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Evaluation of Defatted Soybean Flakes as a Tablet Excipient
Part I. As a Disintegrant

Thau-Ming Cham and Ching-Wei Lin*,
School of Pharmacy, Kaohsiung Medical College,
Kaohsiung, Taiwan, R.O.C.
*Kaohsiung Government Employees' Clinic Center,
Central Trust of China, Taiwan, R.O.C.

ABSTRACT

Oriental people have been using soybeans as a protein foodstuff for centuries. At present soybeans have become a major source of edible oil, and the meal provides an important source of protein for animal feeds. In the present study, the dehulled, and defatted soybean flakes were investigated as a possible tablet excipient.

Four different samples (sieve fraction 150-180 um), namely samples A, B, C, and D were prepared from dehulled, defatted soybean flakes and their physical characteristics were determined subsequently. Compacts of these four substances and their binary mixtures with dicalcium phosphate dihydrate in four different ratios were also prepared at seven different compression pressures.

The changes in density of the compacts under compression were interpreted using the Heckel plots[1,2]. The crushing strength and disintegration time of the subsequent compacts were also determined. Great differences in the disintegrating properties between the four soybean samples were noticed.

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Samples A, B, C, and D, corn starch, microcrystalline cellulose and starch 1500 were added to dicalcium phosphate dihydrate either as intragranular, extragranular or both intra- and extragranular disintegrants respectively; the compacts of these substances were prepared at two compression pressures and the disintegration time of the compacts determined. In general the disintegrating efficiencies are in the rank order corn starch>starch 1500>sample C>sample D>sample B>sample A>microcrystalline cellulose.

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INTRODUCTION

Soy polysaccharide has been shown to perform well as a tablet disintegrant in tablet made by both direct compression and wet granulation[3,4]. By incorporation of the soy polysaccharide in formulation the friability of the tablets could be improved. In addition, aging has no adverse effect on the dissolution rate of hydrochlorothiazide tablets containing the soy polysaccharide as an disintegrant[4]. Later, Teng et al[5] also demonstrated that commercial type of soy protein could be employed as an inexpensive tablet excipient. These studies indicated that different soybean products would have the potential to be employed as a tablet excipient.

In Taiwan, soybeans are the major source of edible oil, and the meal provides an important source of protein for animal feeds. In this study three soybean samples were prepared from the meal and one soybean sample was prepared from fresh soybeans. Then, their tableting properties were evaluated, particularly their disintegrating properties. Dicalcium phosphate dihydrate was used as a prototype tablet base.

MATERIALS

Microcrystalline cellulose, starch 1500, corn starch, (Hui-Ming Co., Taiwan, R.O.C.); dicalcium phosphate dihydrate, (China Petrochemical Corporaton); n-hexane, toluene, (Riedelde, West Germany); acetone, ether, acetic anhydride, hydrochloric acid, ethanol, (Union Chemical Works Ltd., Taiwan, R.O.C.), defatted

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soybean flakes (Siao-Kang By-Products Factory, Taiwan Sugar Corporation, Taiwan, R.O.C.)

METHODS

Preparation of Four Soybean Samples

Four soybean samples namely samples A, B, C, and D were prepared according to the procedures which were described in Figures 1 and 2 respectively.

Analysis of the Composition of the Four Soybean Samples

The four soybean samples were analysed according to the standard methods[8] (CNS Serial No. 1418) set by the government (Taiwan, R.O.C.).

Determination of the Physical Properties of Powders

(i) The true density of the powders was determined by a liquid displacement method, which toluene (specific gravity 0.86 g/ml at 20°C) was the supernatant liquid.

(ii) The bulk density and the compressibility of the powders were determined using the Engelsmann bulk density apparatus (Stampfvolumeter, Stav 2003. J. Engelsmann AG., West Germany). The volume readings were taken at an interval of 50 taps until constant readings (about 500 taps) were reached. The compressibility[9] (compressibility %=(tapping bulk density-bulk density)/tapping bulk density x 100 %) of the powders was determined.

(iii) The angle of repose of the powders was determined by a fixed height (3.0 cm) method[10]. The results are the mean of six determinations.

(iv) About 10g of the powder was accurately weighed and dried in a vacuum oven at 60°C, until the weight of the powder was constant. The loss on drying of the powder was determined on a wet basis method. The results are the mean of 6 determinations.

