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Achieving SDGs in South East Asia: Challenging and Tackling of Tropical Health Problems

Editors:
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Darrimiya Hidayati

Editor on Board: Febi Dwirahmadi

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FOREWORD

The point of Sustainable Development Goals (SDGs) has been determined in the consistent meeting in all countries. The health sector position is one of the key components in achieving the indicators. Special attention to the health sector focuses on community nutrition, national health systems, access to reproductive health and family planning and sanitation and clean water.

Based on that, Southeast Asian countries are seen as important part in formulating strategic and policy efforts to improve the effectiveness and efficiency of achieving the various goals of the SDGs. Therefore, the Doctoral Program of Health Science, Faculty of Public Health, Universitas Airlangga held The 2nd International Symposium of Public Health. This remarkable event is in collaboration with Faculty of Medicine, Widya Mandala Catholic University Surabaya and Magister Program of Public Health, Jember University. It's an honour to present **"Achieving SDGs in South East Asia: Challenging and Tackling of Tropical Health Problems"**.

We have tried to give our best contributing of our knowledge in the field of public health especially our contribution to help the problems on tropical health, health equity and quality of health care, clinical and community relationship to enhance public health, emerging and re-emerging diseases, nutrition-enhancing as strategic investment, global strategy framework for food security and nutrition, environmental and occupational health and mental health for achieving SDGs in South East Asia.

The aim of this symposium is to disseminate knowledge and share it to the public, especially in the scientific community, such as academics and practitioners in the field of health. The symposium focusing on formulation of policy recommendations for related parties to accelerate the achievement of the target of SDGs in the field of health. The results of this symposium are also expected to be an input for policy makers, from various levels in formulating programs to accelerate the SDGs goals' achievement. This international symposium will help us, to grasp and share more knowledge especially in public health science.

At last, we would like to ackowledge for all parties which are provide the valuable materials as well as financial support for the successful symposium. As chair of organizing committee, I would also like to say deep thank you for all committees; my colleagues, and also students in faculty of Public Health Universitas Airlangga, who have been working to be part of a solid team and amazing committee.

I am looking forward to seeing you at ISoPH in the near future.

Rachmad Suhanda
Chairman of the Committee

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PAPERS

FULL PAPERS

The Effect of Heating Temperature on Flow rate and Moisture Content in Granules of Toxic Compound in the Mixture of Betel Leaves (*Piper betle*) and Srikaya Seeds (*Annona squamosa*) Extract

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Keywords: Flow rate, granule, heating temperature, moisture content.

Abstract: Dengue fever is a challenge that has to be overcome by Indonesian strategically, nationally, focus and comprehensive. A new product of toxic compounds granules from mixture of *Piper betle* extract and *Annona squamosa* extract is very promising as a new alternative bio-insecticide to eradicate *Aedes aegypti* mosquito larvae. The advantage of granule extract has brought a number of new trends in terms of formula composition and dosage. Granules can kill 95% *Aedes aegypti* mosquito larvae with 1 g of dosage in 10 liters of water within 105 minutes. The purpose of this research is to analyze the effect of heating temperature on flow rate and moisture content of granular. This is laboratory based study which examines the effect of heating temperature (40°C, 50°C, and 55°C) to granular flow rate and humidity of 100 gr granules. The result showed that there were effect on flow rate and moisture content of mixed granular due to the difference of temperature. Heating temperature would affect the granular humidity; when heating temperature was low, the granular humidity would be high since the water contained in granular is less evaporated and result in higher granular cohesiveness which causing stronger granular friction and slower flow rate.

1 INTRODUCTION

Dengue fever is a challenge that has to be overcome by Indonesia strategically, nationally, in focus, and comprehensively. The most effective method in overcoming this disease is by breaking the spreading chain of *Aedes aegypti* as the vector of this disease (Wahyuni, 2015). *Temephos*, as the only one chemical insecticide which is used to eradicate the larva of *A. aegypti*, has been popular with its negative impact, e.g. resistance (Nugroho, 2011; Felix, 2008). Indonesia needs to be motivated in finding new insecticide as the control of *A. aegyti* larvae. World Health Organization (WHO) suggests to develop the bio-insecticide usage and to find a new bio-controller as the alternative control of this disease vector to get more specific, safe, and environmentally friendly target (WHO, 1991 in Wahyuni, 2010).

