Bull. Pharm. Sci. Assiut University
Vol. 6, PP. 123 -134

A STUDY ON THE DISSOLUTION OF DIRECTLY COMPRESSED DIIODOQUIN TABLETS

A.E. Aboutaleb & S.A. Tout
Department of Industrial Pharmacy, Faculty of Pharmacy,
University of Assiut, Assiut, Egypt.

The effect of certain directly compressible vehicles on the dissolution rate of directly compressed diiodoquin tablets was investigated. Different tablet formulations containing various vehicles were selected for this study.

Tablets investigated were prepared using different proportions of either single or binary blends of vehicles and was found to possess different disintegration times. A significant correlation was obtained between the dissolution time (T50) and the disintegration time.

The dissolution rate was dependent on the type of vehicle used and its actual concentration in the formula. Other factors such as the type and concentration of the lubricant (s), hardness values of the tablets prepared, solubility of the drug as well as interactions between the drug and vehicles used may also, play a part.

Nadi et al[1] investigated the effect of formulation additives on the dissolution behaviour of tetracycline fromtheir directly compressed tablets.

Solvang and finholt[2] attributed the fact that tablet containing free acid radicals disintegrated rapidly in acidic

media, but those containing sodium salt did not disintegrate but only swelled and dissolved slowly from their surface. Accordingly, hydrochloride salts of tetracycline dissoluted rapidly in acidic media. The presence of water soluble surfactants lubricante and disintegrants enhanced the rate of dissolution of the drug[3].

On the other hand many industrial factors can also, effect the dissolution rate, as compressional pressure[4], double compression method[5] and the method by which granules were prepared[6]. Singh et al[7] investigated the role of wetting and the rate of drug release from inert matrix. Matrix permeability and rates of permeation of matrix, by the solvent medium used can individually limit the amount of drug released.

Drug vehicle interaction or drug lubricant interaction may occour and this lead to decrease in the dissolution rate. Eid[8] studied the influence of complex formation on drug release from tablets. It was found that the higher the adjuvant/drug ratio the greater the interaction tendency between the drug and adjuvant. Kaneniwa and Watari[9] investigated the influence of particle size on the dissolution behaviour of slightly soluble drugs.

EXPERIMENTAL

Materials and equipments:

a) Diicdoquin tablets were selected from the different formulations previousely prepared. Their physical standa rds are shown in Table 1.
b) 0.1N hydrochloric acid.
c) Pye unicam SP6-400 U.V. Spectro-Photometer.

d) B.P. disintegration apparatus.

Procedures:

The dissolution rate was determined using B.P. disintegration apparatus as used by Broadbent et al[10]. One tablet was introduced in each cup in place of the usual five tablets specified officially, and the dissolution medium was 250 ml of 0.1N hydrochloric acid. Samples were taken at different time intervals accomodated according to disintegration behaviour of the batch under test, but generally dissolution was followed for more than 110 minutes up to two hours. Samples of 0.2 - 1 ml were withdrawn from the cup keeping the apparatus in motion replacing the samples by equal volume of 0.1N hydrochloric acid. The samples were transfered to 25 ml volumetric flasks and completed to volume with 0.1N hydrochloric acid and measured spectrophotometrically at 258 nm. The percentage of diiodoquin dissoluted at various time intervals was determined for 5 tablets from each batch and the mean value was calculated. As shown in Table 2.