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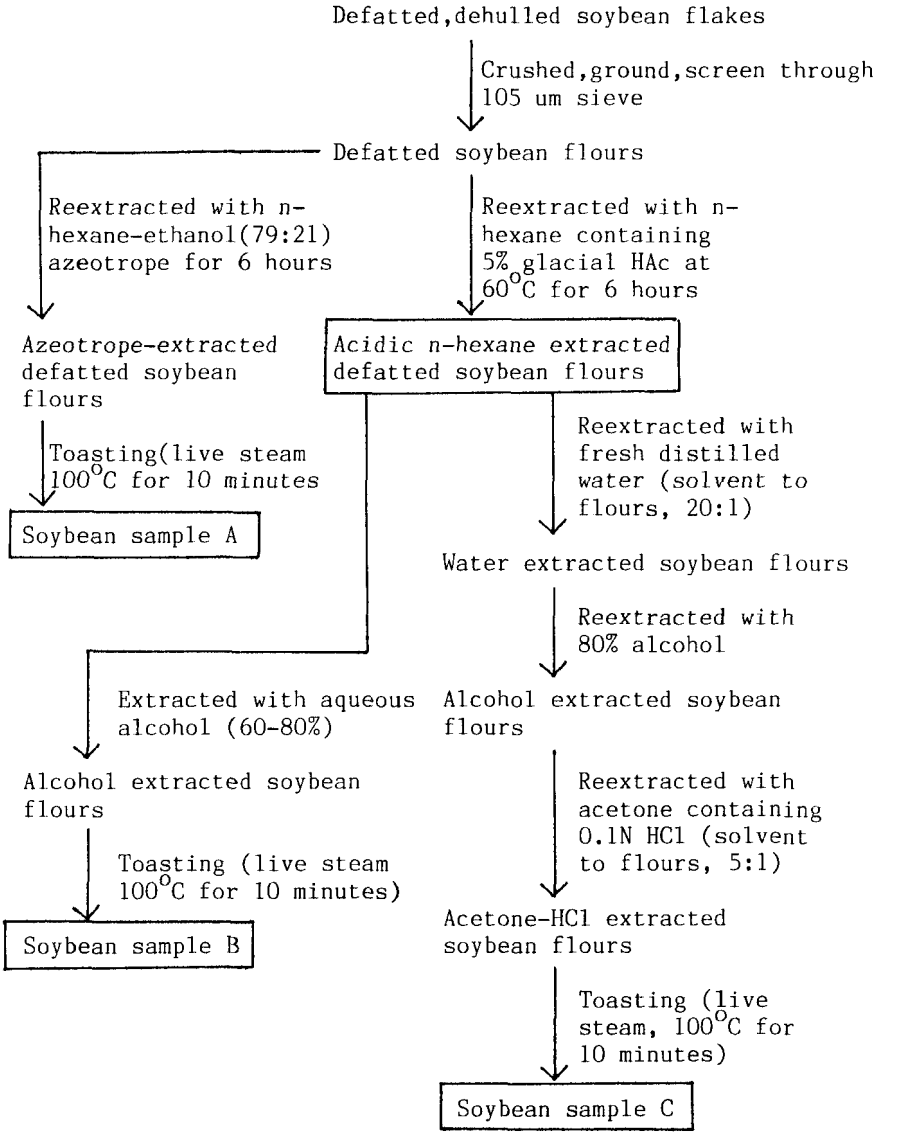

FIGURE 1
Flowsheets [6,7] of soybean sample A, soybean sample B and soybean C preparation.

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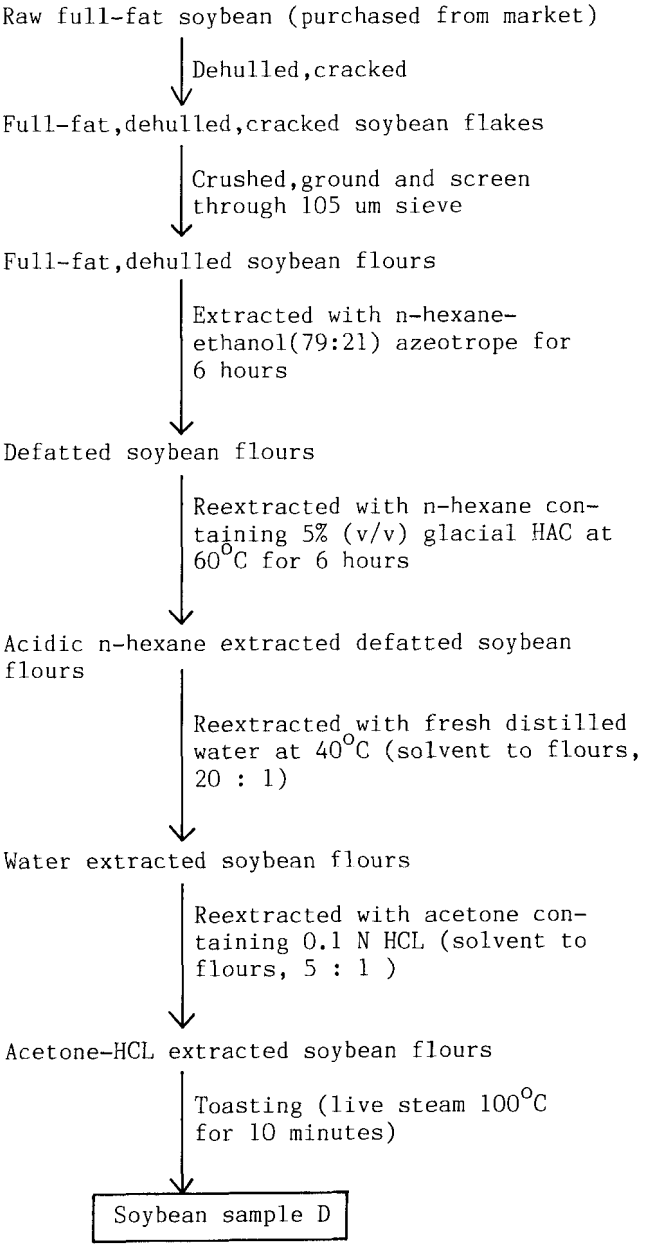

FIGURE 2
Flowsheet of soybean sample D preparation[6,7].

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(v) Electronic micrographs of the four soybean samples were made using a scanning electron microscope (JEOL JSM-35CF SEM, Japan). Prior to examination, the samples were dried in a vacuum and coated with a sputtering device.

Preparation of Mixtures

The required amounts of soybean samples (either sample A, B, C or D) and dicalcium phosphate dihydrate were sieved through a 350 um sieve on to paper and mixed for 5 minutes with a spatula. The mixture was then transferred to a V-blender (Chia-Sheng Iron Works, Taiwan, R.O.C.) and mixed for a further 15 minutes. One kg of each mixture was prepared according to the following proportions by weight; soybean sample : dicalcium phosphate dihydrate = 3 : 1; 1 : 1; 1 : 3; 1 : 19.

Preparation of Granules

Granules containing dicalcium phosphate dihydrate as the base material were prepared by wet granulation. Distilled water was the granulating agent. If intragranular disintegrant was required it was dry mixed with the dicalcium phosphate dihydrate powder before the addition of the granulating agent. After drying in a hot air oven at $45^{o}C$ for 24 hrs, the granules were cooled and sieved to obtain the desired size fraction (150-180 um).

Extragranular disintegrants were added to the dried granules and blended.