In the development of science and technology, an appropriate formulation to process natural materials into a form of dosage that is easily accepted by the public can be made now. One of them is treating Betel leaves (*Piper betle*) and Srikaya seeds (*Annona squamosa*) into a product of granules which is usefu in controlling *Aedes aegypti* mosquito larvae. The new product of toxic compound of green Betel leaves (*Piper betle*) with Srikaya seeds (*Annona squamosa*) extract is very promising to be raised as a new bio-insecticide alternative to *Aedes aegypti* mosquito larvae. Granules of toxic compound of green betel leaves (*Piper betle*) and Srikaya seeds (*Annona squamosa*) extract have amorphous characteristic, brownish white, mesh size in 40-60, 2-6 hours of heating time, heating temperature is 40-55 degrees Celcius, can kill *Aedes aegypti* mosquito larvae with a dose of 1 gram in 10 liters of water within 105 minutes by 95% with effective duration of 14 days (Wahyuni, 2016). The results of this study indicate that toxicity of granules of toxic compound extract of green Betel leaves (*Piper betle*) and Srikaya seeds (*Annona squamosa*) is able to match the abate toxicity with the same dose differ only in LT (Lethal Time) 50.

Formulations and specifications are the most important part of making a product. Granule

Elmaghfuroh, D., Ma'rufi, I. and Wahyuni, D.
The Effect of Heating Temperature on Flow rate and Moisture Content in Granules of Toxic Compound in the Mixture of Betel Leaves (Piper betle) and Srikaya Seeds (Annona squamosa) Extract.
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formulation of toxic compounds in this study is made from betel leaves extract and substituted with Srikaya seeds extract. Making granules of toxic compound of Betel leaves extract (*Piper betle*) and Srikaya seeds (*Annona squamosa*) extract is through the process of wet granulation (Shanmugam, 2015). Furthermore, the heating process is required to dry granular mass which is still wet due to the addition of binder solution. Heating is a process to eliminate damp conditions that can damage the stability of the preparation where the heat transfer and mass are involved in this process. The purpose of heating is to reduce water content to the extent of development of microorganisms and enzyme activities that may cause decay to be stunted or halted (Siregar, 2010).

Granular specification is a breakdown of the physical properties of granulite blend of Betel leaves and Srikaya seeds extract that can be known by conducting a series of processes in the laboratory. The results of the specification test can indicate whether or not the influence of heating temperature specifies granules of toxic compound of Betel leaves (*Piper betle*) and srikaya seeds (*Annona squamosa* extract. The existence of heating process with optimal temperature aims to produce granules with good physical properties and qualified water content (Voigt, 1984 in Hadi, et al, 2014).

2 METHODS

2.1 Research Time and Area

The research was conducted from September until October 2017 at Pharmacy Laboratory of Jember University for physical properties of granule combination of extract of betel leaves (*Piper betle*) and extract of srikaya seeds (*Annona squamosa*).

2.2 Research Instruments and Materials

The instruments used in the process of a series of physical properties tests were: Drying bin (memmert), Stainless steel funnel, Stopwatch, Digital Scales, Moisture analyzer. The materials used were toxic compound granules in mixture of betel leaves and srikaya seeds extract with heating of 40ºC, 50ºC, and 55ºC.

2.3 Research Procedure

The physical properties of the granules were tested by a series of processes:

2.3.1 Granular Flow Rate

100 grams of granulite were weighed first, and then they were inserted into the funnel that had been closed down the bottom. The bottom of the funnel then closed. It was pulled while the stopwatch was turned on. The time required was recorded for all the granules to flow down.

2.3.2 The Moist Granular Content

The wet granules obtained were weighed as needed, and then the granules were inserted into the moisture analyzer. The result was then recorded after the tool turned off.

2.4 Data Analysis

Analytical analyzes were used to analyze the effect of three heating temperatures on the physical properties of granules using Annova One Way with p-value <0.05, then significant at 95% confidence level.

3 RESULTS

3.1 Effect of Heating Temperature on Granular Flow Rate of Betel Leaves (*Piper betle*) and Srikaya Seeds (*Annona squamosa*) Extract

The value of flow velocity of the granules of toxic compound in mixture of Betel leaves and Srikaya seeds extract can be seen in table 1 below:

Table 1: Flow velocity value (g/sec) of granule of Betel leaves (*Piper betle*) and Srikaya seeds (*Annona squamosa*) extract.

Formulation	Mean	Parameter	P value
F1	8.38 ±0.31	<10gr/det	0.004
F2	7.08 ±0.01		
F3	6.38 ± 0.53		

*The mean value obtained from the measurement results as much as 3 times replication

3.2 Effect of Heating Temperature on Moist Content (%) of Granular Mixture Mixture of Betel Leaves (*Piper betle*) and Srikaya Seeds (*Annona squamosa*) Extract

The value of moist granular content of toxic compound in mixture of Betel leaves and Srikaya seeds extract can be seen in table 2 as follows:

Table 2: Values of moist granular content of Betel leaves (*Piper betle*) and Srikaya seeds (*Annona squamosa*) extract.

Formulation	Mean	Parameter	P value
F1	6.63±0.09	2-5 %	0.001
F2	5.63±0.12		
F3	4.13±0.37		

*The mean value obtained from the measurement results as much as 3 times replication.

