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Research Article

CAN MAKJONG (*SCAPHIUM MACROPODUM*) POWDER FORMED GEL IN EFFERVESCENT BLEND?

CHAOWALIT MONTON*, JIRAPORNCHAI SUKSAEREE, PATHAMAPORN PATHOMPAK

Faculty of Pharmacy and Sino-Thai Traditional Medicine Research Center (cooperation between Rangsit University, Harbin Institute of Technology, and Heilongjiang University of Chinese Medicine), Rangsit University, Pathum Thani 12000, Thailand.
Email: chaowalit@rsu.ac.th

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ABSTRACT

Objective: The aim of this preliminary study was to investigate gel forming of Makjong powder in effervescent blend and evaluate the probability to develop Makjong effervescent powder formulation for medicinal and beverage applications.

Methods: Blank effervescent blend consisted of citric acid, tartaric acid, and sodium bicarbonate with different ratio was prepared. The effervescent blends were evaluated the effervescent time and pH of the solution. Furthermore, the Makjong gel powder was mixed with effervescent blend to provide Makjong gel effervescent powder. Furthermore, Makjong gel powder and Makjong gel effervescent powder were compared for swelling property.

Results: The F5 formula consisted of 0.78 g citric acid, 1.56 g tartaric acid, and 2.66 g sodium bicarbonate was the best effervescent formula. The pH of all five formulas was quite different, approximately 5.20-5.80. The Makjong gel effervescent powder with different ratio of effervescent blends and different ratio of Makjong gel: effervescent blend had pH of approximately 5.60-6.00. All Makjong-containing formulas cannot determine effervescent time due to their bulky or low density of herbal powder. Furthermore, effervescent systems could alter the swelling property of Makjong gel; the swelling volume decreased half of original Makjong gel powder.

Conclusion: Makjong gel effervescent powder was bulky and low density, the preparation into effervescent tablets or effervescent granules may be prefer. Furthermore, the swelling property in effervescent systems was altered. This phenomenon must be further study to confirm the effect of swelling property on efficacy of herbal preparation.

Keywords: Makjong, *Scaphium macropodum*, Effervescent blend.

INTRODUCTION

Traditional medicines are used for treat of patient illness and diseases for long time ago. Even though, the Western medicines are most popular worldwide, traditional medicines are still used because they had good therapeutic effects with fewer side effects [1]. Many researchers try to develop the medicinal herbal drugs to modern dosage form such as tablets [2-4], capsules [5], sprays [6], transdermal patches [7,8], etc.

Scaphium macropodum (Miq.) Beumée ex K. Heyne. (Malvaceae) or malva nut most found in Myanmar, Cambodia, Laos, Vietnam, Thailand, Peninsular Malaysia, Sumatra, and Borneo (throughout the island). In Central Thai called Samrong or Pungtalai while the Northeastern Thai called Makjong. It flowering and fruiting every 3-4 years. Soaked Makjong fruits formed a large quantity of gel that has been reports many medicinal applications such as against intestinal infections, diarrhea, constipation, throat aches, asthma, dysentery, fever, coughs, inflammation for urinary ailments. Some people drink Makjong juice as a dietary beverage because of its cooling property [9].

Effervescent systems in powder, granules, or tablets form have many advantage more than liquid dosage forms. It can be administered in liquid form so they easy to take by patients who cannot swallow by themselves, the effervescent use less space of package because no water is added until it use [10]. However, the Makjong gel can swelling in water but cannot absorb into the body. Consumption of Makjong should be adequate water added before use to avoid the obstruction of gastrointestinal tract that may worsen constipation in severe constipated patient [11]. In case of constipation treatment, the Makjong is a bulk-forming agent, the same category with psyllium (ispaghula husks), calcium polycarbophil, methylcellulose, and bran that swell with water to increase bulk of the stool and increase bowel movements [12]. The aim of this preliminary study was to investigate gel forming of Makjong powder in effervescent blend and evaluate the probability to develop Makjong effervescent powder formulation for medicinal and beverage applications.

MATERIALS AND METHODS

Materials

Makjong fruits were obtained from Koh Chang (Chang Island), Trad province, Thailand in April 2014. Anhydrous citric acid and tartaric acid were purchased from Sigma Aldrich, Australia. Sodium bicarbonate was obtained from Ajax Finechem, Australia.