Granules containing both intra- and extragranular disintegrants were prepared by blending equal amounts of the granules containing intra- and extragranular disintegrants.

In all cases, the concentration of the disintegrant in the granules was 5% (w/w).

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Table 1. Composition of four different soybean sample powders, % (w/w).

Composition	Soybean sample A	Soybean sample B	Soybean sample C	Soybean sample D
Crude protein	51.9	73.0	16.5	6.5
Crude fat	<0.1	<0.1	<0.1	<0.1
Carbohydrate	34.2	17.5	53.0	63.0
Crude fiber	3.2	2.5	23.6	23.4
Ash	5.8	2.9	2.0	1.8

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Preparation of Compacts

Compacts weighing 400mg and 12.5 mm in diameter were compressed individually on a hydraulic press (Riken hydraulic press, Japan) at various compression pressures; the required pressure was maintained for a constant time of 8 seconds. The die and punches were lubricated with a 2% (w/v) magnesium stearate in acetone prior to each compaction.

After storage in a desiccator for 24 hrs, the compacts were weighed and the thickness measured. The crushing strength of the compacts was determined using a hardness tester (Model CT40, Enginerring System (Nottm.), U.K.).

The disintegration time of the compacts was determined in distilled water using the U.S.P. XXI method without the guide disks in place. The mean of six determinations was quoted.

RESULTS AND DISCUSSION

Heckel Relationship

Table 1 gives the composition of four soybean samples. The relevant physical properties of the substances used in the present

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TABLE 2. Physical properties of substances.

Material	Angle of repose θ^0	Bulk density (g/ml)	True density (g/ml)	Compress-bility on tapping,% (500 times)	Loss on drying, %
Sample A	36.6	0.360	1.443	12.8	4.9
Sample B	37.7	0.310	1.255	12.6	6.4
Sample C	38.6	0.279	1.192	13.9	5.8
Sample D	39.1	0.322	1.213	14.1	5.3
Dicalcium phosphate dihydrate	54.7	0.530	2.248	32.1	1.1
Microcry-stalline cellulose	38.8	0.302	1.454	26.1	3.7
Starch 1500	45.7	0.408	1.411	24.6	5.2
Corn starch	36.5	0.439	1.457	34.6	6.4

study were listed in Table 2. Scanning electron micrographs of the four soybean samples were shown in Photograph 1 (a-d).

Although Rue and Rees[11] have expressed reservations in using Heckel plots[1,2] to classify compaction behaviour of solids under compaction[12,13]. However, several workers have successfully applied the Heckel relationship to a number of pharmaceutical powders[14,15,16]. In this study changes in the density of four soybean samples, dicalcium phosphate dihydrate, and binary mixtures between dicalcium phosphate dihydrate and each of the four soybean samples were interpreted using the Heckel plots.

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The plots of ln 1/(1-D) versus compression pressure for samples A ,B,C, and D increase with an increase in compression pressure. However ,the plots level off at pressures of and greater than 148.5 MNm^{-2}. In fact, the plot for sample D shows a decrease at the higher pressure range. The differences in the densification properties of the four soybean samples could not be explained by their physical properties (Table 2 and Photograph 1). The differences might be due to the differences in the composition of the four soybean samples (Table 1), since Rue and Rees had proposed that the Heckel plots could be applied in comparing the plastic deformation of different materials[11]. The curve for dicalcium phosphate dihydrate shows that the value of ln 1/(1-D) is still increasing at the highest pressure studied, indicative of continuing densification of the compacts (Figure 3).

The influence of the concentration of dicalcium phosphate dihydrate on the compaction behaviour of binary mixtures between dicalcium phosphate dihydrate and either samples A, B, C, or D is shown in Figures 4-7. The Heckel plots of mixtures are not intermediate between the two individual components, and are usually lower than the plot of the component which has a lower value of ln 1/(1-D). This indicates that the dicalcium phosphate dihydrate presented in the mixtures does not increase the degree of densification of soybean samples. This may be due to the relative effect of the different compaction mechanisms of the materials upon compaction.

Sodium chloride and lactose consolidate by plastic deformation and fragmentation respectively[12]. Studying the compaction of binary mixtures between these two substances, Sheikh-Salem and Fell[17] explained that differences in the consolidation mechanisms between these two substances would influence the effect one would have on the other during compaction. In the present study the four soybean samples consolidate by mechanisms involving elastic and plastic deformation. However, dicalcium phosphate dihydrate consolidates mainly by fragmentation[18]. As fragmentation takes place, the compaction load is borne at more and more contact points and the transmitted pressure to the soybean sample particles might be reduced. This would reduce the

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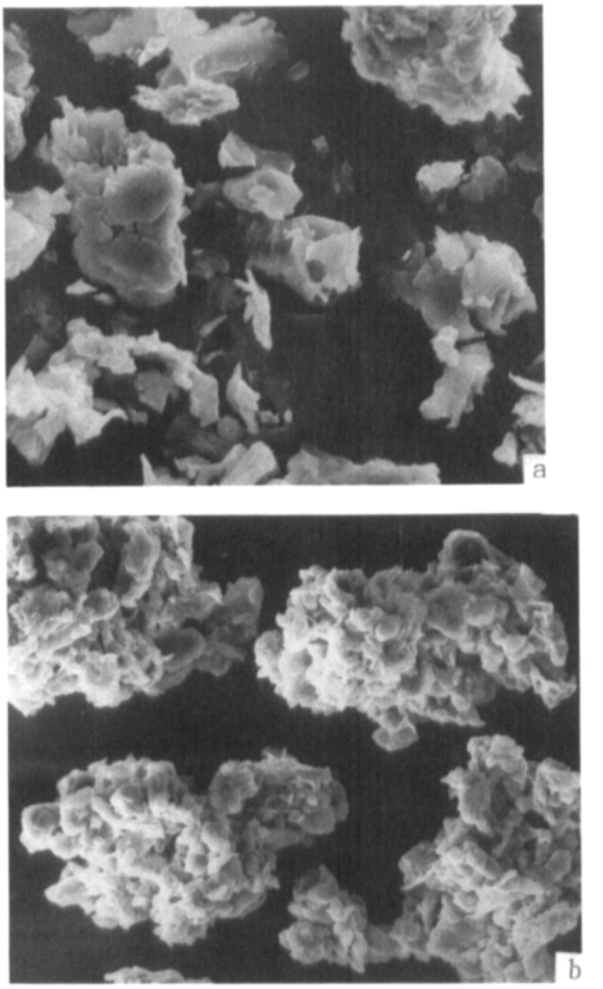

