

**HASIL PENILAIAN SEJAWAT SEBIDANG ATAU PEER REVIEW
KARYA ILMIAH : PROSIDING SEMINAR INTERNASIONAL**

Judul Karya Ilmiah (Artikel)	Formulation And Physical Quality Of Effervescent Granules Containing Rambutan (Nephelium lappaceum L) Peel Dried Extract	
Nama Penulis	: Arisanty,Dwi Rachmawaty	
Jumlah Penulis	: 2 orang	
Status Pengusul	: penulis ke 2	
Identitas Prosiding	a. Nama Prosiding	Proceeding The 3 rd International Conference Interprofessional Collaboration on Urban Health
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	c. Volume, Nomor, Bulan, Tahun	Vol 3, Nomor 1, 22 September 2021
	d. Penyelenggara Seminar	Poltekkes Kemenkes Makassar
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Makassar , 15 September 2022

Reviewer 1

Nama : Dr. Rusli, Sp.FRS., Apt
NIP : 19670506 199703 1 002
Unit Kerja : Poltekkes Kemenkes Makassar
Jabatan Fungsional : Lektor Kepala
Bidang Ilmu : Farmasi

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Nilai Pengusul = $40\% \times 8,9 = 3,56$					

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5. Indikasi Plagiasi
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6. Kesesuaian bidang ilmu
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Makassar, 15 September 2022
Reviewer 2



Nama : Dr. Sesilia Rante Pakadang, M.Si., Apt
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Jabatan Fungsional : Lektor Kepala
Bidang Ilmu : Farmasi

Urban Health



All praise and gratitude should we pray to Allah SWT, because overabundance of grace and His mercy so The 2nd International Conference Interprofessional Collaboration on Urban Health; A Strategy for All Nations, and In Collaboration with center of excellence in urban health study center can be completed in accordance with a predetermined time and also we would like to thank Mamuju Health Polytechnic and Palu Health Polytechnic have organized this conference, Management & Science University and Lincoln University College Malaysia for supporting this conference and Budi Luhur International Network for Education (BIN for Edu) as representatives.

Furthermore, we express our thanks and appreciation to all those who have helped in the publication of proceeding among others to the reviewer, writer, editor, co-editor, Poltekkes Makassar's research units and especially to the committee which has been coordinating the preparation of proceeding to be distributed.

This proceeding is a collection of abstracts as research results, especially in the face of managing urban health on all nations such as climate risk, air pollution,

housing-related health risks, urban green spaces, nutrition insecurity, and unhealthy diets, etc.

Finally, we apologize for any shortcomings and we received input for the preparation of proceeding improvement in future activities. Hopefully, this proceeding can provide benefits and receive a blessing from Allah SWT. Amen.

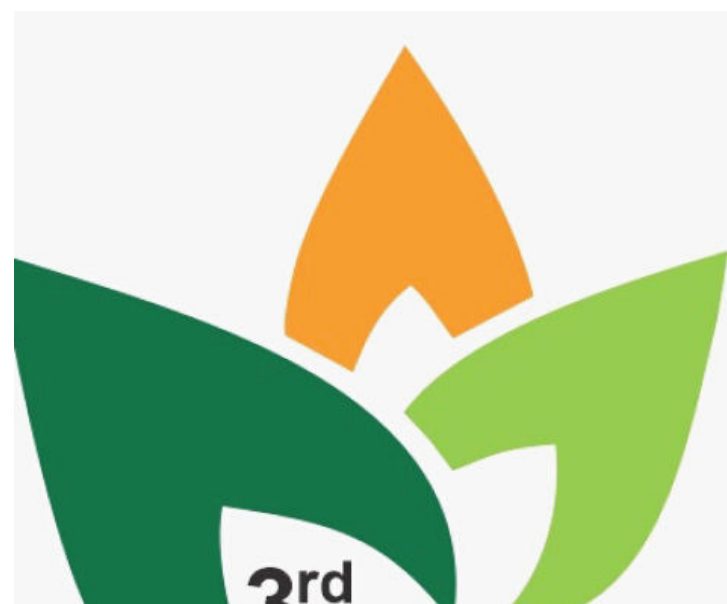
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No announcements have been published.

[More Announcements...](#)

Vol 3, No 1 (2021): The 3rd International Conference on Urban Health, The Covid-19 pandemic and Urban Health Issues

TABLE OF CONTENTS



[OPEN JOURNAL SYSTEMS](#)

[Journal Help](#)

USER

Username

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[View](#)

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LANGUAGE

Select Language

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INFORMATION

[For Readers](#)

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International Conference on Urban Health

The Covid-19 Pandemic and Urban Health Issues



PROCEEDING BOOK

The Third International Conference on Urban Health(ICUH)
with Theme "The Covid-19 Pandemic and Urban Health
Issues"
September 21 - 22, 2021

MAKASSAR, INDONESIA

E-ISSN : 2808-8352

The proceeding is a part of the 3rd International Conference on Urban Health (ICUH) 2021 was held by Health Polytechnic of Ministry of Health In Makassar in collaboration with Management and Science University Malaysia, Health Polytechnic of Ministry of Health in Mamuju, and Sandi Karsa Polytechnic in Makassar on September, 21st – 22nd, 2021. This year conference takes theme "The Covid-19 Pandemic and Urban Health Issues". This theme was chosen because in this year we were still in the situation of Covid-19 Pandemic since January, 2021 in Indonesia. The conference was held in hybrid meeting (virtual and offline). The offline site was held in the Four Points Hotel by Sheraton Makassar.