4 DISCUSSION

Granular flow rate is shown by the amount of granules which flows per second. Granules with equal weight and active substance content have good flow rate. Good granular flow rate was less than 10 seconds for 100 gr of granules. In short, the flow rate was 10gr/s. As stated by Voight in Yuliestina (2010) that good low rate obtained when 100 gr of granules flow in 10 seconds, it means the flow rate is $\geq$ 10gr/s. Form, size, surface condition, and granular humidity affect granular flow rate. Big granules usually have better flow rate since the cohesion are lower and not easy to clot.

The result showed that flow rate value for the three formulas fulfilled the terms and criteria of good flow rate. The result clarified that low heating temperature gave slower granular flow rate response while high heating temperature gave faster granular flow rate.

This condition was related to granular humidity. Low temperature caused water content of granules less evaporated than higher one. High temperature led to more evaporation for water content of granules. Higher granular humidity led to slow flow rate since the bond among the particles was stronger. It causes stronger granular cohesiveness so that the granules are more difficult to flow (Srinath et. al., 2011).

In line with a study conducted by Hadi et. al. (2014), factors which affect granular flow rate are: 1) Particles form and texture. For dimensional particles (round and cube), larger diameter leads to better flow rate but it is different to anisomeric particles. The best flow rate is owned by particles with optimum diameter (200-500µm). Particles with diameter less than 100µm are more cohesive. Particle or granules with low friction will flow easier while the high ones will more difficult. 2) Porosity. Granules with high porosity have less contact with the other granules so that the flow rate is better. 3) Humidity. Granular surface area contact increase when the humidity is high and lead to stronger bond among the granules. It causes the granules to be difficult to flow since the particles tensile strength is stronger.

Examination result for MC (Moisture Content) percentage showed that granules with high heating temperature had lower humidity than those with lower heating temperature. Granules in formula 3 with the highest heating temperature (55°C) had the lowest humidity among the other formulas. This was shown by the lowest MC percentage compared to the others. Granules in formula 1 with the lowest heating temperature (40°C) had the highest humidity. It was shown by the highest MC percentage. Granules in formula 2 with 50°C heating temperature had lower humidity than in formula 1. From the previous result, it can be concluded that the sample of mixed granular of Betel leaves (*Piper betle*) and Srikaya seeds (*Annona squamosa*) extract in formula 1 and 2 did not fulfill the humidity test since they had humidity more than 5% (the standard was 2-5%). Only granules in formula 3 which fulfilled the humidity test. The results of humidity test showed that granular humidity was inversely proportional with the temperature. It was proven by granules with higher temperature that had lower humidity while granules with lower temperature had higher humidity.

Moisture Balance (MB) temperature could be set as desired. In measuring granular water content, MB could be set at 70°C to prevent evaporation of crystal water in the material used for producing granules. The crystal water would evaporate at temperature >100°C. If it happened, there would be a mistake in measuring granular humidity since crystal water, which evaporate when water contented measuring process, did not happen in drainage process at 40-55°C (Lachman, 2007).

Another water or steam in granules with excess amount will damage granules properties. The damages are the emergence of particles bond which led to bad flow rate, high granular compactness, the emergence of liquid role possibility as catalyst in chemical reaction (decomposition, oxidation, reduction) (Nagar et. al., 2011). Liquid in certain amount is useful for granules especially to give mass power and compactness after being pressed. Water level of granules can be measured by using determination of drying shrinkage number or steam level/Moisture Content. Granular humidity evaluation is done by using Moisture Analyzer device. Basically, one of the methods which can be used to measure water level is gravimetric method by comparing granular weight after the heating process to granular weight before heating process. In heating process, the water left in granules will evaporate (Ade et al., 2014). One of the tools which can be used to measure water level with gravimetric principal is moisture analyzer. Moisture analyzer is used to analyze humidity or moisture. In short, this tool is useful to measure humidity in the tested sample which then evaporated due to the heat from the tool. Humidity includes water or organic solvent which is used to produce granules. Practically, it is not specifically measure water. If the wetter used in producing granules is organic solvent, the one which should be measured is organic solvent level (Voight, 1995).

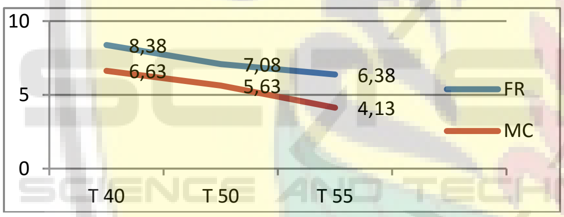

Figure 1: Graph of mean value of flow rate (FR) and moisture content (MC) of granules

5 CONCLUSION

There was an effect of heating temperature to granular flow rate of Betel leaves (*Piper betle*) and Srikaya seeds (*Annona squamosa*) extract. There was an effect of heating temperature to moist granular content of Betel leaves (*Piper betle*) and Srikaya seeds (*Annona squamosa*) extract. The higher the heating temperature used, the slower the value of the flow rate obtained. The higher the heating temperature of the granulated moist contented, the smaller the content would tend to be than the granules with lower temperature heating.

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