RESULTS AND DISCUSSIONS

All tested diiodoquin tablets disintegrated within the official time. Diiodoquin tablets produced using STA-R_x1500 starch completely dissoluted after relatively long time. The percentage of diiodoquin obtained after 10 minutes was 18 - 24% w/w and reached to 52 - 47% w/w after one hour, further, the rate decreased by time. This may be due to the insolubility of the medicament as shown in Table 2. The increase in STA-R_x1500 percentage in the formula was accompanied

by an increase in the percentage of diiodoquin dissoluted. This may be due to the disintegration effect of STA-R_x which gave rise to small granules with large surface area which inturn may increase the solubility of the medicament. The percentage diiodoquin dissoluted from the batches prepared using different concentrations of STA-R_x1500 can be arranged as follows:
STA-R_x1500 49% > STA-R_x1500 42% > STA-R_x1500 32.6% > STA-R_x1500 19.6%

Tablets prepared using STA-R_x1500 blended with Avicel in ratio 1:1 were also, studied. Avicel was found to increase the hardness of the tablets. Which in tura may lead to decrease in the dissolution rate. On the other hand blends of vehicles can be arranged as follows with regard to the rate of dissolution of diiodoquin form its directly compressed tablets using STA-R_x1500/Avicel 1:1 blends

STA-R_x1500/Avicel 49.0% > 42% > 32.6% 19.6% w/w as shown in Table 2 and Figure 1.

Blends of Celutab with STA-R_x1500 produced tablets with relatively small dissolution rate. The increase in actual concentration of the vehicle in the formula lead to adecrease in the disintegration time and increase in the dissolution rate.

From Table 1 and Figure 2 the dissolution rates of tablets produced using Avicel/STA-R_x1500 1:1 and STA-R_x1500 were more than that produced using STA-R_x1500/Celutab 1:1 This can be explained by the increase in the viscosity of the dissolution medium due to the solubilization of sugars and therefore a decrease in the dissolution rate may occur.

From diiodoquin tablets containing blends of STA-R_x/ Celutab 3:1 the percentages of diiodoquin dissoluted after 60 minutes were 45 - 25,43.01, 42.12 and 38.15 from formulas containing 49% w/w, 42.0% w/w, 32.5% and 19.0% w/w respectively.

A significant correlations was obtained between disintegration time and dissolution rate of diiodoquin tablets for the blend containing Avicel/STA-R_x1500 it was T50 = 32.6 + 1.16 D

There D is the disintegration time.

CONCLUSION

From the previous results and discussions it can be concluded that:

Generally the dissolution rate of diiodoquin was affected mainly by the vehicle used for the preparation of tablets. Diiodoquin tablets produced using single vehicles did not disintegrations during a reasonable time except those containing STA-R_x1500. Tablets produced using Avicel/STA-R_x1:1 blend gave rise to tablets with relatively longer dissolution time.

A significant correlation was obtained between disintegration time and dissolution rate for the tablets investigated T50 = 32.6 + 1.16 D where D is the disintegration time.

Table 1: Effect of blends of STA-R$_x$ 1500 with other vehicles on the Physical characteristics of Diiodoquin tablets.

