure-surface area (π -A) curves of mixed egg lecithin-cholesterol-bovine serum albumin (2:2:4 area ratio) films on subphases at pH 5.9 containing no local anesthetic (O), 0.5% lidocaine hydrochloride (□), 0.5% bupivacaine hydrochloride (Δ).

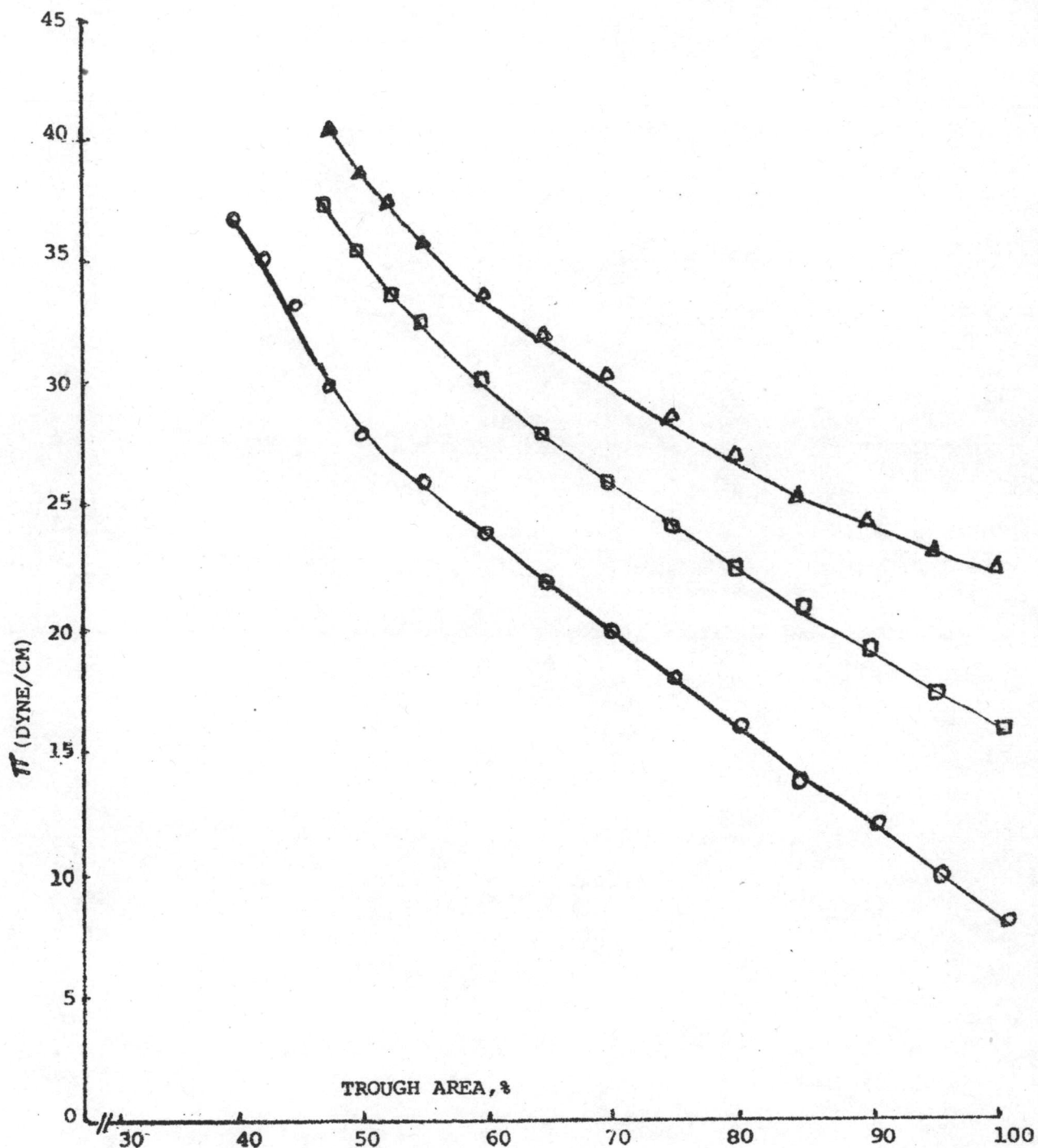


Fig.23 Surface pressure-surface area (π -A) curves of mixed egg lecithin-cholesterol-bovine serum albumin (3:1:4 area ratio) films on subphases at pH 5.9 containing no local anaesthetic (O), 0.5% lidocaine hydrochloride (□), 0.5% bupivacaine hydrochloride (Δ).