PHOTOGRAPH 1
Photomicrographs of four soybean samples. (a) sample A; (b) sample B ; (c) sample C; (d) sample D; magnification: x 700.

degree of plastic deformation of soybean sample alone. Apparently, the rate of closing the pores is higher for the mechanism by plastic deformation than by fragmentation[19].

Disintegration Time, Crushing Strength and Porosity

Dicalcium phosphate dihydrate compacts which were prepared over all the pressure range studied did not disintegrated. While the

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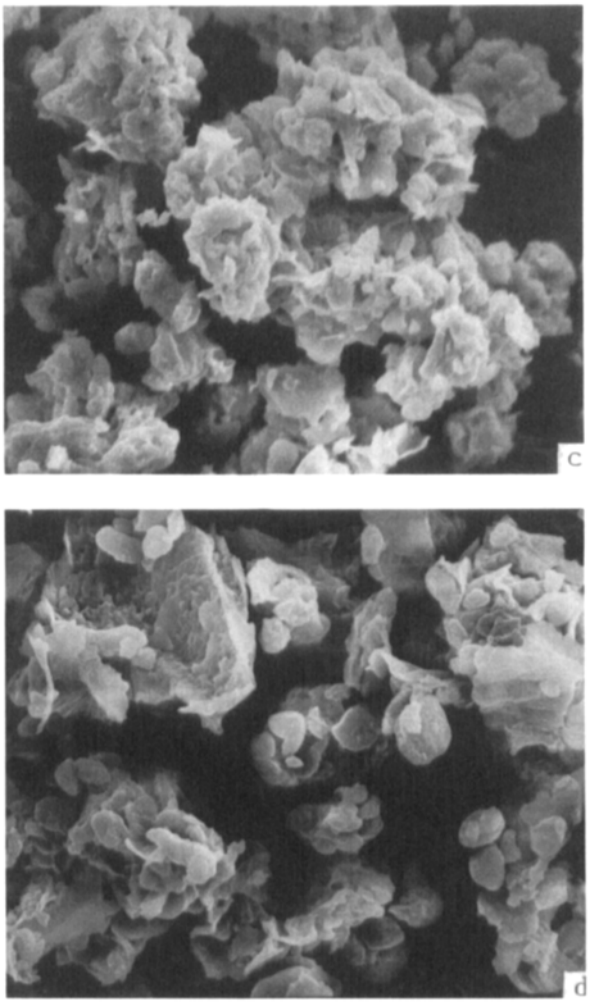

PHOTO. 9-1 CONTINUED

disintegration time of compacts of the four soybean samples increases with increase in compaction pressure (Table 3). The disintegration time for compacts of sample D is lower than those of the other three soybean samples at any given pressure; except that sample C compact gives the lowest disintegration time at 49.5 MNm^{-2}. In general the disintegrating efficiencies of compacts of the four soybean samples are in the rank order sample D>sample C>sample B>sample A.

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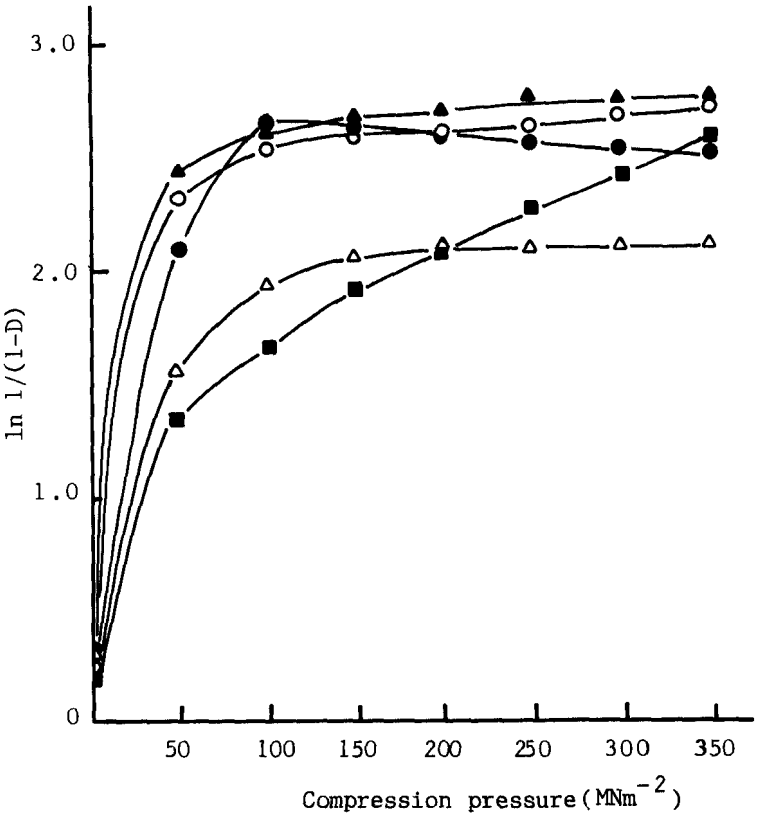

FIGURE 3
Plots of ln 1/(1-D) vs compression pressure for four soybean samples and dicalcium phosphate dihydrate. Keys: ■ , dicalcium phosphate dihydrate; △ , sample A; ▲ , sample B; ○ , sample C; ● , sample D.