Makjong gel isolation

Dried fruits of Makjong were soaked in water for two hours. The Makjong gels were isolated from seed and seed coat. The isolated soaked Makjong gels were dried in hot air oven at 60±2 °C. The dried Makjong gels were ground and then were sieved through 60-mesh sieve. The Makjong gel powder was stored in desiccator until use. Isolation methods of Makjong gel are shown in Figure 1.

Preparation and evaluation of effervescent powder

Effervescent blend consisted of different ratio of citric acid, tartaric acid, and sodium bicarbonate (Table 1), without Makjong gel powder (blank effervescent formula). All ingredients were mixed together by the geometric dilution. The effervescent blends were evaluated the effervescent time and pH of the solution. Furthermore, the Makjong gel powder was mixed with effervescent blend to provide Makjong gel effervescent powder. Formula 1-5 were represented as F1-F5, respectively.

Evaluation of effervescent time and pH

The effervescent time was tested with conventional method, the effervescent blend were put in beaker containing 200 mL of water. The effervescent time was determined by stopwatch technique. Effervescent time was defined as the moment that the clear solution

was obtained in second unit. In addition, pH of the solution was determined using pH meter (SevenCompact, Mettler Toledo, Thailand). The pH meter was calibrated by using standard buffers solutions before test. Each test was performed in triplicate.

Table 1: Ingredient of Makjong effervescent powder (grams)

Ingredients	F1	F2	F3	F4	F5
Dried Makjong gel	2.5	2.5	2.5	2.5	2.5
Citric acid	0.39	1.14	-	0.59	0.78
Tartaric acid	0.78	-	1.19	1.17	1.56
Sodium bicarbonate	1.33	1.36	1.31	1.99	2.66
Total	5.0	5.0	5.0	6.25	7.5

Fig. 1: Isolation of Makjong gel from dried Makjong fruits

Evaluation of Makjong gel swelling

Makjong gel powder and Makjong gel effervescent powder (F5 formula) were added into 25 mL graduated cylinder (calculate based on 0.25 g of Makjong gel powder) and 20 mL of water was then added. The volume of swelled Makjong gel was recorded at 0, 15, 30, 60, 90, and 120 min. The swelling of Makjong gel powder and Makjong gel effervescent powder were compared. Each test was performed in triplicate.

RESULTS AND DISCUSSION

Dried Makjong fruits were rapidly swelled in water (Figure 1), isolation of gel from seed and seed coat is very easy. The wet Makjong gel was smooth and soft in texture. We observed that isolated Makjong gel was approximately 20% of weight of dried Makjong fruit.

F1, F4, and F5 formula had the same stoichiometric ratio of citric acid: tartaric acid: sodium bicarbonate (1:2:3.4) but different ratio of Makjong gel: effervescent blend; 1:1, 1:1.5, and 1:2, respectively. The F2 formula had citric acid: sodium bicarbonate ratio of 1:1.2 and F3 formula had tartaric acid: sodium bicarbonate ratio of 2:2.2. The blank formula or effervescent blend had different effervescent time of approximately 22-32 seconds depend on formulas (Table 2). The reaction between acids and base in each formula that release carbon dioxide simultaneously made different appearance of effervescent [13]. Even though, the F3 formula had the greatest effervescent time, but less effervescent quality (data not shown) when compared to another formula. The F2 formula had the same phenomena with F3 formula but had less effervescent time than F3 formula. In addition, though the F1, F4, and F5 formulas that had the same stoichiometric ratio of acids and base, they had different amount of acids and base compared with Makjong gel weight. The greater effervescent quality could follow by F5 > F4 > F1. In addition, pH of all formulas was quite different, approximately 5.20-5.80. The results are shown in Table 2. Thus, the F5 formula was candidate formula that selected to continually study.

The Makjong gel powder did not significantly affect to the pH of all formulas, approximately 5.60-6.00 when it was mixed into the each effervescent blend (each blank formula). The results are shown in Table 2. The effervescent time of all formulas could not determine because the herbal-effervescent mixture floated on the surface of water, the incomplete effervescent was occurred. This phenomena be due to the bulky or low density of herbal powder, the herbal effervescent preparation should be decrease its bulky or increase its density by prepare into tablets [14,15] or granules [16,17]. This result revealed that development of Makjong effervescent formula as effervescent tablets or effervescent granules were appropriate than powder form.