TABLE VI.

The conclusion of the results of lidocaine hydrochloride and bupivacaine hydrochloride action, from the curves, at pH 5.9, on artificial cell membranes (Egg Le : Cho : BSA - 1:3:4, 2:2:4, 3:1:4) .

Egg Le: Cho: BSA (area ratios)	Conc. of local anaesthetic (%)	π at 100% trough area (dyne/cm.)	π at film collapsing point (dyne/cm.)	% trough area at collapsing point	diff. of % trough area collapsing point
1:3:4	0 (standard)	3.5	34.25	37.50	0
	0.25%L	8	35	40	2.50
	0.25%B	13.1	33.85	47.50	10
	0.5%L	11.88	38.01	40	2.5
	0.5%B	17.42	37.25	45	7.5
2:2:4	0 (standard)	5.9	37.62	37.5	0
	0.25%L	10	37.52	40	2.5
	0.25%B	15.05	38.02	45	7.5
	0.5%L	13.84	38.00	42.5	5
	0.5%B	19.4	38.61	47.5	10
3:1:4	0 (standard)	8	36.62	40	0
	0.25%L	13.07	38.41	40	0
	0.25%B	16.63	39.60	45	5
	0.5%L	15.63	37.25	47.5	7.5
	0.5%B	22.25	40.5	47.5	7.5

4. The action of the 0.25% and 0.5% solution of lidocaine hydrochloride (L) and bupivacaine hydrochloride (B), at pH 7.2, on artificial cell membranes composed of egg lecithin (Egg Le), cholesterol (Cho), and bovine serum albumin (BSA), at various proportions of trough area (1:3:4, 2:2:4 and 3:1:4 area ratios), had been shown in Fig. 24-29 and Table VII.....