Vehicle Name	Conc.% w/w	Weight (gm) mean	Weight (gm) C.V.%	Thickness (mm) mean	Thickness (mm) C.V.%	Hardness (Kg) mean	Hardness (Kg) C.V.%	Friability (Loss%) mean	Friability (Loss%) C.V.%	No. of capped Tablets	H.F.R.	D.T. (minutes) mean	D.T. (minutes) C.V.%
STA-R$_x$ / Anhydrous Lactose 1:1	0	-	-	-	-	-	-	-	-	-	-	-	-
	19.6	0.096	2.52	1.94	0.74	1.50	10.41	2.72	34.95	13	0.55	108.42	20.85
	32.6	0.1085	2.55	2.07	1.07	1.88	11.33	2.71	69.95	15	0.69	24.51	5.97
	42.0*	0.117	2.58	2.20	1.29	4.70	77.43	1.54	52.78	1	3.05	25.80	11.75
	49.0*	0.129	0.86	2.39	1.19	8.53	54.67	0.77	10.54	0	11.08	15.55	9.45
STA-R$_x$ / Anhydrous Lactose 1:3	0	-	-	-	-	-	-	-	-	-	-	-	-
	19.6	-	-	-	-	-	-	-	-	-	-	-	-
	32.6	0.094	3.83	2.05	1.41	1.50	15.71	2.54	55.12	811	0.59	45.03	10.04
	42.0*	0.1154	1.86	2.22	1.13	4.73	8.90	0.984	21.9	0	4.81	26.69	13.58
	49.0*	0.1270	1.36	2.36	6.77	7.90	7.02	0.935	78.05	0	8.45	34.59	4.34
STA-R$_x$ / Anhydrous Lactose 3:1	0	-	-	-	-	-	-	-	-	-	-	-	-
	19.6	-	-	-	-	-	-	-	-	-	-	-	-
	32.6	0.095	5.31	2.13	1.22	1.225	17.86	3.05	31.48	11	0.40	11.03	11.84
	42.0	0.109	2.60	2.31	0.814	1.80	10.95	1.29	10.3	13	1.40	8.81	22.06
	49.0*	0.1194	1.78	2.40	0.611	3.40	8.63	0.923	7.08	3	3.68	17.91	13.25
STA-R$_x$ / Emcompress 1:1	0	-	-	-	-	-	-	-	-	-	-	-	-
	19.6	-	-	-	-	-	-	-	-	-	-	-	-
	32.6	-	-	-	-	-	-	-	-	-	-	-	-
	42.0*	0.119	0.209	2.34	0.8	1.68	15.04	1.57	66.14	14	1.07	4.17	80.4
	49.0*	0.124	2.36	2.44	0.755	2.05	11.20	1.32	35.28	5	1.55	4.18	11.93
STA-R$_x$ / Emcompress 1:3	0	-	-	-	-	-	-	-	-	-	-	-	-
	19.6	-	-	-	-	-	-	-	-	-	-	-	-
	32.6	-	-	-	-	-	-	-	-	-	-	-	-
	42.0	-	-	-	-	-	-	-	-	-	-	-	-
	49.0*	0.121	1.88	2.51	0.62	1.75	16.32	5.14	19.04	811	0.24	1.76	24.4
STA-R$_x$ / Emcompress 3:1	0	-	-	-	-	-	-	-	-	-	-	-	-
	19.6*	0.094	0.71	2.197	1.02	0.825	20.45	5.42	50.5	811	0.152	23.13	18.86
	32.6*	0.088	0.912	2.26	1.03	0.725	25.44	5.89	6.14	811	0.120	12.55	6.67
	42.0	0.097	1.28	2.31	1.00	0.83	33.73	5.22	43.34	811	0.16	5.60	18.81
	49.0*	0.1036	1.74	2.44	1.04	0.85	20.56	1.56	16.78	811	0.54	5.75	13.43

