

## FORMULATION DEVELOPMENT OF HERBAL CAPSULE CONTAINING OLEORESIN OF *ZINGIBER OFFICINALE* EXTRACT

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Received: 26 July 2013, Revised and Accepted: 28 Aug 2013

### ABSTRACT

**Objective:** The aim of this present study was to investigate an appropriate type and amount of adsorbent to adsorb *Zingiber Officinale* extract in order to prepare the *Zingiber Officinale* liquisolid powder for capsule filling with the satisfied powder flow-ability to obtain the good uniformity of capsule weight.

**Methods:** Liquisolid powder of ginger was prepared by non thermal drying method of adsorption. The liquid ginger was adsorb by four different adsorbent powders which were microcrystalline cellulose (MC), dibasic calcium phosphate dihydrate (DB), lactose (L) and calcium carbonate (CC) to obtain the crumbly dried powder. The moisture content, flow-ability, morphology of powder and amount of volatile oils in the capsule were evaluated.

**Results:** Adsorbent powders that could dry the extracted ginger into a crumbly powder within the amount of powder capable to be filled in capsule no. 0 were the adsorbent MC, L and CC. The moisture contents found were less than 5%w/w in all three formulations. The flow-ability of CC was improved after the adsorption while the flow-ability of L and MC were worse, respectively. After the adsorption, both the rod particles of MC and geometrical particles of L were held together as a lump of various sizes but not much larger than the original size, with the fusion of surface materials. Conversely, the various shapes of CC particles were combined as a huge cluster, larger than original size, but with a very uniform cluster size so that flow-ability of CC was enhanced from these appropriated characteristics of powder. The capsule appearances of all three formulations were perfect but there were only two formulations of L and CC that passed the uniformity of weight test. The results of uniformity of weight corresponded to the flow-ability of powder that the powder with good flow-ability resulted into the good uniformity of capsule weight. All formulations passed the disintegration test. The active volatile oil, 6-gingerol, was retained and found in 95.207% and 103.67% of the reference amount according to CC and L capsule formulations, respectively.

**Conclusion:** Drying of extracted ginger by avoiding heat could be accomplished by calcium carbonate since calcium carbonate, as the best choice of adsorbent, provided a good powder flow-ability after the liquid ginger adsorption resulting into the capsule with the good uniformity of weight. The active volatile oil of 6-gingerol was retained with the satisfied amount in calcium carbonate formulation.

**Keywords:** Adsorbent powder, Calcium carbonate, Capsule, Flow-ability, *Zingiber officinale*, Liquisolid

### INTRODUCTION

The intellect of herbal remedies to treat various diseases has been inherited from one generation to the next in the country of Thailand. Most of medicinal herbs remain in the original form with little number of scientific supports to proof their therapeutic uses. Therefore, herbal products available in the market are lack of standard in term of the amount of active substances and the therapeutic application. This might be considered as the limitation of the use of herbal medicine worldwide. However, the herbs are still well known in many countries as the health care product, especially in the form of supplements. Thus, the number of international researcher that aims to develop the herbal product has been increasingly grown. Therefore, it tempts for Asian countries to use the local resources to manufacture the local medicine from herbal plants in order to set the standard of the plants extract, the therapeutic use, the safety, including the product dosage form for international medicinal competition. Additionally, the good standard leads to the actual use of herbal remedies in health care system as an alternative medicine so as to decrease the number of the imported medicine and active medicinal ingredients with the aim to foster the self-reliance of health care system in Asian countries.

In Thailand, many potential herbs are available and ready to be developed into the health care product. Ginger, the rhizome of *Zingiber officinale* Roscoe, is one of those herbs. Ginger is in the *Zingiberaceae* family which is easy to be grown and used as ingredients in many kind of Thai food. The extracted ginger composes of oleoresin containing volatile oils of gingerols, shogoals,  $\alpha$ -zingiberene,  $\beta$ -bisabolene,  $\beta$ -sesquiphellandrene and *ar*-curcumene [1], [2]. Gingerols has been considered as a main substance responsible for the pungent smell of fresh ginger. There