All valuable paper that had been reviewed by professional reviewer especially for proceeding was composed in this book as a summary of all paper presented during the conference. We thanks to all speakers and participants who had shared their best experience and knowledge regarding themes. We also thanks to Dr. Agustian Ipa, M.Kes, Director of Health Polytechnic of Ministry of Health in Makassar that has been approved this conference including his support for conference funding. Especially thanks to tasks executor of dr. Kirana Pritasari, M.QIH, Head of the Health Human Resources Development and Empowerment of Ministry of the Health Republic of Indonesia as the keynote speaker at the conference and Mr. Mohammad Ramdhan Pomanto, the Major of Makassar City for sparing the time to attend and open the conference.

This proceeding also provided in cooperation with the Center of Excellent of Urban Health and the Center of Research and Community Services of Health Polytechnic of Ministry of Health in Makassar. We do hope this abstract book would have benefits for us to face and step forward to face the Covid-19 Pandemic and improve the management of urban health issues in the future. In representing the team, we apologize if there was any mistaken during the conference and also in this abstract book. Thank you very much for all contributors that has been participated so this abstract book can be published in planned time.

ISSN: 2808-8352

Vol 3, No 1 (2021)

The 3rd International Conference on Urban Health, The Covid-19 pandemic and Urban Health Issues

DOI: <https://doi.org/10.32382/uh.v3i1>

[TABLE OF CONTENTS](#)



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Table of Contents

Articles

- Family Satisfaction in Emergency Patient Services PSC SIGA 119 Kabupaten Mamuju** PDF
Edi Purnomo, Andi Nasir, Firdaus Syafii
- Family Is A Supporting Factor Of Adolescent Resilience In Facing The Covid-19 Pandemic** PDF
Hardiyati Hardiyati, Masnaeni Ahmad, Rachmawati Rahim, Musdalifah Musdalifah
- Establishment Of A Covid-19 Administration (Jucovid) As A Strategic Measures For The Protection Of Family From Covid-19 Transmission; A Library Study** PDF
Malik Saepudin
- Patterns of Using Masks in Prevention of Covid-19 Transmission in Makassar, Indonesia** PDF
M. Askar M. Askar, Ernawati Ernawati, Wa Mina La Isa, Muhammad Nur
- Prevalence of Reactive HBsAg in Pregnant Women at Binanga Health Center, Mamuju Regency** PDF
Abbas Mahmud, Nurdiana Nurdiana, Riski Dyah Haninggar, Irmawati Irmawati
- Formulation And Physical Stability Test Of Celery Leaf Extract Gel (Apium graveolens L.) With Variations Concentration Of Hydroxy Propyl Methyl Cellulose And Carbopol** PDF
Agust Dwi Djajanti, Irene Nopi Praja Sumule, Firmansyah Firmansyah, Rusli Rusli
- Formulation High Fiber Cookies Using Modified Banana Flour (Musa paradisiaca)** PDF
Firdaus Syafii, Hasmar Fajriana
- Age And Occupation Related to The Event Of Dementia In The Elderly in Binanga Community Health Centers** PDF
Rachmawati Rahim, Irma Muslimin
- Overview Of The Specific Weight And Composition Of Waste In Offices (Case Study In Governor Of West Sulawesi Province Office Areas)** PDF
Siti Rahmah, Miftah Chairani Hairuddin
- Study Of The Quality Of Life On Patients With Type 2 Diabetes Mellitus** PDF
Alfi Syahar Yakub, Dyah Ekowatiningsih, Irma Dama Yanti
- Breastfeeding Education on Mother about Exclusive Breastfeeding in Mamuju Regency, West Sulawesi Province** PDF
Dina Mariana, Idayati Idayati, Satriani G Satriani G
- Efforts to Prevent Sexually Transmitted Infections (HIV/AIDS) in Wakatobi District, Southeast Sulawesi Province** PDF
Andi Asrina, Muhammad Ikhtiar, Fairus P. Idris
- UTILIZATION OF BIDARA LEAF (Ziziphus mauritiana L.) EXTRACT AS A NATURAL LARVICIDE** PDF
Askur Askur, Ridhayani Adiningsih, Abdul Ganning
- Magnesium Intake and Stunting were Associated with Obesity among Adolescent Girls** PDF
Sitti Patimah, Septiyanti Septiyanti, Sundari Sundari, Andi Imam Arundhana
- Medicines As An Alternative Therapy For Covid-19** PDF
Nur Islami Fahmi, Santi Sinala, Ida Adhayanti, Sisilia Teresia Rosmala Dewi
- Characteristicsof Chemical Compound Content in Meniran Herb Extract and Miana Leave Extract Based On Phytochemical Screening and Thin Layer Chromatography** PDF
Sesilia Rante Pakadang, Jumain Jumain, St Ratnah, Alfrida Monica Salasa
- Relationship between the Role of Health Cadres with Immunization of Tetanus Toxoid (TT) in Women of Childbearing Age in the Work Area of Mangasa Health Center of Makassar** PDF
Ambo Dalle, Sukriyadi Sukriyadi, Ningsih Jaya, Sukma Saini, Sudirman Sudirman
- Women Behavior in Nutrition Compliance for Toddlers During the COVID-19 Pandemic in Coastal Areas of** PDF

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[▶ Other Journals](#)

FONT SIZE

INFORMATION

[▶ For Readers](#)

[▶ For Authors](#)

[▶ For Librarians](#)

Bantaeng Regency in South Sulawesi Province

Sri Ningsih, Erniwati M Erniwati M, Rismayanti Rismayanti, Sulastri Sulastri, Sumarni Sumarni

Implementation Of Health Protocol In Prevention Of Covid-19 In Students

Zaki Irwan, Hasmar Fajriana, Andi Salim, Irma Muslimin

PDF

Levels of Particulate Matter 2.5 (Pm2.5) on Potential Respiratory Disorders in Traders Around the Road of Sultan Alauddin Makassar City