Table 2: Effervescent time and pH of blank formula and Makjong-containing formula (n=3)

Formula	Blank formula		Makjong-containing formula	
	Effervescent time (sec)	pH	Effervescent time (sec)	pH
F1	25.73±0.68	5.44±0.21	N/D	5.61±0.12
F2	25.75±1.10	5.59±016	N/D	5.71±0.05
F3	32.07±0.77	5.19±0.19	N/D	5.60±0.27
F4	21.81±1.42	5.76±0.14	N/D	5.69±0.26
F5	24.01±0.85	5.34±0.09	N/D	5.95±0.08

N/D = not determined

The Makjong extract can formed gel under pH 6-7, addition of NaCl, $CaCl_2$, or sugar altered viscosity and gel strength of them [9]. Our study found that effervescent system could alter the swelling property of Makjong gel (Figure 2 and 3). At 0 min, the volume of

Makjong powder and Makjong gel effervescent powder (F5 formula) were 0.55 mL and then rapidly increased up within 15 min to 15.67±0.58 and 7.58±0.14 mL, respectively. At 30, 60, 90, and 120 min, the volume of Makjong gel was slightly increased, 17.00±0.50, 17.25±0.25, 17.42±0.14, and 17.58±0.14 mL, respectively for Makjong gel powder, and 7.92±0.29, 8.50±0.00, 8.83±0.14, and 8.83±0.14 mL, respectively for Makjong gel effervescent powder. The swelling behavior of Makjong gel effervescent powder was decreased about one-half of Makjong gel powder. However, the mechanism was not clarified, might be associated with pH of the solution. The alteration of gel forming of Makjong may be affected the efficacy of Makjong to treatment constipation because it was decreased bulk-forming property. However, the alteration of efficacy in other indication should be further study.

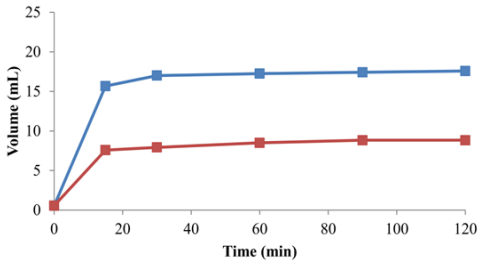

Fig. 2: Swelling volume of Makjong gel powder and Makjong gel effervescent powder (F5 formula) at various time

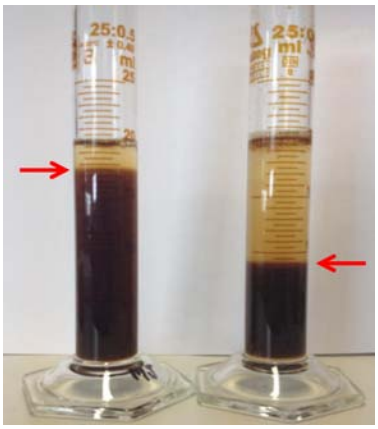

Fig. 3: Comparison of swelling volume of Makjong gel powder (left) and Makjong gel effervescent powder (F5 formula) (right) at 120 min

CONCLUSIONS

This preliminary study was to investigate gel forming of Makjong powder in effervescent blend and evaluate the probability to develop Makjong effervescent powder formulation for medicinal and beverage applications. The F5 formula consisted of 0.78 g citric acid, 1.56 g tartaric acid, and 2.66 g sodium bicarbonate was the best effervescent formula. The pH of all five formulas (both blank formula and Makjong-containing formula) was approximately 5.20-6.00. Nevertheless, all Makjong-containing formulas cannot determine effervescent time due to their bulky or low density. Furthermore, effervescent systems could decrease the swelling property of Makjong gel. Thus, the Makjong gel could not be developed and prepared in effervescent powder form. However, this effect may be improve by prepare in effervescent tablets or effervescent granules form that may develop in the future study.

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CONFLICT OF INTERESTS

Declared None

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