are some reports proving that gingerols and shogoals are substances related to many pharmacological effects of ginger [3]-[5]. Shogoals could be distributed to various tissues of the body such as gastrointestinal tract, liver, heart and lung for many pharmacological outcomes [6]. Nonetheless, shogoals could not be found in fresh ginger but could be found during the high thermal processing of ginger as a degradation product of gingerols [7]. Ginger has been used to treat diseases related to gastrointestinal tract such as flatulence [1], indigestion [1], [4], nausea and vomiting [8]. Some effects are additionally reported such as the anti-inflammatory [9], anti-oxidant [10]-[13], anti-microbial [14]-[15], anti-cough [1], as well as the application to prevent diabetes [16]-[20], peptic ulcer [21]-[22] and the application to lower cholesterol [16]-[17] and blood pressure [23]-[24]. Up until now, the extracted ginger has been used clinically to prevent the symptoms of nausea and vomiting from various causes such as pregnancy, post-surgery and motion-sickness [25]-[27]. The ginger products such as ginger tea, ginger candy, ginger cookie and so on are also manufactured.

It is necessary to formulate the medicinal product into the dosage forms that are practical to use in order to gain the patient compliance and to meet the prescribed medicine delivery requirement while manufacturing is capable. These criteria are the challenge for most researcher and formulation scientist. Capsules are the common dosage form considered for many oral drugs that perceive good patient compliance and more simply to manufacture with less cost compare to the manufacturing of tablet [28]. Since the volatile oils and the moisture contents in extracted ginger might react critically with the capsule shell resulting into the poor stability of capsule [29], there is a considerable need to dry the extracted ginger prior to the capsule filling process in order to eliminate the

moisture content but retain the volatile oil in dried form. Thus, drying of the extracted ginger by non thermal method of adsorption to obtain liquisolid powder, a free flowing, non adherent, crumbly look powder form of liquid medication, is a challenging option. In the liquisolid system, the liquid is molecularly dispersed within the powder prepared to improve the flow-ability and drug solubility, especially for poorly water soluble drug such as piroxicam [30].

The purpose of this research was to investigate an appropriate type and amount of adsorbent to dry the oleoresin containing volatile oils of ginger in order to obtain the dried powder of ginger (liquisolid powder) for capsule filling with the satisfied powder flow-ability in order to get the good uniformity of capsule weight. Additionally, the expected amount of volatile oil could be obtained with the moisture content of powder in a range of 4-5%w/w. The characteristics of powdered ginger were as well evaluated.

## MATERIALS AND METHODS

### Materials

Lactose, Microcrystalline cellulose (Avicel® PH101), Dibasic calcium phosphate dihydrate (Emcompress®), Calcium carbonate and Talcum were purchased from Samchai Chemicals. Ltd., Bangkok, Thailand. Extracted ginger from rhizome of *Zingiber officinale* Roscoe received as a gift from the Department of Thai Traditional Medicine, Faculty of Medicine, Thammasat University, Pathumthani, Thailand.

### Methods

#### Preparation of liquisolid powder from extracted ginger (Powdered ginger)

Extracted ginger in a form of thick brown liquid containing oleoresin of volatile oils with some moisture content was dried by mixing separately with four different adsorbent powders which were lactose, microcrystalline cellulose, dibasic calcium phosphate dihydrate and calcium carbonate. In brief, the amount of extracted ginger for 30 capsules was exactly weight and pour onto the slab. The adsorbent powder, each one of them, was sprinkling added onto the extracted ginger and thoroughly mixed until the liquid became the dump mass, then turn into the incoherent powder and eventually reach the crumbly look. The dried powder ginger was consequently sieved through the mesh number 16. The amount of adsorbent powder to dry the liquid ginger could be calculated by the weight different between the starting weight of adsorbent powder and the final weight after adding into the extracted ginger to dry the liquid. The amount per dose of adsorbent powder was the weight different of adsorbent powder divided by 30.

#### Evaluation of powdered ginger

##### Moisture content of powdered ginger

The moisture content of powdered ginger prepared by four different kinds of adsorbent was determined by moisture content analyzer (Scaltec SMO 01, Germany). The moisture content of powdered ginger was attained by comparing the difference between the moisture content of powdered ginger itself with the moisture content of adsorbent powder at an equal weight of powder. In brief, 1 gram of powdered ginger and 1 gram of adsorbent powder were heated at 130°C until the weights were constant, then the weights were compared to find the moisture in powdered ginger.