Abdur Rivai, Hamsir Ahmad, Rasman Rasman, Inayah Inayah, Febriyanti Febriyanti

PDF

The Physical Activity of Patients Diagnosed with Diabetes Mellitus: A Basis for A Counseling Program

Amriati Mutmainna, Rusni Mato, Sitti Nurbaya, Dahrianis Dahrianis

PDF

Comparison of Iron (Fe), Calcium (Ca) and Magnesium (Mg) Qualitative Test on Yellow and Black Raisins Nutrition-Rich Snacks as Alternative Blood Enhancement

Ratnasari Dewi, Hendra Stevani, Nurisyah Asyhari, Tajuddin Abdullah, Djuniasti Karim, Mulyadi Mulyadi

PDF

A Study on the Social Support Approach in Overcoming Drop-Out (DO) and Multi Drug Resistant (MDR) Patients of Tuberculosis

Simunati Simunati, Sudirman Sudirman, Abd. Hady J, Andi Asrina

PDF

The Mckenzie Exercise Methods For Prevent Text Neck Syndrome Due to Gadget Overused

Desti Kurniawati

PDF

Analysis of Examination Results of Ast (Aspartate Aminotransferase) and Alt (Alanine Aminotransferase) Levels in Covid-19 Patient in RS TK II Pelamonia Makassar

Andi Favian Orvala Ruhban, Syahida Djasang, Rahman Rahman

PDF

Analysis of Factors Affect the Incidence of Chronic Energy in Pregnant Women in Puskesmas Samata Gowa

Nurul Indah Sari, Ros Rahmawati, Suriani Suriani

PDF

Evaluation Of The Phbs Program For 2018, 2019, And 2020 In Masalle Village, Enrekang Regency

Angghi Pertiwi, Muh. Ikbal Arif, Haderiah Haderiah

PDF

The Relationship Between Behavior of Hospital Officers with the Use of PPE to Prevent Nosocomial Infections in Thalia Irham Hospital Kab. Gowa

Lutfiah Amanda Harris, Andi Ruhban, Muh. Ikbal Arif

PDF

The Effectiveness of Bobath Exercises on the Ability to Walk and Leg Spasticity of Stroke Patients

Suharto Suharto, Arpandjam'an Arpandjam'an, Abd Rahman, Suriani Suriani

PDF

Acceptance and Analysis of Protein and Carbon Content in Quinoa Flour Substituted Cookies and Dragon Fruit Flour

Lydia Fanny, Nur Indah Purnamasari

PDF

Risk Factors of Preeclampsia in RSKDIA Pertiwi Makassar

Andi Zulfaidawaty, Djuhadiah Saadong, Theresia Limbong, Indriani Indriani, Maria Sonda

PDF

Negative Correlation between the scoring prevention policy with stunting prevalence in South Sulawesi: Cross-Sectional Study

Agustian Ipa, Sirajuddin Sirajuddin, Rudy Hartono

PDF

Effect of Precipitation Time of Moringa Seed Powder (Moringa Oleifera) and Tamarind Seed (Tamarindus Indica L) as Coagulant in Reducing Bod and TSS of Domestic Wastewater

Syamsuddin S, Ashari Rasjid, Wahyuni Sahani, Rafidah Rafidah, Nur Humayrah. M.S

PDF

Formulation And Physical Quality Of Effervescent Granules Containing Rambutan (Nephelium lappaceum L) Peel Dried Extract

Arisanty Arisanty, Dwi Rachmawaty Daswi

PDF

The Effectiveness of Deep Breathing Against Blood Pressure Reduction

Agussalim Agussalim, Muhammad Asikin, I Takko Podding, M. Nasir M. Nasir, Syarifuddin Syarifuddin

PDF

Instrument of Inequality in Accessibility of Maternal and Child Health Services, for early detection of stunting: Cross-Sectional Study

Sirajuddin Sirajuddin, Trina Astuti, Ulty Desmarnita, Sitti Saharia Rowa

PDF

Acceptance and Iron Content in Amplang with Flour Spinach Substitution (Amaranthus gangeticus)

Fatmawaty Suaib, Sopia Natalia Hangin2, Adriyani Adam, Mustamin Mustamin

PDF

Content of Essential Fatty Acids in Polymeric Formula for Stunting Prevention

Hendrayati Hendrayati, Adriyani Adam, Laras Budhyghifary

PDF

The Effect of God's Crown Fruit Extract and Cinnamon Extract On Decrease Total Cholesterol Levels In Rats White Male

Sainal Edi Kamal, Zulfiah Zulfiah, Rina Asrina, Herman Herman, Gerfan Patandung, Alfreds Roosevelt, Muh. Farid, Megawati Megawati, Sulfiyana H. Ambo Lau, Muhammad Taufiq Duppa, Syachriyani Syachriyani, Firmansyah Firmansyah, Agust Dwi Djajanti, Rusli Rusli

PDF

Acceptance and Content of Macro Nutritional Instant Baby Porridge Red Rice Flour and Soy Beans With Substitute of Moringa Leaf Flour

Zakaria Zakaria, Hikmawati Mas'ud, Sunarto Sunarto, Nursalim Nursalim, Nur Fajri Amalia

PDF

Literature Study of Mental Health Issues In Families (Communities) During The Covid-19 Pandemic