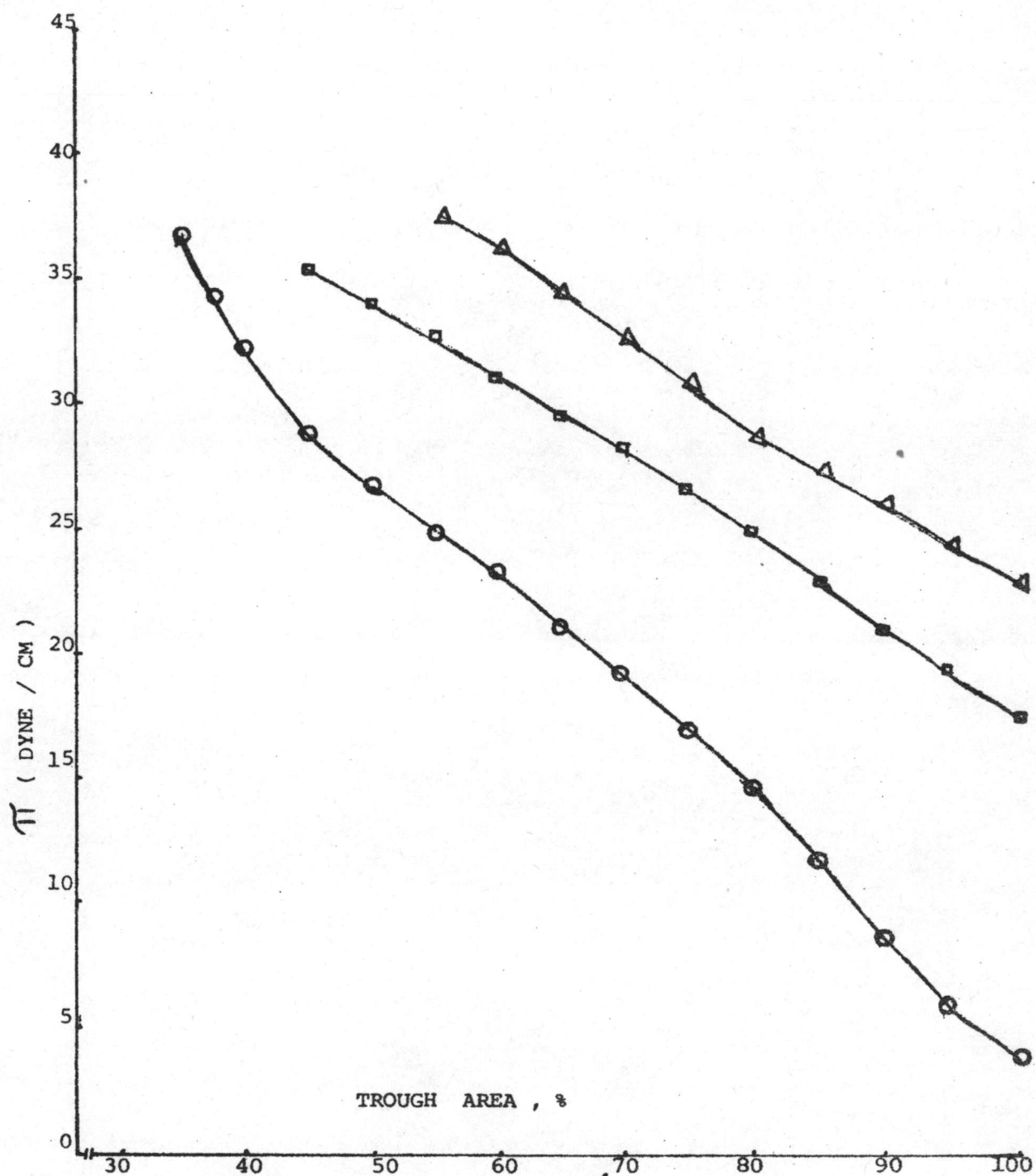


Fig.24 Surface pressure-surface area (π -A) curves of mixed egg lecithin-cholesterol-bovine serum albumin (1:3:4 area ratio) films on subphases at pH 7.2 containing no local anesthetic: (○), 0.25% lidocaine hydrochloride (□), 0.25% bupivacaine hydrochloride (△).