##### Flow-ability of powdered ginger

Flow-ability of powdered ginger could be obtained from the percentage of powder compressibility which could be calculated from the tapped density and bulk density of powdered ginger as shown in the following equation 1:

$$\% \text{ Compressibility} = \frac{(\text{tapped density} - \text{bulk density})}{\text{tapped density}} \times 100 \quad \dots\dots\dots(1)$$

Bulk density and tapped density were determined by adding 40 grams of powdered ginger into 100ml cylinder. The cylinder was subsequently tapped for 100 times by tapped density tester (Vankel, USA). Bulk density and tapped density could be calculated by the following equations 2 and 3, respectively:

$$D_b = M / V_o \quad \dots\dots\dots(2)$$

$$D_t = M / V_f \quad \dots\dots\dots(3)$$

Where  $D_b$  represents bulk density (g/ml),  $D_t$  represents tapped density (g/ml),  $M$  represents weight of the powder (g),  $V_o$  represents volume of powder before tapping (ml),  $V_f$  represents volume of powder after tapping (ml).

The relationship between the flow-ability and percentage of compressibility is shown in Table 1.

**Table 1: Relationship between percentage of compressibility and flow-ability**

Compressibility (%)	Flow-ability
>10	Excellent
11- 15	Good
16-20	Fair
21-25	Passable
26- 31	Poor
32- 37	Very poor
> 38	Extremely poor

#### Preparation of capsule containing powdered ginger

##### Powdered ginger blended with filler and glidant

The amount of powdered gingers prepared from three different adsorbent powders that required to be filled in one dose of capsule were different. Therefore, the amount of active powder in one capsule was firstly calculated as mentioned before. Subsequently, the quantity of filler was calculated in order to fill up the volume of capsule by the following equation 4. Dibasic calcium phosphate dihydrate was selected as filler since it has a good flow-ability (passable) characteristic.

$$D = W[1 - (G/WG)] \quad \dots\dots\dots(4)$$

Where  $D$  represents the weight of filler required to fill up the capsule volume of each formulation,  $W$  represents the average weight of filler that could fill up the whole capsule volume,  $G$  represents the weight of powdered ginger per capsule (Active per capsule),  $WG$  represents the average weight of powdered ginger that could fill up the whole capsule volume

The amount of powdered ginger was subsequently blended with the calculated amount of filler, dibasic calcium phosphate dihydrate, and with 2%w/w of talcum as a glidant in dry mixer (Erweka, Apparatebau, Germany), respectively for 5 minutes. The mixed powder was packed into capsule no. 0 by semiautomatic capsule filling machine (Robert Bosch, Waiblingen, Germany). The capsules were storage in a desiccator at room temperature throughout the experiment.

##### Evaluation of powdered ginger blended with filler and glidant

###### Flow-ability of powdered ginger blended with filler and glidant

The method to evaluate the flow-ability of powdered ginger blended with filler and glidant was similar to the evaluation method of pure powdered ginger as described above.

###### Morphology of powder by scanning electron microscope

Morphological characteristics of adsorbent powder and powdered ginger blended with filler and glidant were analyzed by scanning electron microscope (SEM, JEOL, JSM-5410LV, Jeol, Japan). Firstly, the dried powder samples were sprinkled onto a sticky tape that attached onto the top of the stab. Then, dried samples attached onto the stab were coated with gold. Coated samples were photographed in order to determine the powder morphology by scanning electron microscope.

##### Evaluation of ginger capsule

###### Physical appearance and uniformity of weight

The physical appearances of capsule were evaluated which were the completeness of the capsule shells in term of appearance and color. The content inside the capsule shell was as well investigated for its physical appearance.

The uniformity of weight was also evaluated. Firstly, the weight of 20 filled capsules were determined and recorded. Then, the inside contents were totally discarded and the empty shells were subsequently weighted. The weight different between the filled capsule and the empty capsule shell was calculated as the weight of powdered ginger. The average weight and percentage of deviation were as well calculated and compared with the reference value (BP) shown in Table 2. Not more than two capsules that their weight could exceed the average weight  $\pm$  percentage of deviation shown in Table 2 and none of any capsules that their weight could be differ from the average weight more than two times of the percentage of deviation limit. If within the criteria limit, the production lot of capsule would be considered as a "pass".