Bahrudin Bahrudin, Natsir Natsir, Rahman Abd, Abidin Abidin

PDF

Analysis of Kelch-Like Ect-Associated Protein (Keap 1) Receptors in Improving Physical Fitness (VO2max) of Indonesian Hajj Healthcare Personnel Candidates <i>Ismail Ismail, Alfi Syahar Yakub, Muhammad Basri</i>	PDF
Impact of the Covid-19 Pandemic on Blood Glucose Management in Diabetes Mellitus Patients <i>Ridha Dwi Reski N, Muhammad Ardi, Ningsih Jaya, Ruslan Hasani, Sri Wahyuni Awaluddin</i>	PDF
Different Effect of Lateral Glide Mulligan and Ventral Glide Kaltenborn on Changes in Lumbal Range of Motion and Functional Capacity on Chronic Low Back Pain <i>Sudaryanto Sudaryanto, Tiar Erawan, Desti Kurniawati</i>	PDF
Effectiveness Combination Muscle Energy Technique and Strain Counterstrain Lumbar and Functional Changes to The Range of Motion in Patients With Non Specific Low Back Pain <i>Tiar Erawan, Sudaryanto Sudaryanto, Mar'a Nur</i>	PDF
Nursing Strategy to Protect Post-Partum Mothers from Covid-19 at RS TK II Pelamonia <i>Suhartatik Suhartatik, Hasriana Hasriana, Karolina M.D</i>	PDF
Quick Response Code Osteoarthritis Exercise to Improve Life Quality of the Elderly in Covid-19 Pandemic <i>Lisda Oktaviani, Andi Alya Amalia Yusuf, Fathur Rahma Bahtiar</i>	PDF
Analysis of the Relationship of Drug Side Effects and Tuberculosis Patient's Compliance After Treating With Drug Synthesis and Herbal Medicine <i>Rusli Rusli, Rusdriaman Rusdriaman, Raymundus Chaliks, Rudy Hartono, Zizka Zizka, Sainal Edi Kamal, Zulfiah Zulfiah, Rina Asrina, Agust Dwi Djajanti, Ananda Ramadhani</i>	PDF
Antioxidant Compound Profile and Total Flavonoid Levels of Ethanolic Extract 70% and 96% Cinnamon (Cinnamomum Burmannii) <i>Nurisyah Nurisyah, Asyhari Asyikin, Ratnasari Dewi, Tajuddin Abdullah</i>	PDF
The Construction a Model of the Community Empowerment to Prevention, Preparedness and Response Disaster Emergency <i>Abd Hady J, Naharia Laubo, Firdaus W Firdaus W, Suhaeb Suhaeb, Hariani Hariani</i>	PDF
Analysis of Levels Blood Cholinesterase and Factors of Defects of Pesticides in Farmer Spraying of Rice in the Pakalu Village Kallabirang District Bantimurung <i>Haderiah Haderiah, Mulyadi Mulyadi, Lataha Lataha</i>	PDF
A Method of Stunting Reduction Intervention Based on Community and Local Culture <i>Hariani Hariani, Ramlah D Ramlah D, Abd. Hady J, Rahmatiah Rahmatiah</i>	PDF
Analysis Affecting the Event of Low Birth Weight Babies in Aisyiyah St. Khadijah Hospital Pinrang Regency on 2020 <i>Nur Ilmi, Ros Rahmawati, Subriah Subriah, Zulaeha A. Amdadi, Asmawati Gasma</i>	PDF
Knowledge of Prevention Tuberculosis Disease in Makassar City of South Sulawesi Province <i>Herman Herman</i>	PDF
Acceptability and Protein Levels of Bassang with Addition of Tempe <i>Suriani Rauf, Rudy Hartono, Ruhul Amin, Rizka Ramadanani Yusuf</i>	PDF
The Comparison Between Extracts of Basil Leaves (Ocimum sanctum) and Papaya Leaves (Carica papaya) in Killing Aedes Aegypti Mosquitoes <i>Zaenab Zaenab, Wahyuni Sahani, Maulidyah Maulidyah</i>	PDF
The Different Effect of Hold Relax and Contrax Relax on Pain and Range of Motion in Knee Joint Osteoarthritis <i>Andi Halimah, Sitti Muthiah</i>	PDF
The Comparison Results of Examination of Platelet Counts using EDTA Blood and Sodium Citrate Using Hematology Analyzer <i>Artati Artati</i>	PDF

Formulation And Physical Quality Of Effervescent Granules Containing Rambutan (*Nephelium lappaceum* L) Peel Dried Extract

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ABSTRACT

Rambutan (*Nephelium lappaceum* L), known as a fruit plant, is also used as a medicinal plant. The parts used include pericarp (fruit peel). Rambutan peel has a high antioxidant content, but it has not been widely used and is only considered as waste. The aim of this study was to make an effervescent granule formulation from dried extract of rambutan peel which can be used as an antioxidant health drink, according to the results of previous studies on the effects of rambutan peels. Effervescent granules were made in 3 formulas with variations of PEG 6000 which functioned as granule binder. After that the granule formula was made by the dry method and physical quality testing was carried out including organoleptic test, water content, flow rate and angle of repose, density of granule, time to disperse and pH measurement of solution. The results showed that the water content for formulas A, B and C were 0.64%, 0.24% and 0.38% respectively. Results of flow velocity test of formulas A, B and C respectively are 9.82 seconds, 8.22 seconds and 8.64 seconds. Angle of repose for formulas A, B and C are 29,980, 29,980 and 29,980, respectively. Densities for formulas A, B and C are 0.8898 g/ml, 1.1183 g/ml and 1.5325 g/ml, respectively. The dispersion times for formulas A, B and C are 128 seconds, 107 seconds and 112 seconds, respectively. While the average pH of the granule solution for formulas A, B and C respectively was pH 6.91, pH 7.01 and pH 6.85. From the overall tests carried out on the effervescent granules of rambutan peel, it was shown that the three granule formulas met the physical quality requirements of granules, and the formula with the best physical quality among the three was formula B. This is evident from the pH value closest to neutral pH, dispersion time the fastest, the most fast flow rate and the least water content.