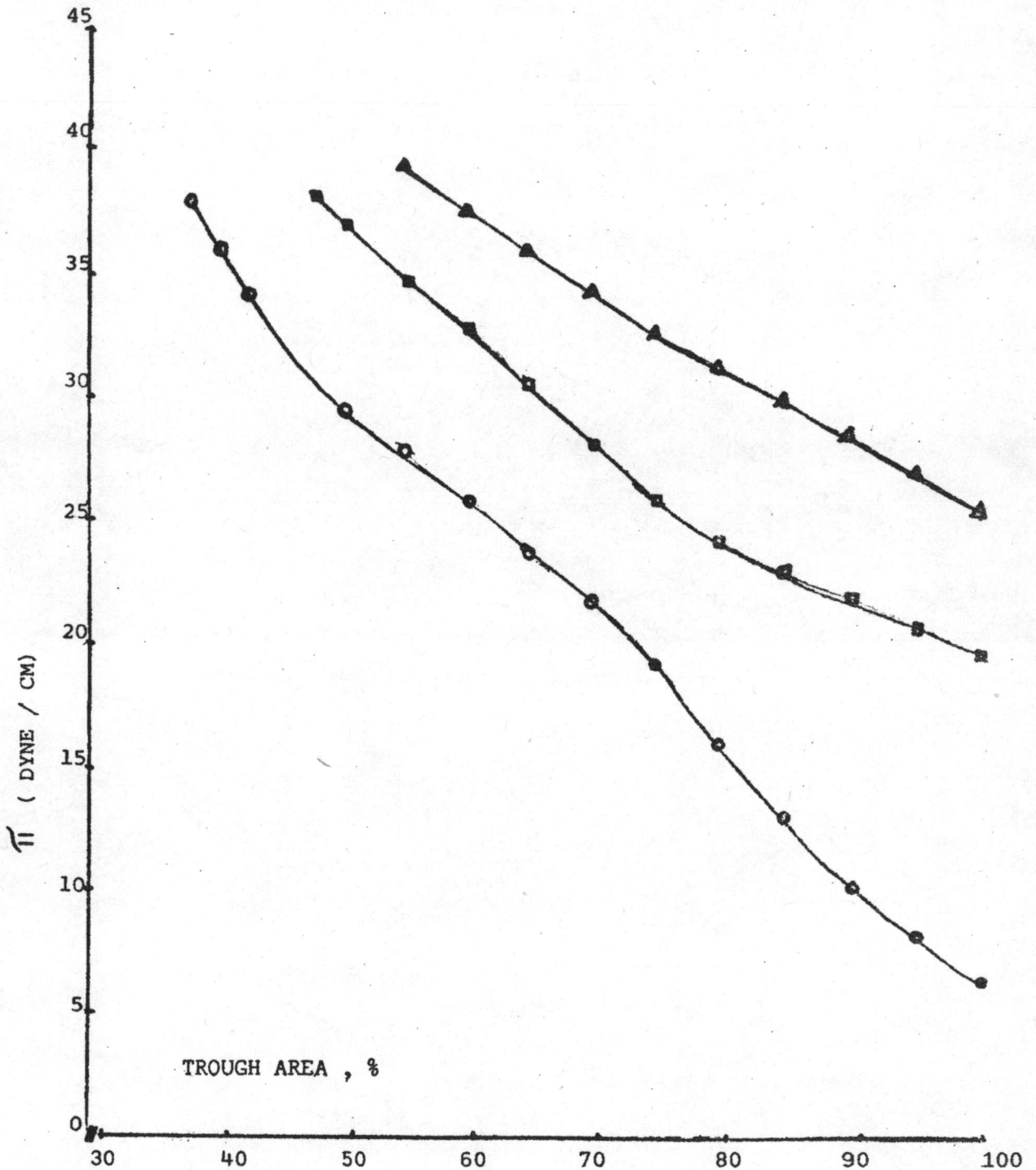


FIG 25. Surface pressure-surface area (π -A) curves of mixed egg lecithin-cholesterol-bovine serum albumin (2:2:4 area ratio) films on subphases at pH 7,2 containing no local anaesthetic: (●), 0,25% lidocaine hydrochloride (◻), 0,25% bupivacaine hydrochloride (▲).