### Disintegratoin

Disintegration of capsules was tested in disintegration tester (Hamburg, Germany). Water R was used as a testing medium, the temperature was set at 37°C. Six capsules were evaluated for their time of disintegration by putting each capsule into disintegrating tube and covered by the disc, testing until powdered ginger totally disintegrated from the capsule shell. The disintegration times were recorded and the average time was consequently calculated.

**Table 2: Uniformity of weight of capsule**

Pharmaceutical form	Average mass	Percentage of deviation
Capsule, Granule (Uncoated, Single-dose) and Powder (Single-dose)	Less than 300mg 300mg or more	10 7.5

### Content of active volatile oil, 6-gingerol in capsule by high performance liquid chromatography (HPLC)

The amount of 6-gingerol was determined by High performance liquid chromatography (HPLC) (Shimadzu, Kyoto, Japan) using column RP-C18 of 150x4 mm (Phenomenex®). A mixture of acetonitrile and distilled water was used as mobile phase. Samples were prepared at 10mg/ml. Samples were gradient eluted with the flow rate of 1.0ml/minute at different ratio of mobile phases at any specific point of time which were (0 minute ; 45:55),(8 minutes ; 50:50),(17 minutes ; 65:35), (32 minutes ; 100:0),(38minutes ; 100:0),(43 minutes ; 45:55),(48 minutes ; 45:55),respectively. Samples were detected at a wavelength of 282 nm. The experiments were done in triplicate.

## RESULTS AND DISCUSSIONS

### Moisture content of dried powder ginger

The moisture contents of dried powder ginger prepared by four different adsorbent powders are shown in Table 3.

**Table 3: Moisture contents of powdered ginger**

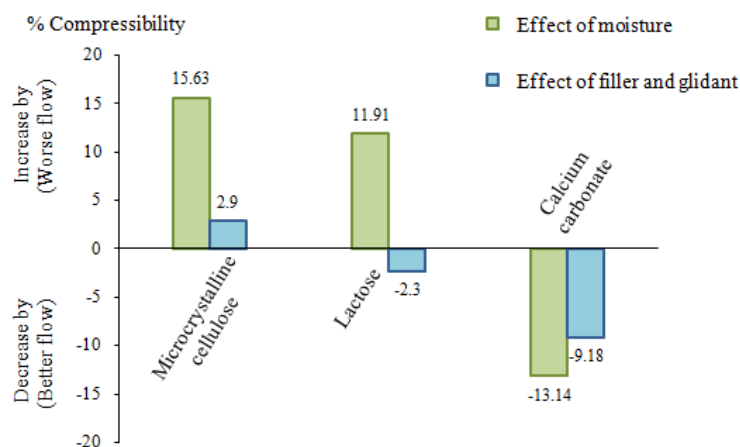
Adsorbent	Percentage of moisture content of powdered ginger ( $\pm$ SD)
Microcrystalline cellulose	4.241% ( $\pm$ 0.504)
Lactose	4.189% ( $\pm$ 0.640)
Dibasic calcium phosphate dihydrate	*NA
Calcium carbonate	4.855% ( $\pm$ 0.202)

\*Not available. Data is not available as within the amount of dibasic calcium phosphate dihydrate to be fully filled in one capsule, this amount was insufficient to dry the extracted ginger into a dried crumbly powder of the less moisture content than 5% w/w.

It was observed that microcrystalline cellulose, lactose and calcium carbonate could be used as adsorbent powders to dry the extracted ginger in order to obtain the dried powder with the moisture content of less than 5%w/w, within the amount to be filled in one capsule. Therefore, these three adsorbent powders were quite the suitable materials to adsorb the extracted ginger. For dibasic calcium phosphate dihydrate, its specific property of non-hygroscopic at room temperature [31]-[33] might be the reasonable explanation of the adsorption failure of this adsorbent.