Keywords: Effervescent Granule, PEG 6000, Rambutan peel dried extract

INTRODUCTION

Food intake that exceeds energy expenditure can cause obesity because it will be metabolized continuously so as to produce free radicals in amounts that exceed normal limits, while the antioxidants in the body are unable to capture all the free radicals produced. Obesity can be caused by an increase in free radicals in the body (Dambal and Kumari, 2012).

Antioxidants are substances that are very useful to eliminate the effects of free radicals which have the property of damaging healthy cells. Oxidant levels in the body will certainly be higher especially if the body is too often exposed to pollution also if the body often consumes unhealthy foods such as fast food which lately are increasingly available. Demands for healthy drinks and food are now increasingly high along with the increasing level of education and public awareness of healthy living.

In nature, there are lots of fruits that contain antioxidants. One of them is *Nephelium lappaceum* L. or better known as rambutan,

which is a tropical fruit spread in Southeast Asia. This fruit is a seasonal fruit and is very popular because of its sweet and low fat taste. The skin of the fruit is so hairy that it is known as rambutan. In Indonesia, there are several types of rambutans which are usually named according to their area of origin.

Rambutan (*Nephelium lappaceum* L.), known as a fruit plant in its development, is also used as a medicinal plant. The parts used include pericarp (fruit peel). Rambutan's peel has a high antioxidant content, but it has not been widely used and is only considered as waste.

Based on the research of Thitilertdecha, et al (2010), the phenolic components of rambutan peels include geraniin, corilagin, both of which are flavonoid groups, and elagic acid from the tannin group. Rambutan peel extract has an IC₅₀ of 20, 39 µg / dl which means that with 20, 39 µg / dl can suppress 50% of DPPH free radicals (Wulandari and Lestari, 2012).

Based on the results of these studies the utilization of rambutan peel waste as an antioxidant has great potential to be developed, one of which is in the form of

effervescent granules. Effervescent granules are an alternative to developing soft drink products that are attractive and provide variety in the presentation of traditional drinks as well as practical storage and transportation compared to ordinary soft drinks in liquid form. The advantage of drinking effervescent granules compared to ordinary drinks is the ability to produce carbon dioxide (CO₂) gas which gives a fresh taste as in soda water. Drinks in the form of granules have advantages, namely the stability of the product and its mass is smaller and can meet demand on a large scale (Susilo, 2005).

Polyethylene glycol in an effervescent granule formulation is used as a binder to glue the powder into granules and is preferred over other binders because it can improve the flow of granules for the better (Rowe, 2009). The choice of binder must be adjusted to the active substance and in the right amount in order to obtain the desired binding quality but does not affect the quality of the granule disintegration and dissolution of the active substance.

From the background described, the problem is whether rambutan fruit skin can be used as a component of effervescent drinks in the form of effervescent granules.

The general objective of this study was to make an effervescent granule formula from rambutan (*Nephelium lappaceum* L) peel dry extract. while the Special Purpose of this study was to compare the physical qualities of the effervescent granule formula from rambutan (*Nephelium lappaceum* L) peel dry extract with variations of polyethyleneglycol 6000 as binder.

This research is the development of health drink dosage form in the form of effervescent granules by utilizing rambutan (*Nephelium lappaceum* L) peel which has been mostly used as waste.

MATERIAL AND METHOD

This research was a laboratory research with a simple experimental technique that was done by formulating effervescent granules from Rambutan (*Nephelium lappaceum* L.) peel dry extract then testing several physical quality

parameters. The research was conducted at the Pharmacy Technology Laboratory of the Department of Pharmacy, Makassar Health Polytechnic

Tools used: slugging tools, dryers, glass beakers, stirring rods, glass funnels, Erlenmeyer, measuring cups, grinders, mixers, ovens, 18 and mesh 60 mesh screens, picnometers, digital scales

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The population of this study was rambutan (*Nephelium lappaceum* L) peel obtained in the city of Makassar. The research sample was the peel of rambutan (*Nephelium lappaceum* L) which was made in the form of dried watery extract

Research Procedure

Sampling and Processing

Rambutan (*Nephelium lappaceum* L.) samples were obtained from fruit sellers in the city of Makassar

The peel of rambutan fruit is wet sorted and then washed with flowing water until it is clean and free of dirt

The Making of Rambutan Peel Dry Extract

Rambutan peel is weighed as much as 2 kg and then juiced using a juicer with the addition of water 0.5: 1. After extracting the essence of rambutan peel, it is then filtered.

The liquid extract of rambutan peel added with glucose as much as 60% then stirred until dissolved. The juice is dried using an oven dryer at a temperature of 60 ° C for ± 8 hours until it thickens. After the juice is thick, the juice is stirred and the oven is turned off and left until the juice of the fruit peel will dry out by itself. After getting dried juice, grind until it becomes a powder. The powder is crushed using a grinder and then sifted using a 60 mesh sieve. The results of the sieve are then placed in an airtight container.

Manufacture of effervescent granules

Table 1. Formula of Rambutan Peel Effervescent Granule

Components	Formula (%)		
	A	B	C
Rambutan's peel	10	10	10
Dried extract			
Effervescence mix :			
▪ Natrium bikarbonat			
▪ Asam Sitrat			
▪ Asam Tartrat	16,0	16,0	16,0
	5,0	5,0	5,0
	5,162	5,162	5,162
Aspartam	1,5	1,5	1,5
Polietilenglikol 6000	1	1,5	2
Mannitol	11,338	10,838	10,338
Esens (Pengaroma)	qs	qs	qs
Total	100	100	100

Dry method is used. The citric acid is crushed and then sieved with an 18 mesh sieve and then added tartaric acid and mixed until homogeneous. After that, aspartame and mannitol are added, while stirring until homogeneous. Then add the dried extract of rambutan's peel and stir it evenly. The mass mixture is put into the oven for one and a half hours at 50°C. After that sodium bicarbonate was added and half the mass of Polyethylene glycol 6000 was then dislugged and sieved with mesh 18. Essence (scented) dissolved in ethanol then sprayed onto granules. The resulting granules are stored in a dry place at temperatures below 25°C in airtight containers that are not permeable to moisture.