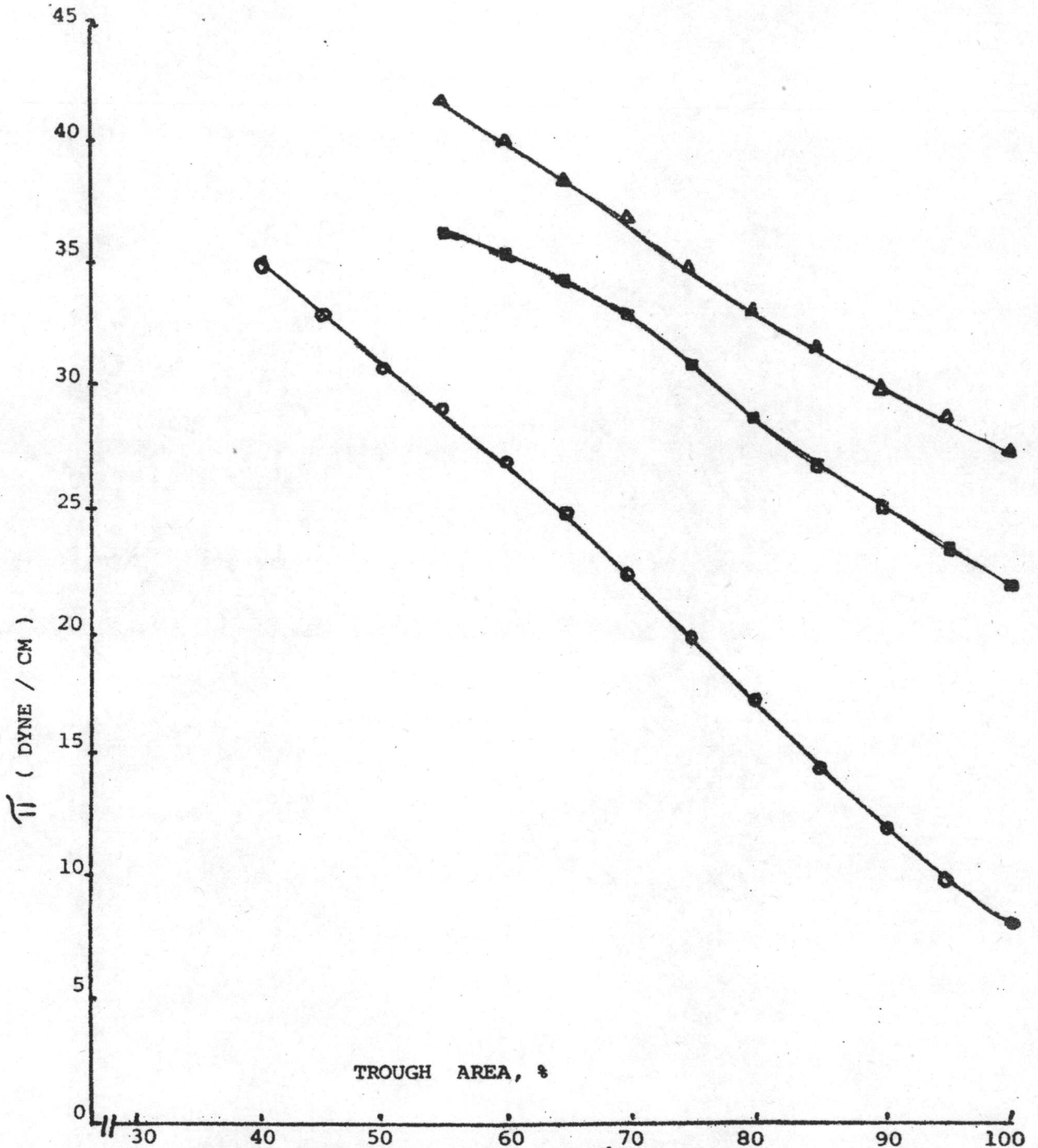


Fig. 26 Surface pressure-surface area (π -A) curves of mixed egg lecithin-cholesterol-bovine serum albumin (3:1:4 area ratio) films on subphases at pH 7.2 containing no local anesthetic (\circ), 0.25% lidocaine hydrochloride (\square), 0.25% bupivacaine hydrochloride (Δ).