### Effect of moisture on flow-ability of powdered ginger prepared by three different adsorbent powders

Moisture contents, even though there were within 4-5%w/w for all three formulations, had the influence on flow-ability of powder differently. Percentage of compressibility could be compared to find the flow-ability of powdered ginger as shown in above Table 1. The percentages of compressibility and flow-ability of all adsorbent powders and powdered ginger illustrated in Table 4 were relatively poor. It was also observed that the flow-ability of all adsorbent powders were reduced by the effect of moisture content adsorbed onto the adsorbent powder, except for the calcium carbonate. Percentage of compressibility of powdered ginger prepared by calcium carbonate was decreased so that the flow-ability was better than adsorbent powder of calcium carbonate itself as shown in Table 4, Figure 1. Regarding to microcrystalline cellulose and lactose, the increase of percentage of compressibility after the adsorption of moisture from extracted ginger was relatively obvious, however, the increased value of percentage of compressibility of these two adsorbent were comparable as shown in Figure 1. Therefore, the order of flow-ability ranking from the best one was; calcium carbonate > lactose  $\geq$  microcrystalline cellulose, respectively, regarding to the effect of moisture. These results could be explained by morphological investigation of adsorbent powder and powdered ginger which were described in the section below of SEM technique.



**Fig. 1: The change of percentage of compressibility of three adsorbent powders, microcrystalline cellulose, lactose and calcium carbonate, after the moisture content adsorption (green bar) and the change of percentage of compressibility of powdered ginger after the filler and glidant addition (blue bar)**

**Table 4: Percentage of compressibility of adsorbent powder and powdered ginger (Effect of moisture)**

Adsorbent powder	% Compressibility of adsorbent powder	% Compressibility of adsorbent after moisture content adsorption (powdered ginger)
Microcrystalline cellulose	26.67% (Poor flow-ability)	42.30% (Extremely poor flow-ability)
Lactose	25.37% (Passable flow-ability)	37.28% (Very poor flow-ability)
Dibasic calcium phosphate dihydrate	16.17% (Fair flow-ability)	*NA
Calcium carbonate	36.30% (Very poor flow-ability)	23.16% (Passable flow-ability)

\*Not available.

#### Formulation of powdered ginger prepared by three different adsorbent powders with the addition of filler and glidant

The formulations of capsule containing powdered ginger with the addition of dibasic calcium phosphate dihydrate as filler and talcum as glidant are shown below in Table 5. These amount of active and inactive ingredients were calculated using the described method above.

#### Effect of the addition of filler and glidant on flow-ability of dried powder ginger prepared by three different adsorbent powders

It was observed that the percentage of compressibility, which could imply to the flow-ability of powder, were slightly changed after the addition of filler and glidant into the powdered ginger prepared from microcrystalline cellulose and lactose as shown in Table 6,

Figure 1. These results correlated to the flow-ability of powdered ginger of microcrystalline cellulose and lactose since only the slight amount of filler and glidant were added into these two formulations. On the other hand, the flow-ability of powdered ginger blended with filler and glidant prepared by using calcium carbonate as adsorbent, was considerably improved. The better flow of this formulation might be the result of the filler itself that had a fair flow-ability which was added into this formulation in more amount than the other two consequences into an improvement of the flow of the whole formulation. Moreover, the better flow was probably a consequence of the passable flow of powdered ginger prepared from calcium carbonate itself as well. The addition of higher amount of glidant into calcium carbonate formulation compared to the other two, also resulted into the better flow of this formulation.

**Table 5: Formulations of capsule containing powdered ginger (Amount per one capsule)**

Formulation number	Type of adsorbent powder	Powdered ginger (mg)	Filler (mg)	Talcum (mg)
1	Microcrystalline cellulose	163.33	3.25	3.33
2	Lactose	276.66	17.69	5.84
3	Dibasic calcium phosphate dihydrate	*NA	*NA	*NA
4	Calcium carbonate	134.33	374.64	10.17

\*Not available

**Table 6: Percentage of compressibility of powdered ginger and powder ginger blended with filler and glidant (Effect of filler and glidant)**