Vehiche Nams	Conc. w/w	Weight mean	C.V.%	thickness (mm) mean	C.V.%	Hardness (Kg) mean	C.V.%	Friability (Loss%) mean	C.V.%	No of capped tablets	H.F.R.	D.T. (minutes) mean	C.V.%
STA-R / Celutab 1:1	0												
	19.6												
	32.6												
	42.0*	0.1132	2.81	2.41	1.03	1.45	19.57	2.11	35.25	16	0.89	13.31	9.40
	49.0	0.1032	2.53	2.32	1.76	2.5	22.53	1.81	37.70	811	1.38	12.99	4.41
STA-R / Celutab 1:3	0												
	19.6												
	32.6	0.0979	5.35	2.16	0.951	0.825	28.74	3.36	10.74	811	0.25	35.55	9.85
	42.0	0.1050	4.18	2.30	1.34	2.25	10.47	1.65	12.89	16	1.36	28.03	13.42
	49.0*	0.116	3.95	2.39	1.29	3.08	16.72	1.46	35.45	14	2.11	33.68	3.79
STA-R / Celutab 3:1	0 *	0.080	5.811	2.045	1.26	0.9	19.42	5.84	4.68	811	0.15	> 120	
	19.6	0.0939	1.488	2.103	2.32	1.075	11.33	3.29	14.79	12	0.33	30.74	7.08
	32.6	0.102	2.80	2.24	1.06	1.30	15.16	2.40	8.84	15	0.54	13.80	6.03
	42.0	0.108	0.998	2.31	0.86	1.63	10.87	2.31	25.33	14	0.71	12.48	17.17
	49.0*	0.1164	1.99	2.47	1.57	2.36	7.43	1.91	23.81	7	1.24	1.67	9.08
STA-R / Sugartab 1:1	0												
	19.6*	0.085	2.45	2.19	1.47	0.90	14.34	3.51	38.20	811	0.26	> 120	
	32.6	0.1023	2.74	2.30	1.80	1.25	16.32	3.44	35.20	811	0.36	35.31	
	42.0*	0.1174	4.73	2.44	1.51	1.30	15.81	2.53	24.72	811	0.51	17.00	10.15
	49.0*	0.1187	4.33	2.51	1.39	1.81	12.51	1.28	23.55	811	1.41	13.09	9.69
STA-R / Sugartab 1:3	0												
	19.6*	0.0859	4.55	2.35	1.13	0.4	32.27	5.42	3.90	811	0.074	>130	
	32.6	0.098	4.48	2.38	1.62	0.45	34.0	5.67	43.53	811	0.079	73.61	11.73
	42.0	0.0911	1.36	0.106	5.55	0.48	34.3	4.55	18.46	811	0.101	45.95	7.37
	49.0*	0.1105	5.54	2.46	2.02	0.55	19.16	3.50	30.30	811	0.157	26.0	8.01
STA-R / Sugartab 3:1	0												
	19.6*	0.081	1.95	2.116	0.637	0.45	35.13	6.33	25.98	811	0.071	21.75	9.75
	32.6	0.0919	2.65	2.23	1.37	0.46	35.14	6.24	60.8	811	0.074	11.14	7.93
	42.0	0.0995	2.88	2.36	1.32	0.575	29.34	0.985	51.11	811	0.58	6.791	9.70
	49.0	0.1032	2.83	2.45	1.66	0.625	21.08	0.805	28.33	811	0.78	4.99	11.86

Table 2: Effect of STAR-X1500 and its blends with other vehicles on the dissolution of diiodoquin from its directly compressed tablets.

Vehicle	Actual Conc.% w/w	% of diiodoquin after (minutes)												
		10	20	30	40	50	60	70	80	90	100	110	120	130	140
	49	18.27	25.88	31.17	38.97	45.49	54.47	68.97	73.85	83.04	91.68	95.13			
	42	17.24	21.95	29.79	39.83	50.17	53.44	67.24	71.99	81.14	89.0	93.15	98.12		
STA R-X	32.6	14.40	17.02	25.51	35.16	42.0	51.71	64.15	71.8	81.12	88.58	92.12	- -	- -	--
	19.6	17.20	20.64	28.16	36.14	43.51	49.16	53.26	61.26	71.18	81.21	89.05	94.03	- -	- -
	00.0	--	--	- -	- -	--	--	--	--	--	--	--	--	--	--
	49	18.81	23.21	31.61	39.61	42.13	54.28	62.91	73.14	80.01	89.10	95.09	- -	--	—
	42	18.35	22.17	31.66	41.09	45.16	53.18	61.75	69.38	81.81	91.24	--	- -	--	—
STA R-X /	32.6	--	--	--	--	- -	--	--	--	- -	--	- -	- -	--	—
Celutab	19.6	--	--	--	--	—	--	--	--	—	- -	--	- -	--	—
1:1	0	--	- -	-	--	--	—	--	--	—	--	--	-	--	--
STA R-X /	49.0	4.85	11.31	21.03	.30.71	38.79	45.25	53.08	61.42	64.66	69.13	71.08	74.35	63.05	91.9
Celutab	42	10.76	16.91	20.98	29.66	35.81	43.01	58.40	63.11	70.7	76.84	79.92	82.21	88.13	94.15
3:1	32.6	7.12	11.39	18.97	28.01	34.88	42.12	46.08	58.16	66.31	75.08	78.31	83.24	89.14	95.15
	19.6	2.51	8.80	16.84	25.44	31.61	38.15	47.16	53.38	61.22	73.16	78.89	85.23	91.05	- - -
	0	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -

		% of diiodoquin after (minutes)												
		2	5	15	20	30	40	50	60	70	80	90	100	110	120
Avicel/	49	19.33	28.11	33.35	41.11	48.10	59.12	65.04	76.15	81.72	93.15	96.1	- - -	- - -	- - -
STA R-X	42	18.55	23.12	31.55	38.16	45.06	57.10	62.15	75.15	85.00	94.05	- - -	- - -	- - -	- - -
1:1	32.6	16.00	25.64	32.66	43.19	54.03	56.08	61.12	73.06	88.13	91.06	- - -	- - -	- - -	- - -
	19.6	15.12	22.14	30.18	33.99	44.16	53.07	62.9	71.15	88.21	92.33	- - -	- - -	- - -	- - -
	0	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -

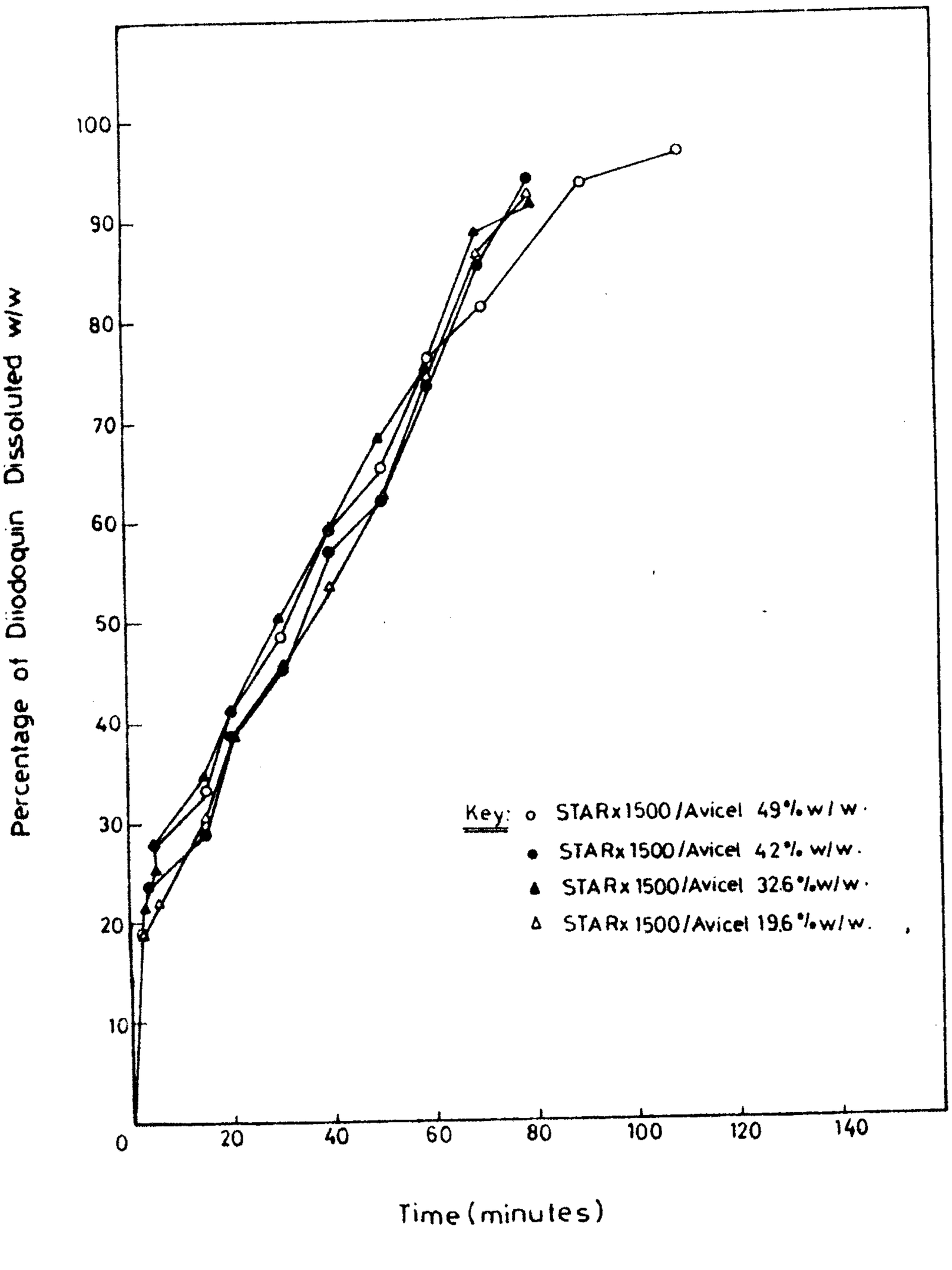

Fig.(1) Effect of STARx1500/Avicel (1:1) Blends on Dissolution of Diiodoquin from its Directly Compressed Tablets.