Physical Quality Test of Efferent Granules

Organoleptic Test

Seen directly from the shape, color, smell and taste of the granules produced. Shape, the color produced as far as possible is the same between one another.

Moisture content

A number of granules are placed in the dish and then put into the exicator which contains silica gel for 4 hours. Water content can be calculated using the formula:

$$\text{Moisture content} = \frac{\text{initial weight of granules} - \text{final weight of granules}}{\text{initial weight of granules}} \times 100\%$$

The moisture content of efferent granules with herbal ingredients is a maximum of 0.4-0.7% (Lestari & Natalia, 2007).

Flow speed and angle of repose

The working procedure for obtaining good quality granules is that a number of granules are inserted into a funnel which is closed at the bottom. Open slowly until all the granules come out of the funnel and form a pile on the graph paper. The granule flow is good if the time needed to drain 100 grams \leq 10 seconds (Anshory et al. 2008).

The angle of repose (α) is obtained by measuring the height and diameter of the formed granule stack, using the formula:

$$\tan \alpha = \frac{h}{r}$$

If the angle of repose formed $\leq 30^\circ$ states that the preparation can flow freely, and if the angle formed $\geq 40^\circ$ states that the preparation has an unfavorable flow rate. From the value of the angle of repose it can indicate the acceptability of the flow properties possessed by a material (Ansel, 2012).

Density Test

The Density test is actually testing the quality of the granule by comparing the mass with the volume of the granule.

Weight empty picnometer (25,0 ml) with a cover that is clean and dry (**a** gram) than fill with liquid paraffin until the fullmark (if the liquid is closed it will leave no air bubbles) then close clean and weigh (**b** gram). Cleaned by granules from fines, weigh in 1 gram of picnometer then put liquid paraffin into it until it is full and free of air bubbles and weigh (**c** gram). True density calculated

$$\text{Density of Parafin} = \frac{B - A \text{ (gram)}}{\text{Piknometer Volume}} = x \text{ g/ml}$$

$$\text{True density} = \frac{1 \text{ g}}{25 \text{ ml} - \frac{C - A}{\text{Density of Parafin}} - 1 \text{ g}} = x \text{ g/ml}$$

Dispersion time

Test method by entering a number of granules per formula into 200 mL aquadest at a temperature of 15-25°C. Soluble time was calculated using a stopwatch starting from the dipped granule in the aquadest until all the granules were dissolved and the bubbles around the container began to disappear. The time to dissolve efferent granules ranges from 1-2 minutes. If the granule is well dispersed in water with a time of ≤ 5 minutes, then the

preparation meets the requirements at the time of dissolution. (Anshory, et al., 2007).

Average pH Test

To determine the homogeneity of the acid component and the granule base, the pH of the granule that has been dissolved in water is measured using a pH meter. The granules to be pH measured are weighed as much as 4 grams from several places from the granule container and then dissolved in 150 ml of water then after the granules dissolve all immediately measure the pH of the solution. Measurements were made 3 times (triplo).

Data Analysis

Data from several tests carried out were collected and then analyzed and compared with the literature requirements to determine the physical properties of effervescent granules of rambutan peels. The results of testing the physical quality parameters of effervescent granule formulas are presented narratively by comparing the results of the physical quality testing of granules formulated with the physical quality requirements of effervescent granules from the literature.

Discussion
The discussion was prepared based on the results of the study.

RESULT AND DISCUSSION

RESULT

Testing of organoleptic formula for effervescent granules of rambutan peel, from the three granule formulas made was obtained by the form of coarse granules with a distinctive odor of rambutan, faded brick red color and salty sweet taste.

The moisture content of the formula of dried extract effluent from rambutan peel for formula A was 0.64%, for formula B it was 0.24% and Formula C was 0.38%.

For flow speed test, the average flow velocity for formula A is 9.82 seconds, for formula B for 8.22 seconds and for formula C for 8.64 seconds. Whereas in testing the angle of repose of the granule for formula A obtained 29.98°, for formula B obtained 28.76° and for formula C obtained 29.62°.

Test for True density of granules for formula A is 0.8898 g / ml, for formula B which is 0.1183 g / ml and for formula C which is 1.5325 g / ml

The average dispersion time of granules for formula A for 128 seconds, formula B for 107 seconds and formula C for 112 seconds.

The results of the pH measurements of the granules after being dissolved in water for formula A were 6.91, for formula B that is 7.01 and for formula C which is 6.85.

DISCUSSION

Rambutan (*Nephelium lappaceum* L.) is a tropical fruit that is very popular in Indonesia because of its sweet and distinctive taste. All this time, the fruit is only sweet and delicious, the skin itself has not been fully utilized because it tastes bitter and tends to be bitter. Although several studies have been carried out on rambutan peels, including Thitilertdecha, et al. (2010), phenolic components of rambutan peels include geraniin, corilagin, both of which are flavonoids, and elagic acid from the tannin group. Rambutan peel extract has an IC₅₀ of 20, 39 µg / dl which means that with 20, 39 µg / dl can suppress 50% of DPPH free radicals (Wulandari and Lestari, 2012).