The crushing strength for compacts of dicalcium phosphate dihydrate and the soybean samples increases with the increase in compaction pressure. However, the crushing strength for compacts of the four soybean samples at pressures of and in excess of 148.5 MNm^{-2} reached a plateau. This pattern is similar to the Heckel plots for these four soybean samples (Figure 3).

Table 4 listed the effect of compression pressure on the crushing strength of compacts compressed from mixtures of dicalcium phosphate

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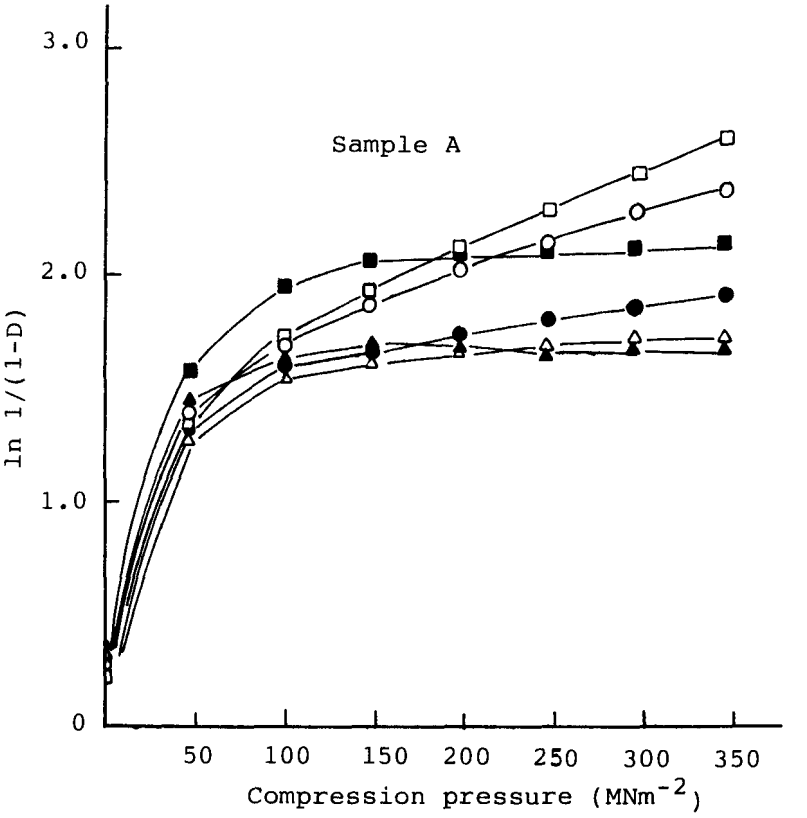

FIGURE 4
Plots of ln 1/(1-D) vs compression pressure for binary mixtures. Keys: □ , dicalcium phosphate dihydrate; ■ , soybean sample; ○ , 5% soybean sample; ● , 25% soybean sample; △ , 50% soybean sample; ▲ , 75% soybean sample.

dihydrate and each of the four soybean samples respectively. The results show that as the percentage concentration of soybean sample in a mixture increases, the crushing strength of the compacts made at the same compression pressure decreases.

Results in Table 5 show that the disintegration time for the compacts prepared at the same compression pressure decreases with the increase in the percentage of soybean sample in the mixture. For mixtures between sample A and dicalcium phosphate dihydrate there is

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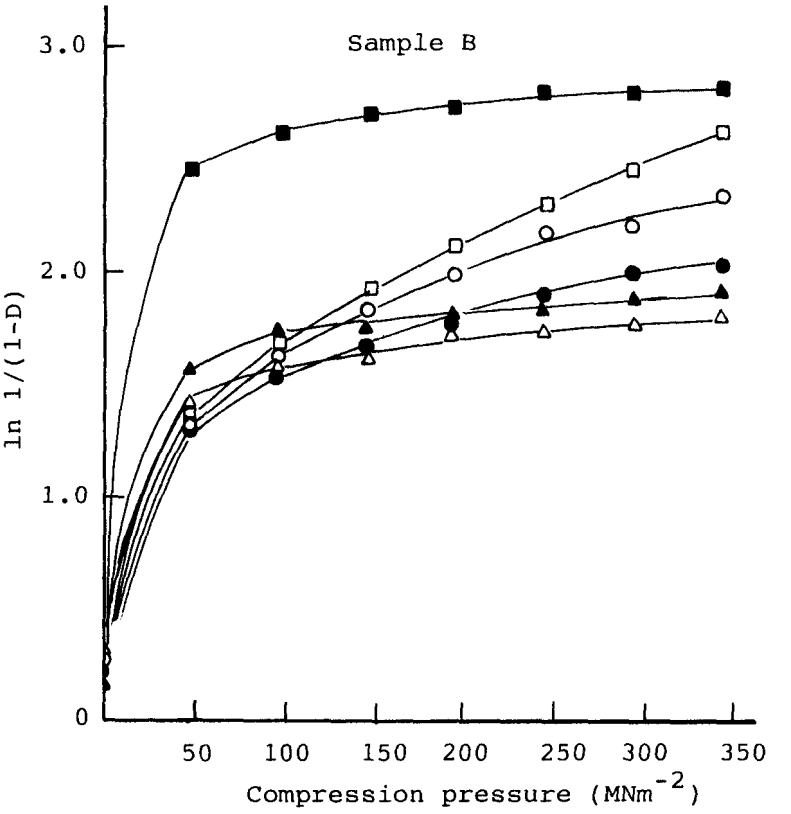

FIGURE 5
Plots of ln 1/(1-D) vs compression pressure for binary mixtures. Keys as for FIGURE 4.

an optimal disintegration concentration. The mixture containing 25% sample A gives the lowest disintegration time at any given compression pressure. Chalabala and Maly[20] had reported that at a concentration of 10%, corn, potato and wheat starches had a maximum disintegrating effect.