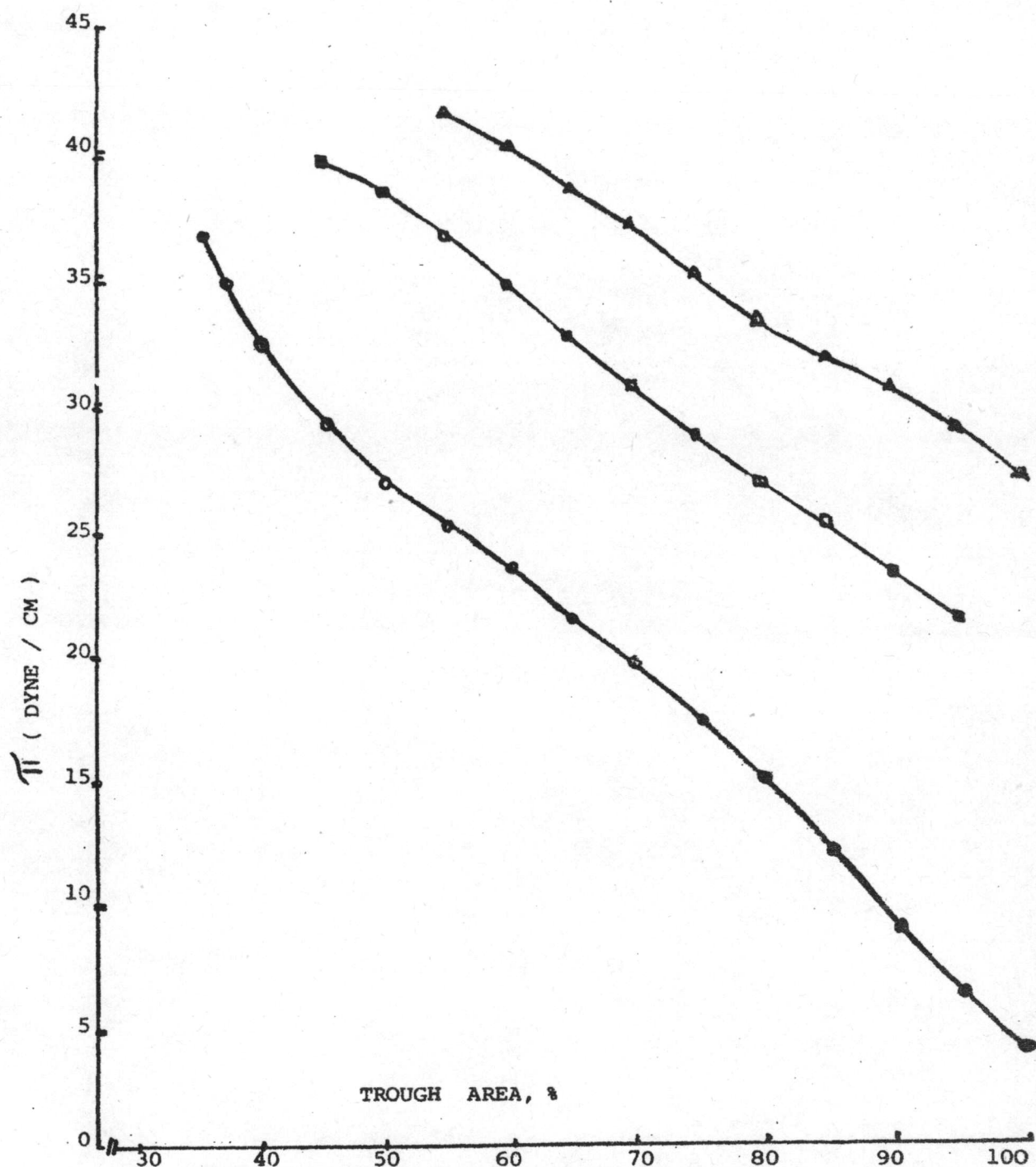


Fig.27 Surface pressure-surface area (π -A) curves of mixed egg lecithin-cholesterol-bovine serum albumin (1:3:4 area ratio) films on subphases at pH 7.2 containing no local anesthetic (O), 0.5% lidocaine hydrochloride (□), 0.5% bupivacaine hydrochloride (Δ).