This study aims to utilize the rambutan (*Nephelium lappaceum* L.) peel as a health drink in the form of effervescent granules. Rambutan fruit peel which has been separated from the flesh of the fruit and its fine hair is washed clean and then made in the form of dried juice by adding 60% glucose to the juice of rambutan's peel. The purpose of adding glucose is so that the rambutan's peel liquid extract is easier to dry, in addition to overcoming the taste of the juice that is very tight. This mixture is then dried to obtain dried extract of rambutan fruit peel.

After obtaining dried extract of rambutan's peel, effervescent granules are made. In this research 3 effervescent granule formulas were made with variations in the amount of polyethylene glycol as a granule binder. The use of polyethylene glycol as a dry binder is preferred because of its crystal-shaped structure and its ability as a good dry binder especially when using dry granulation

methods. Polyethylene glycol 6000 in a concentration of 3% can be used as a lubricant or as a binder. When using polyethylene glycol 400 or 6000 in the formula, the quality of the granule is very good. In the pharmaceutical industry polyethylene glycol is used to dissolve water-insoluble drugs. The use of polyethylene glycol can also increase the spread of drugs in the body (Rowe, 2009). As an effervescent mix, citric acid, tartaric acid and sodium bicarbonate are used with the weight ratio adjusted according to the calculation of the acid-base reaction. Mannitol is added to the formula as a filler to meet the weight of the granule, the advantage is that it has a sweet taste that does not produce a sandy texture when the preparation has been dissolved.

For mixing effervescent granules, the dry method is used. The ingredients in the formula are not given liquids in the process of making granules to minimize the occurrence of acid-base reactions between the components of the effervescence. After being mixed with acids and bases the granule components are dislugged and sifted using mesh number 18. This is done so that the resulting granules have uniform size and uniform particle shape.

Effervescent granule quality tests were carried out through several physical quality tests, namely organoleptic test, moisture content test, flow velocity test and angle of repose, density test, dispersion time test and average pH test.

Organoleptic tests were carried out by observing the shape, color, taste and odor of the granule formula produced. Of the three formulas made by the three, they show the shape of particles, smell, taste and color are almost the same. Then proceed with the water content test to observe what water content is contained in the granule. The test results showed the water content for formulas A, B and C respectively were 0.64%, 0.24% and 0.38%. From these results it can be seen that the three formulas made meet the moisture content test requirements. The moisture content of efferent granules with herbal ingredients is a maximum of 0.4-0.7% (Lestari & Natalia, 2007).

Flow velocity test is done to see if the formulated granules can flow well. Test results for formulas A, B and C respectively were 9.82 seconds, 8.22 seconds and 8.64 seconds. Good granule flow if the time needed to drain 100 grams gram 10 seconds (Anshory et al. 2008). Angle of repose test aimed to determine the ability of the granule to flow freely. The test results for formulas A, B and C are 29.98°, 29.98° and 29.98° respectively. If the angle of repose formed $\leq 30^\circ$ states that the preparation can flow freely, and if the angle formed $\geq 40^\circ$ states that the preparation has an unfavorable flow rate. From the value of the angle of repose it can indicate the acceptability of the flow properties possessed by a material (Ansel, 2012).

The True density test done to determine the quality of the granule by comparing the mass with the volume of the granule. The test results for formulas A, B and C are 0.8898 g / ml, 1.1183 g / ml and 1.5325 g / ml, respectively. Testing of dispersion time was carried out to determine the ability of the dissolution rate of granules in water. Test results for formulas A, B and C respectively were 128 seconds, 107 seconds and 112 seconds. These results all show that the time needed to dissolve the three granule formulas did not exceed 2 minutes. The time to dissolve efferent granules ranges from 1-2 minutes. If the granule is well dispersed in water with a time of ≤ 5 minutes, then the preparation meets the requirements at the time of dissolution. (Anshory, et al., 2007). The solution produced from the granule formula was then tested for pH to see the pH suitability of the neutral pH solution. Test results for formulas A, B and C respectively were pH 6.91, pH 7.01 and pH 6.85.

All of the tests carried out on the rambutan effervescent granules all showed that the three granule formulas met the physical quality requirements of granules, and the formula with the best physical quality among the three was formula B. This is evident from the pH value closest to neutral pH, time the fastest dispersion, the most fast flow rate and the least water content. In the manufacture of PEG effervescent granules, it is preferred that the

effervescent granule formula is avoided by using wetting agents such as water or alcohol. Aside from being an anhydrous binder, PEG 6000 can improve the flow of granules and increase the dissolution of granules in the body.

Binder is a substance that is added to increase the cohesiveness or quality of bonds between the powder components in the formula. Polyethylene glycol can be used up to a concentration of 3% as a dry binder in granules. The choice of binder must be adjusted to the active substance and in the right amount in order to obtain the desired binding quality but does not affect the quality of the granule disintegration and dissolution of the active substance. From the research that has been done, it is obtained that PEG 6000 levels as the most optimal binder for the formula of granule effervescent sari dried rambutan fruit peel is at a concentration of 1.5%.

CONCLUSION

Based on the results of the research that has been done, it can be concluded:

1. Dried extract of rambutan (*Nephelium lappaceum* L.) peel can be formulated as health drinks in the form of effervescent granules.
2. The three granule formulas that have been made, granules with good physical quality are formula B using 6000 polyethylene glycol as much as 1.5%.