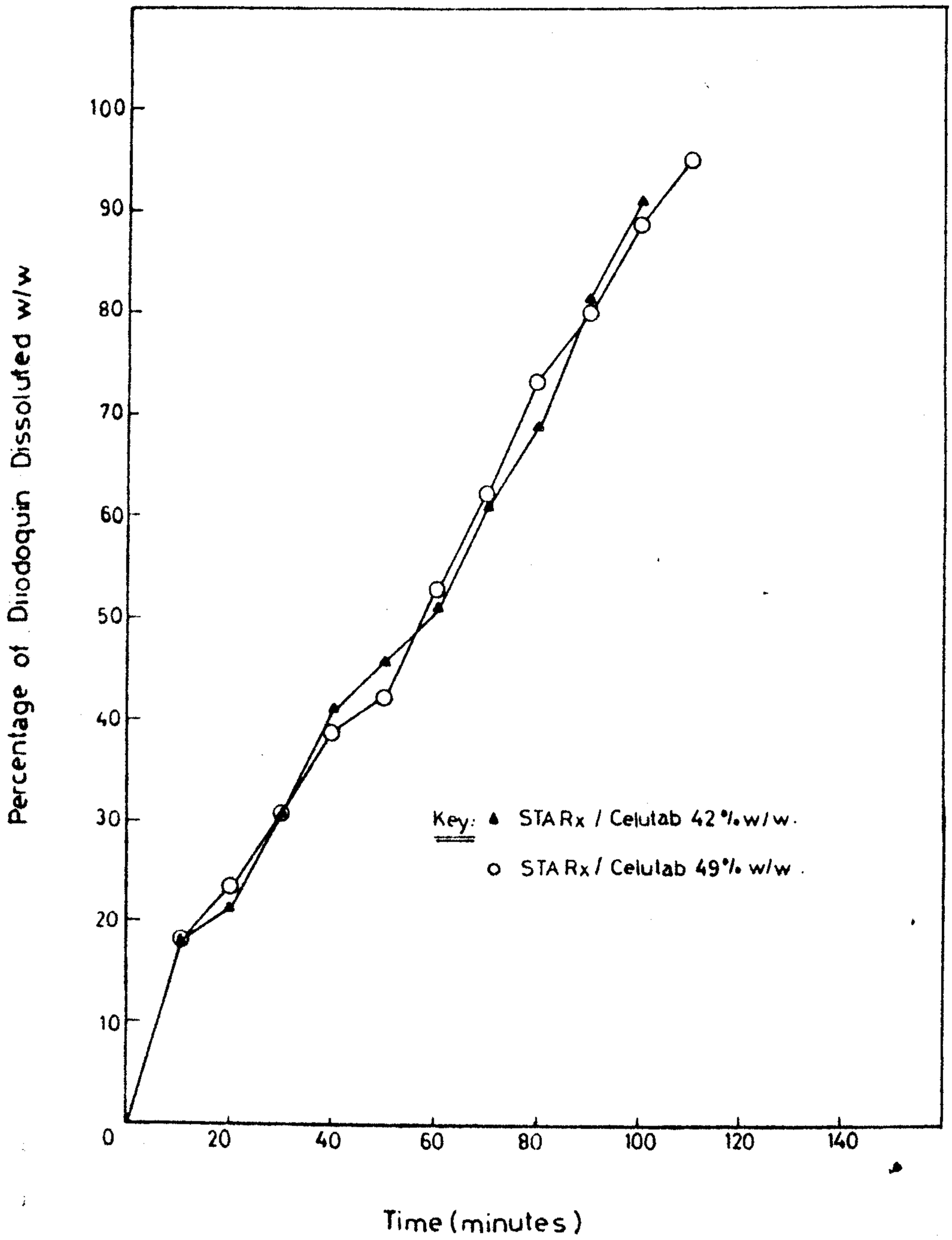

Fig. (2) Effect of STA Rx / Celutab (1 : 1) Blend on Dissolution of Diiodoquin from its Directly Compressed Tablets.

REFERENCES

1) *T. Nadi, S. Miyazaki, H. Endo, T. Arita, and M. Nakano; Chem. Pharm., Bull., 25, 1186 (1977).*

2) *S. Solwang , and R. Finholt, J. Pharm. Sci., 51, 249 (1962).*

3) *G. Levy, and R.H. Gumtow, ibid, 52, 1139 (1963)*

4) *K.A. Khan, and D.J. Rooke, J. Pharm. Pharmaco, 78, 633 (1976)*

5) *G. Levy, J.M. Anlokowiak, J.A. Procknall, and D.G. White, J. Pharm. Sci., 52, 1047 (1963).*

6) *E. Kristoffersson, Farm. Aikak 78, 183 (1969).*

7) *P. Singh, S.J. Desai, A.P. Simonelli and W.I Higuchi ibid., 51, 213 (1968).*

8) *G.J. Eid, Acta Pharm. Suecica 10, 229 (1973).*

9) *N. Kuneniwa and N. Watari, Chem. Pharm. Bull., 22, 1699 (1974).*