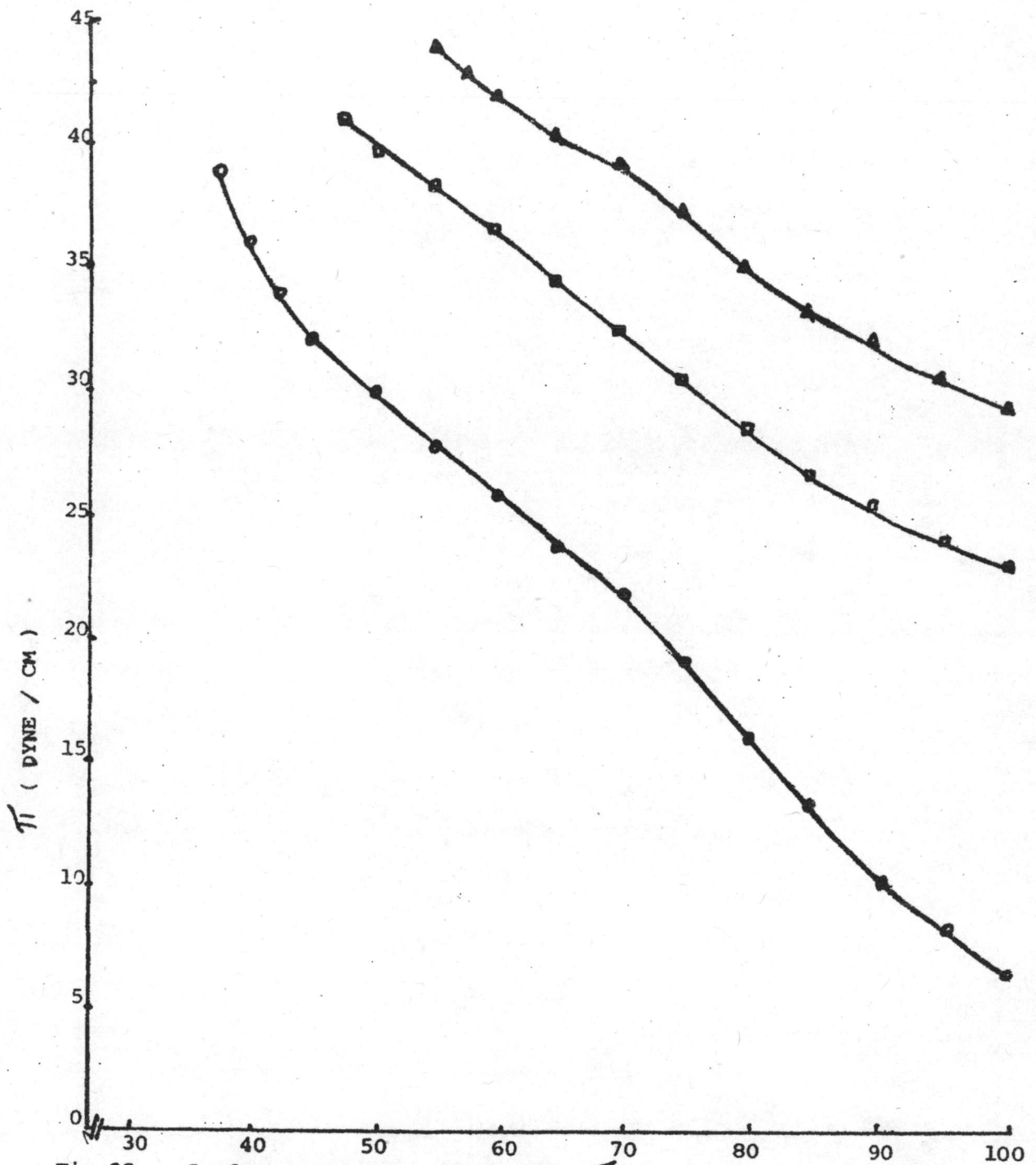


Fig.28 Surface pressure-surface area (π -A) curves of mixed egg lecithin-cholesterol-bovine serum albumin (2:2:4 area ratio) films on subphases at pH 7.2 containing no local anesthetic (●), 0.5% lidocaine hydrochloride (□), 0.5% bupivacaine hydrochloride (Δ).