The effectiveness of the four soybean samples was compared to corn starch, starch 1500, and microcrystalline cellulose as intra-, extragranular, and combination of intra- and extragranular disintegrants in dicalcium phosphate dihydrate compacts made at two

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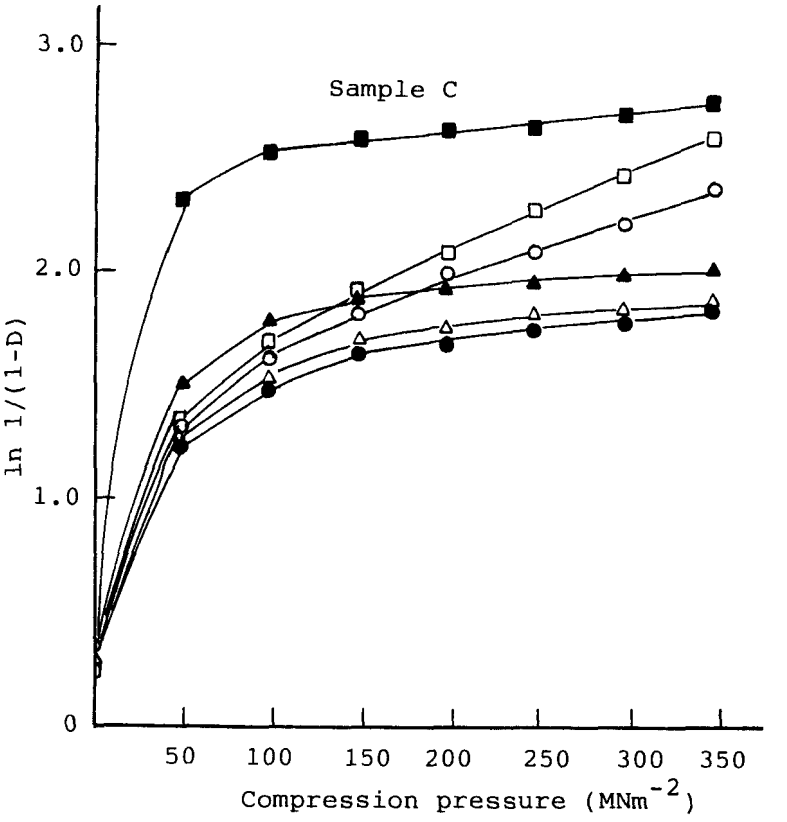

FIGURE 6
Plots of ln 1/(1-D) vs compression pressure for binary mixtures. Keys as for FIGURE 4.

compaction pressures. The disintegration time, crushing strength, and porosity of the compacts were examined (Tables 6 and 7).

Our results contradict those of Shotton and Leonard[21] who reported that the extragranular formulations disintegrated much more rapidly than the intragranular ones. A combination of intra- and extragranular disintegrants in a tablet gave intermediate disintegration time. In the present study the compacts containing intragranular disintegrant gave a relatively lower disintegration time frequently. These could be due to the differences in the consolidation mechanisms of the base materials.

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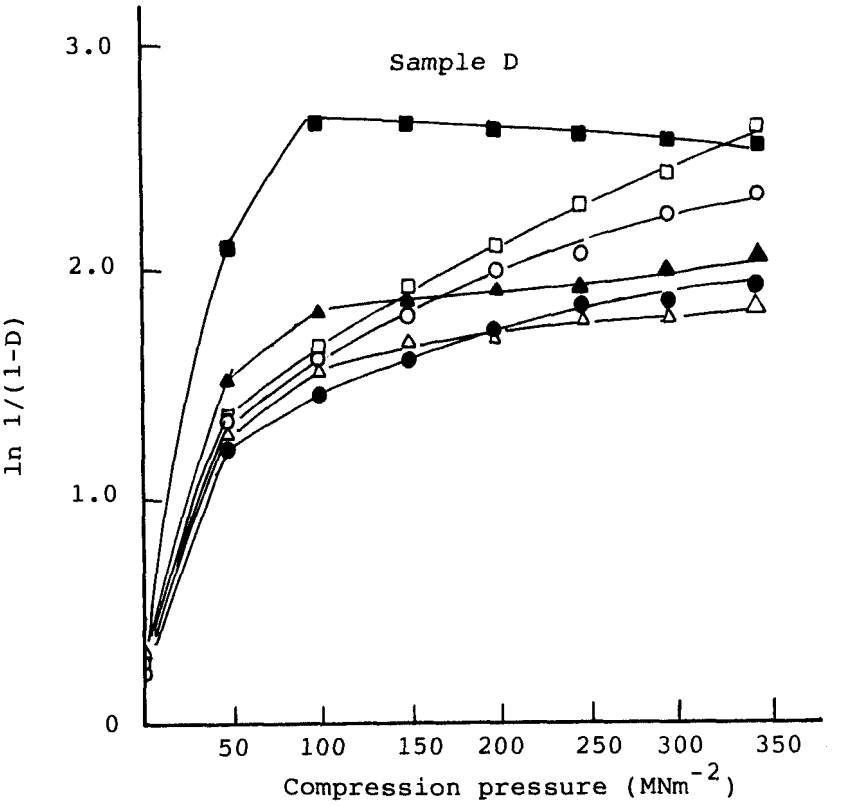

FIGURE 7
Plots of ln 1/(1-D) vs compression pressure for binary mixtures. Keys as for FIGURE 4.

Shotton and Leonard[21] had proved that tablets having intragranular disintegrants, the particles of the disintegrants were isolated and surrounded by sulfadiazine particles which were not readily wetted. This would be justified by following explanation.