10) *J.F. Broadbent, A.G. Mitchell, and W.J. O'Reilly, Australes J. Pharm, 47, 592 (1966).*

دراسة اتاحة أقراص الدا ى أيودوكين المحضرة بطريقة الكبس المباشر

احمد السيد أبو طالب وصلاح ثابت

قسم الصيدلة الصناعية - كلية الصيدلة - جامعة اسيوط

درس تأثير بعض صواغات الكبس المباشر على معدل اتاحة الداى أيودوكين المحضرة بطريقة الكبس المباشر . ولقد أختير لهذه الدراسة مختلف التركيبات التى تحتوى على مختلف الصواغات .

والاقراص التى حضرت بواسطة صواغ واحد او صواغان وجد ان لها أوقات تفتت مختلفة - ولقد كان هناك علاقة هامة بين نصف الحياه ووقت التفتت .

ولقد أعتمد معدل الاتاحة على نوع الصواغ وتركيزه فى التركيبه وهناك عوامل أخرى أعتمد عليها معدل الاتاحة مثل نوع وتركيز المواد الزالقة - صلابة الاقراص المحضرة - ذوبان المادة الدوائية وكذلك التفاعل بين الصواغات والمادة الدوائية .

recieved in 9/5/1982 & accepted in 10/6/1982