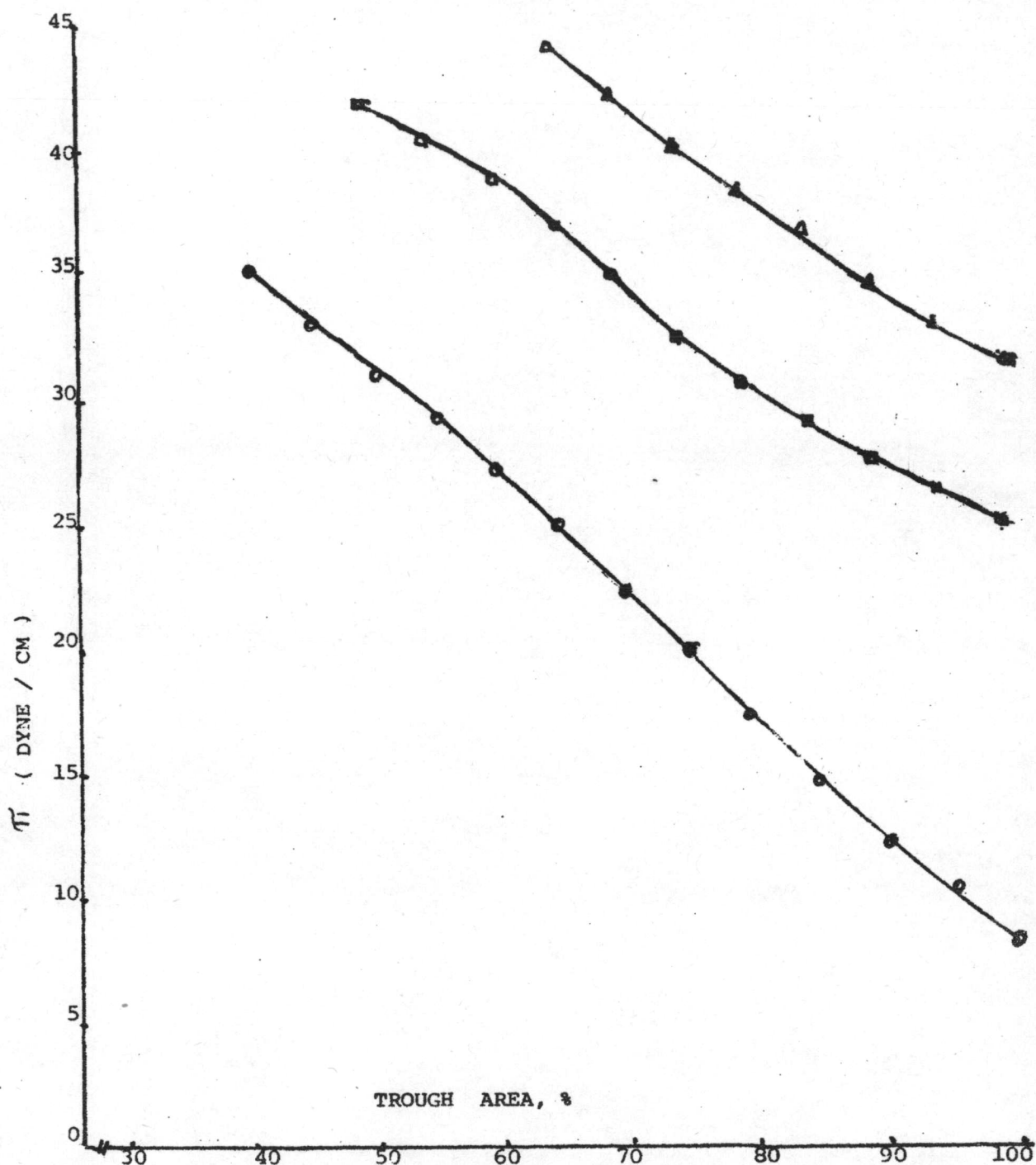


Fig.29 Surface pressure-surface area (π -A) curves of mixed egg lecithin-cholesterol-bovine serum albumin (3:1:4 area ratio) films on subphases at pH 7.2 containing no local anesthetic (O), 0.5% lidocaine hydrochloride (□), 0.5% bupivacaine hydrochloride (Δ).

TABLE VII.

The conclusion of the results of lidocaine hydrochloride and bupivacaine hydrochloride action from the curves, at pH 7.2, on artificial cell membranes (Egg Le : Cho : BSA - 1:3:4, 2:2:4, 3:1:4).

Egg Le: Cho: BSA (area ratios)	Conc. of local anaesthetic (%)	T at 100% trough area (dyne/cm.)	T at film collapsing point (dyne/cm.)	% trough area at collapsing point	diff. of % trough area collapsing point
1:3:4	0 (standard)	3.96	36.43	35	0
	0.25%L	17.24	35.44	45	10
	0.25%B	22.57	37.52	55	20
	0.5%L	20	39.40	45	10
	0.5%B	26.75	41.58	55	20
2:2:4	0 (standard)	6.13	38.61	37.5	0
	0.25%L	19.40	38.25	47.5	10
	0.25%B	25	39.25	55	17.5
	0.5%L	22.97	41.18	47.5	10
	0.5%B	20.34	43.96	55	17.5
3:1:4	0 (standard)	8	35.04	40	0
	0.25%L	21.75	36.01	55	15
	0.25%B	26.93	41.58	55	15
	0.5%L	24.948	41.78	50	10
	0.5%B	30.88	43.96	65	25