Adsorbent powder	% Compressibility of powdered ginger	% Compressibility of powdered ginger blended with filler and glidant
Microcrystalline cellulose	42.30% (Extremely poor flow-ability)	45.20% (Extremely poor flow-ability)
Lactose	37.28% (Very poor flow-ability)	34.98% (Very poor flow-ability)
Dibasic calcium phosphate dihydrate	*NA	*NA
Calcium carbonate	23.16% (Passable flow-ability)	13.98% (Good flow-ability)

\*Not available

#### Morphology of powdered ginger

Morphology of adsorbent powder and powdered ginger blended with filler and glidant are illustrated in Figure 2. The morphological structure of microcrystalline cellulose was considered as rod shape as shown in Figure 2A and 2C. After the extracted ginger adsorption to prepare dried powder ginger, microcrystalline cellulose was held together as a lump with the fusion of surface materials. The size of lump was not that uniform as shown in Figure 2B and 2D. Therefore, the flow-ability of powdered ginger prepared from microcrystalline cellulose was getting worse after the moisture content adsorption. This result corresponded to the other report that at higher moisture content, the flow characteristics worsened, due to an increment of water cohesive forces [34].

Regarding to the morphological structure of calcium carbonate, it was observed that the shape of calcium carbonate particles was quite various as shown in Figure 2E and 2G. After adsorbing extracted ginger, calcium carbonate particles were combined as a considerably huge cluster of a very uniform size as illustrated in Figure 2F and 2H. For this reason, the flow-ability of calcium

carbonate formulation was notably improved as correlated with the other report that the flow-ability of powder increased with the increase of particle size [35].

The morphological structure of lactose particles was in a various geometrical shape. The size was not uniform as shown in Figure 2I and 2K. Subsequently on the adsorption of extracted ginger, lactose particles were gathered into cluster with not much larger in particle size compared to the original particles. The size of cluster was not uniform. The surface was as well cast together as shown in Figure 2J and 2L. The result similar to one study that the increases in moisture content in the powder matrix resulting into a poorer flow-ability as the moisture condenses on the surface and increases the cohesion force [36]. For this reason, the flow-ability of powdered ginger prepared by lactose was poorer than the original lactose.

#### Evaluation of ginger capsule

##### Physical appearances

Physical appearances of all capsules prepared by microcrystalline cellulose, lactose and calcium carbonate as adsorbent were

completed. The shells were not crack with no change in capsule shell color. All capsules contained the content inside without the sign of moist on capsule shell.

### Uniformity of weight

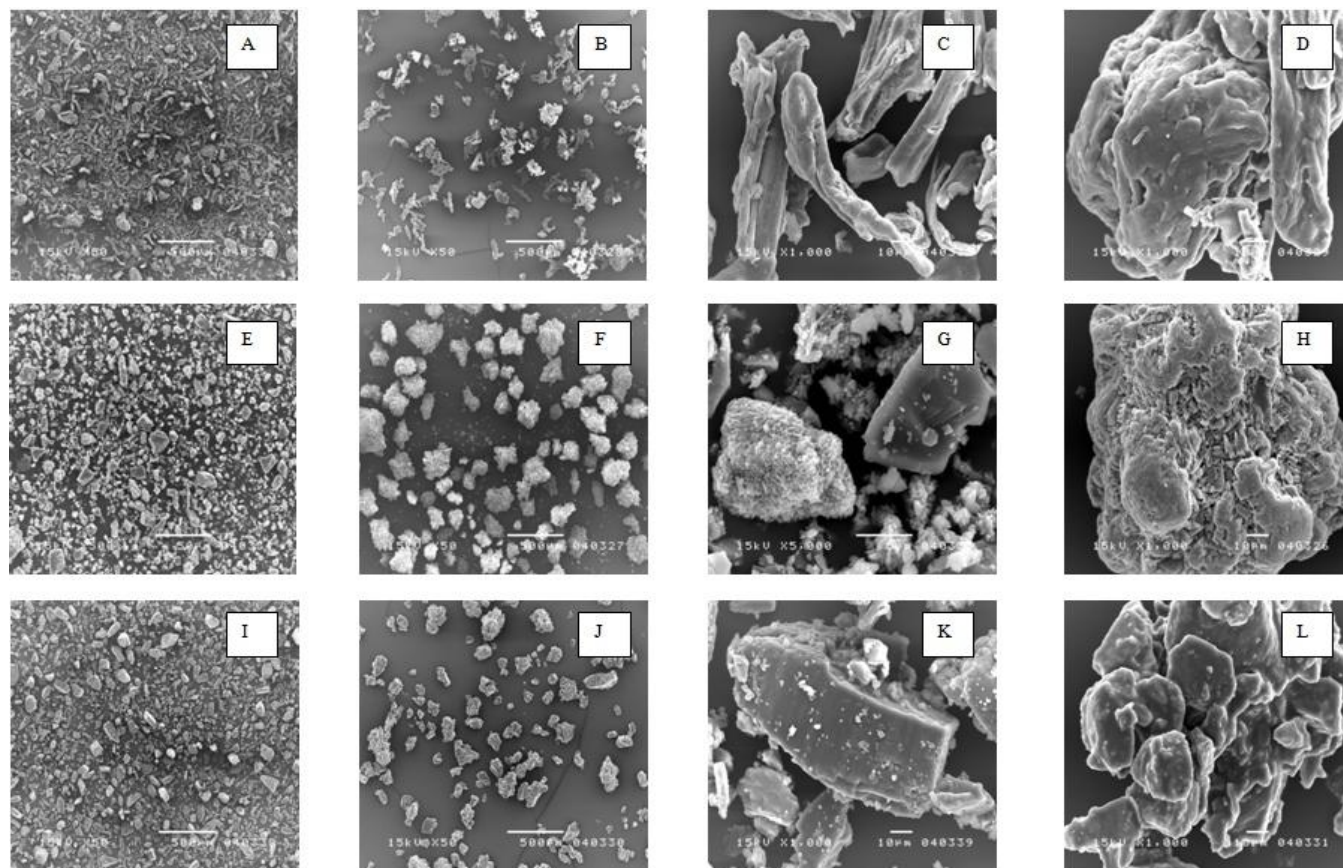
The uniformity of weight of all capsule formulations is shown in Table 7.