Higuchi et al[22] had expressed that the closely related structures of sulfathiazole and sulfadiazine would behave similarly upon compaction. While Sheak and Carless[23] found that sulfathiazole having a particle size smaller than 76 um (the critical particle size for sulfathiazole) would agglomerate upon compaction. In their study the

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TABLE 3. The disintegration time, crushing strength, and porosity of compacts of four soybean samples and dicalcium phosphate dihydrate at various compression pressures.

Material		Compression pressure (MNm^{-2}) 49.5	99.0	148.5	198.0	247.5	297.0	346.5
Sample A	Td(sec)	211.6	381.8	412.5	424.5	431.0	426.0	429.0
	Fc(kg)	3.8	6.8	8.5	8.4	8.8	9.1	9.3
	ε(%)	21.1	14.6	12.8	13.3	12.3	12.2	12.0
Sample B	Td(sec)	26.4	31.3	39.8	38.1	41.7	48.4	52.0
	Fc(kg)	4.3	4.6	4.7	4.9	4.9	5.3	5.1
	ε(%)	8.8	7.3	6.9	6.8	6.3	6.4	6.3
Sample C	Td(sec)	4.7	12.4	12.9	14.7	15.8	17.1	22.3
	Fc(kg)	5.2	6.2	6.3	6.7	6.9	6.7	6.7
	ε(%)	9.7	7.8	8.3	8.1	7.1	6.7	6.4
Sample D	Td(sec)	6.5	6.1	6.8	8.3	7.9	8.8	8.5
	Fc(kg)	8.3	12.2	12.7	12.7	12.7	13.4	13.3
	ε(%)	12.2	7.1	7.1	7.3	7.5	7.8	8.0
Dicalcium phosphate	Td(sec)	-	-	-	-	-	-	-
	Fc(kg)	5.9	11.9	16.4	24.4	24.7	28.5	33.1
	ε(%)	25.8	18.8	14.7	12.3	10.2	9.8	7.4

Td: disintegration time; Fc: crushing strength; ε : porosity.

particle size of sulfadiazine powder was 9.7 um[21]; therefore, agglomeration would be the major mechanism during the compaction of sulfadiazine powder.

Similarly, the intragranular disintegrants would be isolated and surrounded by dicalciuim phosphate dihydrate particles upon compaction. However, this material undergoes mainly by fragmentation upon compression[18]. These would form a porous layer of dicalcium phosphate dihydrate particles around the disintegrant particles offering an easier passage for water absorption by the intragranular disintegrants. This would enhance the disintegration of the compacts.

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TABLE 4. The crushing strength (kg) of compacts of mixtures of soybean sample and dicalcium phosphate dihydrate at various compression pressures.

Mixture	Compression pressure (MNm^{-2})						
	49.5	99.0	148.5	198.0	247.5	297.0	346.5
Sample A mixture							
5%	4.9	9.4	14.5	17.0	22.0	23.5	27.9
25%	3.7	5.7	10.5	14.4	19.3	17.9	18.6
50%	4.1	9.2	11.7	11.0	11.3	12.1	13.6
75%	4.8	7.8	9.0	10.1	10.4	10.6	11.0
Sample B mixture							
5%	4.4	7.7	12.9	15.8	22.8	24.9	27.3
25%	4.0	9.0	12.1	14.4	19.7	20.9	21.7
50%	3.3	5.4	6.8	9.3	9.9	10.2	11.1
75%	3.5	4.2	4.4	4.2	5.1	5.7	5.5
Sample C mixture							
5%	5.1	9.2	15.7	16.8	23.5	25.7	24.5
25%	4.0	8.9	12.8	15.1	16.3	17.8	22.9
50%	5.2	10.8	13.3	14.8	17.1	18.9	19.8
75%	5.4	9.3	10.9	11.7	11.7	13.6	11.7
Sample D mixture							
5%	5.2	12.7	15.3	22.1	21.5	28.7	29.7
25%	4.5	9.2	13.1	17.7	22.2	23.9	25.8
50%	4.4	9.2	12.1	13.7	16.2	17.7	18.5
75%	5.6	9.7	11.2	12.3	12.4	13.4	14.2

The percentage shown is the percentage concentration of soybean sample in the mixture.

During the disintegration test, examinatin showed that compacts containing extragranular disintegrant would disintegrate into larger plate-like aggregates and disintegrated into finer pieces subsequently. With either intragranular or combination of intra- and extragranular disintegrants in the compacts, the disintegration gave much finer pieces of aggregates rapidly, which passed through the screen easily.

The crushing strength of the compacts was affected very little by the position of the disintegrants. However, compacts containing either

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TABLE 5. The disintegration time (sec) of compacts of mixtures of soybean sample and dicalcium phosphate dihydrate at various compression pressures.

Mixture	Compression pressure (MNm^{-2})						
	49.5	99.0	148.5	198.0	247.5	297.0	346.5
Sample A mixture							
5%	41.7	218.9	516.1	769.1	877.8	1619.3	1695.6
25%	6.6	15.3	28.6	45.8	64.9	77.9	93.2
50%	13.0	41.4	122.0	111.7	153.5	242.1	202.1
75%	71.6	210.9	208.6	243.7	154.2	191.2	269.5
Sample B mixture							
5%	36.6	164.4	596.2	744.4	1402.2	1602.2	1937.5
25%	5.0	10.9	15.3	18.9	26.4	33.3	35.3
50%	4.9	7.0	13.3	24.0	31.4	28.7	31.9
75%	6.5	9.6	11.9	8.0	12.5	22.1	23.2
Sample C mixture							
5%	20.1	53.0	158.7	274.3	314.8	480.6	698.9
25%	3.4	5.1	7.5	8.6	10.4	10.9	13.8
50%	4.2	4.7	5.8	6.7	7.4	9.0	10.0
75%	4.5	5.0	5.8	7.0	6.8	7.7	7.3
Sample D mixture							
5%	3.6	9.9	32.2	52.2	161.4	231.1	277.5
25%	3.6	3.6	5.8	7.4	8.9	10.4	11.3
50%	3.8	4.9	5.6	5.4	5.4	5.5	5.6
75%	5.5	5.6	5.7	5.6	5.4	5.9	5.6

The percentage shown is the percentage concentration of soybean sample in the mixture.

corn starch or starch 1500 as the extragranular disintegrant gave relatively lower crushing strength. These results agreed with those obtained by Shotton and Leonard[21]. In all cases, with extragranular disintegrants, the compacts gave consistently higher porosity at the same compaction pressure.