It was found that formulations which passed the criteria of uniformity of weight in the British Pharmacopoeia shown in Table 2 above, were the formulations of lactose and calcium carbonate as seen in Table 7. Regarding to the flow-ability of powdered ginger prepared by microcrystalline cellulose, lactose and calcium carbonate, the formulation of powdered ginger prepared by calcium carbonate had a better flow-ability compared to lactose and

microcrystalline cellulose, respectively, as shown in Table 6 above. Therefore, results of uniformity of weight corresponded to the flow-ability efficiency of powdered ginger in that the powder with the better flow-ability was the reason for the good uniformity of weight of obtained capsule.

**Table 7: Uniformity of weight of all capsule formulations**

Formulation	Average weight and standard deviation
Formulation 1: Microcrystalline cellulose	165.78 mg (SD 21.79)
Formulation 2: Lactose	301.7 mg (SD 8.79)
Formulation 3: Calcium carbonate	538.9 mg (SD 6.76)



**Fig. 2 : Morphology of microcrystalline cellulose (A : x50,C : x1000) calcium carbonate (E : x50,G : x5000) lactose (I : x50,K : x1000) and powdered ginger blended with filler and glidant of microcrystalline cellulose (B : x50,D : x1000) calcium carbonate (F : x50,H : x1000) and lactose (J : x50,L : x1000)**

### Disintegration

All formulations passed the criteria of capsule disintegration in British Pharmacopoeia. The results of disintegration time are shown in Table 8.

**Table 8: Disintegration of capsule formulations**

Formulation	Average disintegration time and standard deviation
Formulation 1: Microcrystalline cellulose	1.97 minutes (SD 0.41)
Formulation 2: Lactose	1.83 minutes (SD 0.36)
Formulation 3: Calcium carbonate	1.97 minutes (SD 0.59)

### Content of Active Volatile Oil, 6-Gingerol, by HPLC

The volatile oil of 6-gingerol is considered as important substance since it relates to many pharmacological effects as medicinal substance of ginger. The amount of 6-gingerol in capsule

formulation was calculated by the extrapolation from the 6-gingerol standard curve or using the least curve equation to make a calculation of the amount. The amount of 6-gingerol found in the formulation of capsule prepared by lactose (1L) and calcium carbonate (1C) as adsorbent are shown in Table 9.