Microcrystalline cellulose has been used extensively as a direct compression excipient and as granular aid for improving the compressibility of tablets. However, it is not an effective disintegrant.

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TABLE 6. Disintegration time, crushing strength, and porosity of the compacts made with seven disintegrants.

Disintegrating agent and siting	Td(sec) mean±S.D.	Fc(kg) mean±S.D.	ε(%) mean
A. Corn starch :			
Intragranular	9.4 ±0.3	12.9 ±0.5	14.2
Extragranular	11.6 ±3.4	8.4 ±0.9	14.4
1/2 i + 1/2 e	5.4 ±0.5	11.9 ±0.4	13.1
B. Starch 1500 :			
Intragranular	7.5 ±0.3	12.4 ±1.1	13.8
Extragranular	5.9 ±0.7	7.7 ±1.1	15.4
1/2 i + 1/2 e	6.8 ±1.7	12.5 ±1.4	12.6
C. Microcrystalline cellulose :			
Intragranular	336.4 ± 73.1	13.9 ± 1.2	12.6
Extragranular	95.4 ± 23.3	14.1 ± 0.5	13.3
1/2 i + 1/2 e	700.5 ±107.0	13.4 ± 1.5	13.3
D. Soybean sample A :			
Intragranular	40.9± 2.6	9.8± 0.5	12.7
Extragranular	217.0 ± 21.3	11.3 ± 0.5	15.5
1/2 i + 1/2 e	24.1 ± 3.4	13.5 ± 0.3	13.6
E. Soybean sample B :			
Intragranular	15.9 ± 2.6	10.5 ± 0.7	13.4
Extragranular	242.7 ±24.4	10.3 ±0.9	16.1
1/2 i + 1/2 e	18.2 ± 1.9	10.5 ±0.5	13.6
F. Soybean sample C :			
Intragranular	7.8 ± 0.3	10.1 ±0.5	14.1
Extragranular	88.8 ± 6.6	8.8 ±0.6	15.4
1/2 i + 1/2 e	9.9 ± 0.8	11.8 ±1.1	13.4
G. Soybean sample D :			
Intragranular	9.8 ± 0.9	10.9 ±0.9	13.8
Extragranular	21.9 ± 4.2	11.9 ±0.8	15.1
1/2 i + 1/2 e	15.4 ± 3.9	12.5 ±0.9	16.3

Compression pressure : 99.0 MNm^{-2}; disintegrant : 5% w/w; Td : disintegration time; Fc : crushing strength; ε: porosity; i: intragranular; e: extragranular; base material : dicalcium phosphate dihydrate.

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TABLE 7. Disintegration time, crushing strength, and porosity of the compacts made with seven disintegrants.

Disintegrating agent	Td(sec) mean±S.D.	Fc(kg) mean±S.D.	ε(%) mean
A. Corn starch :			
Intragranular	11.8 ±0.6	15.5 ±1.5	9.7
Extragranular	21.6 ±3.8	12.9 ±0.8	11.4
1/2 i + 1/2 e	27.8 ±6.8	17.6 ±0.9	9.2
B. Starch 1500 :			
Intragranular	14.5 ±1.9	16.9 ±1.2	10.1
Extragranular	19.7 ±3.5	11.8 ±1.5	10.5
1/2 i + 1/2 e	30.3 ±5.3	18.8 ±1.2	8.1
C. Microcrystalline cellulose :			
Intragranular	>1hr	20.7 ±1.4	9.5
Extragranular	>1hr	18.8 ±1.3	8.8
1/2 i + 1/2 e	>1hr	17.3 ±1.2	8.8
D. Soybean sample A :			
Intragranular	98.6 ± 36.5	15.0 ±0.5	9.3
Extragranular	484.9 ± 55.6	16.3 ±0.9	11.2
1/2 i + 1/2 e	65.7 ± 7.3	17.9 ±0.2	9.1
E. Soybean sample B :			
Intragranular	40.4 ± 4.3	16.3 ±0.4	9.4
Extragranular	541.8 ±78.6	16.4 ±0.8	12.5
1/2 i + 1/2 e	48.8 ± 9.0	16.2 ±0.6	8.8
F. Soybean sample C :			
Intragranular	17.9 ± 2.1	16.7 ±1.3	9.8
Extragranular	114.2 ±38.2	14.5 ±0.9	11.1
1/2 i + 1/2 e	25.2 ± 4.6	17.2 ±1.1	9.5
G. Soybean sample D :			
Intragranular	17.9 ± 2.3	20.4 ±0.3	10.5
Extragranular	50.7 ± 9.9	17.8 ±1.3	11.7
1/2 i + 1/2 e	37.3 ± 8.4	17.0 ±1.9	10.0

Compression pressure : 148.5 MNm^{-2}; disintegrant : 5% w/w; Td : disintegration time; Fc : crushing strength; ε: porosity; i : intragranular; e : extragranular; base material : dicalcium phosphate dihydrate.

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SUMMARY AND CONCLUSION

The subject of this study was a comparative evaluation of the tableting and disintegrating properties of four soybean samples. Reasonable good compacts of either the pure substances, mixtures with dicalcium phosphate dihydrate or granulation with dicalcium phosphate dihydrate could be obtained at relatively lower compaction pressures. Samples C and D perform well as an intragranular disintegrant in compacts giving fairly low disintegration time. In general the disintegrating efficiencies are in the rank order corn starch>starch 1500>sample C>sample D>sample B>sample A>microcrystalline cellulose.

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