The amount of 6-gingerol in the formulation of capsule prepared by calcium carbonate was 95.207% compared to the standard active ginger while 103.967% was the amount of 6-gingerol in the formulation of capsule prepared with lactose. It could be seen that none of any capsules in these two formulations had the amount was deviated from the standard active ginger more than 15%. Therefore, calcium carbonate and lactose could be used as the adsorbent powder to dry the extracted ginger with a little loose of active volatile oil. However, calcium carbonate had more suitable characteristics in term of the flow-ability so that calcium carbonate might be the better alternative. Following are the chromatogram of 6-gingerol and the chromatogram of formulation of powdered ginger prepared by calcium carbonate (Figure 3).

Table 9: Amount of 6-gingerol in capsule formulations

Samples	Amount of 6-gingerol	
	mg/g of extract	%w/w
Active ginger	60.54 ± 2.29	6.05 ± 0.23
Capsule 1C	57.59 ± 1.65	5.76 ± 0.16
Capsule 1L	62.86 ± 2.44	6.29 ± 0.24

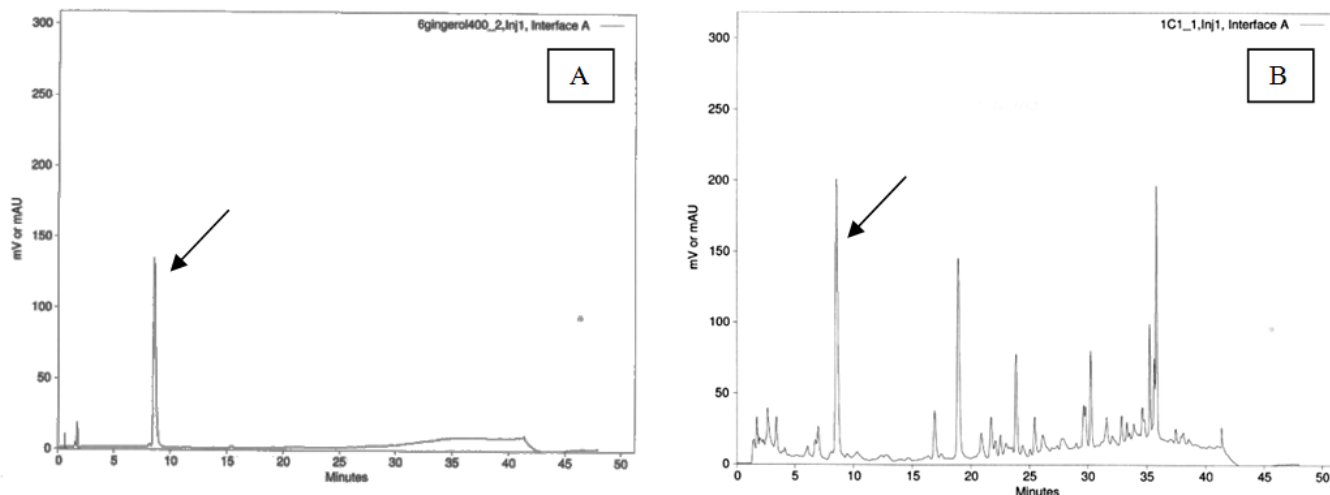


Fig. 3: Chromatogram of 6-gingerol (A) and 6-gingerol in formulation of powdered ginger prepared by calcium carbonate (B)

## CONCLUSIONS

Drying of extracted ginger containing oleoresin and volatile oils by avoid using the heat could be accomplished by some type of adsorbent powder. Appropriate adsorbent powder for extracted ginger to provide a good powder flow-ability in order to obtain the capsule of uniform weight was calcium carbonate. Calcium carbonate was an adsorbent of choice since it formed the huge lump that was uniform in term of size after the extracted ginger adsorption, resulting into the flow-ability enhancement of the powder. Therefore, the prepared capsules were with the good uniformity of weight. The active volatile oil of 6-gingerol found in calcium carbonate formulation was retained with the satisfied amount as well.

## ACKNOWLEDGMENT

The authors are grateful to Faculty of Pharmacy, Srinakharinwirot University, Thailand for the assistantship and National research council of Thailand for the financial support.

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