ACKNOWLEDGEMENT

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Formulation And Physical Quality Of Effervescent Granules Containing Rambutan (*Nephelium lappaceum* L) Peel Dried Extract

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Manufacture of effervescent granules

Table 1. Formula of Rambutan Peel Effervescent Granule

Components	Formula (%)		
	A	B	C
Rambutan's peel	10	10	10
Dried extract			
Effervescent mix :			
▪ Natrium bikarbonat			
▪ Asam Sitrat			
▪ Asam Tartrat	16,0	16,0	16,0
	5,0	5,0	5,0
	5,162	5,162	5,162
Aspartam	1,5	1,5	1,5
Polietilenglikol 6000	1	1,5	2
Mannitol	11,338	10,838	10,338
Esens (Pengaroma)	qs	qs	qs
Total	100	100	100

Dry method is used. The citric acid is crushed and then sieved with an 18 mesh sieve and then added tartaric acid and mixed until homogeneous. After that, aspartame and mannitol are added, while stirring until homogeneous. Then add the dried extract of rambutan's peel and stir it evenly. The mass mixture is put into the oven for one and a half hours at 50°C. After that sodium bicarbonate was added and half the mass of Polyethylene glycol 6000 was then dislugged and sieved with mesh 18. Essence (scented) dissolved in ethanol then sprayed onto granules. The resulting granules are stored in a dry place at temperatures below 25°C in airtight containers that are not permeable to moisture.

Physical Quality Test of Efferent Granules

Organoleptic Test

Seen directly from the shape, color, smell and taste of the granules produced. Shape, the color produced as far as possible is the same between one another.

Moisture content

A number of granules are placed in the dish and then put into the exicator which contains silica gel for 4 hours. Water content can be calculated using the formula:

$$\text{Moisture content} = \frac{\text{initial weight of granules} - \text{final weight of granules}}{\text{initial weight of granules}} \times 100\%$$

The moisture content of efferent granules with herbal ingredients is a maximum of 0.4-0.7% (Lestari & Natalia, 2007).

Flow speed and angle of repose

The working procedure for obtaining good quality granules is that a number of granules are inserted into funnel which is closed at the bottom. Open slowly until all the granules come out of the funnel and form a pile on the graph paper. The granule flow is good if the time needed to drain 100 grams ≤ 10 seconds (Anshory et al. 2008).

The angle of repose (α) is obtained by measuring the height and diameter of the formed granule stack, using the formula:

$$\tan \alpha = \frac{h}{r}$$

If the angle of repose formed $\leq 30^\circ$ states that the preparation can flow freely, and if the angle formed $\geq 40^\circ$ states that the preparation has an unfavorable flow rate. From the value of the angle of repose it can indicate the acceptability of the flow properties possessed by a material (Ansel, 2012).

Density Test

The Density test is actually testing the quality of the granule by comparing the mass with the volume of the granule.

Weight empty picnometer (25,0 ml) with a cover that is clean and dry (**a** gram) than fill it with liquid paraffin until the fullmark (if the liquid is closed it will leave no air bubbles) then close clean and weigh (**b** gram). Cleaned by granules from fines, weigh in 1 gram of picnometer then put liquid paraffin into it until it is full and free of air bubbles and weigh (**c** gram). True density calculated

$$\text{Density of Parafin} = \frac{B - A (\text{gram})}{\text{Piknometer Volume}} = x \text{ g/ml}$$

$$\text{True density} = \frac{1 \text{ g}}{25 \text{ ml} - \frac{C - A}{\text{Density of Parafin}} - 1 \text{ g}} = x \text{ g/ml}$$

Dispersion time

Test method by entering a number of granules per formula into 200 mL aquadest at a temperature of 15-25°C. Soluble time was calculated using a stopwatch starting from the dipped granule in the aquadest until all the granules were dissolved and the bubbles around the container began to disappear. The time to dissolve efferent granules ranges from 1-2 minutes. If the granule is well dispersed in water with a time of ≤ 5 minutes, then the

preparation meets the requirements at the time of dissolution. (Anshory, et al., 2007).

Average pH Test

To determine the homogeneity of the acid component and the granule base, the pH of the granule that has been dissolved in water is measured using a pH meter. The granules to be pH measured are weighed as much as 4 grams from several places from the granule container and then dissolved in 150 ml of water then after the granules dissolve all immediately measure the pH of the solution. Measurements were made 3 times (triplo).

Data Analysis

Data from several tests carried out were collected and then analyzed and compared with the literature requirements to determine the physical properties of effervescent granules of rambutan peels. The results of testing the physical quality parameters of effervescent granule formulas are presented narratively by comparing the results of the physical quality testing of granules formulated with the physical quality requirements of effervescent granules from the literature.

Discussion
The discussion was prepared based on the results of the study.

RESULT AND DISCUSSION

RESULT

Testing of organoleptic formula for effervescent granules of rambutan peel, from the three granule formulas made was obtained by the form of coarse granules with a distinctive odor of rambutan, faded brick red color and salty sweet taste.

The moisture content of the formula of dried extract effluent from rambutan peel for formula A was 0.64%, for formula B it was 0.24% and Formula C was 0.38%.

For flow speed test, the average flow velocity for formula A is 9.82 seconds, for formula B for 8.22 seconds and for formula C for 8.64 seconds. Whereas in testing the angle of repose of the granule for formula A obtained 29.98°, for formula B obtained 28.76° and for formula C obtained 29.62°.

Test for True density of granules for formula A is 0.8898 g / ml, for formula B which is 0.1183 g / ml and for formula C which is 1.5325 g / ml

The average dispersion time of granules for formula A for 128 seconds, formula B for 107 seconds and formula C for 112 seconds.

The results of the pH measurements of the granules after being dissolved in water for formula A were 6.91, for formula B that is 7.01 and for formula C which is 6.85.

DISCUSSION

Rambutan (*Nephelium lappaceum* L.) is a tropical fruit that is very popular in Indonesia because of its sweet and distinctive taste. All this time, the fruit is only sweet and delicious, the skin itself has not been fully utilized because it tastes bitter and tends to be bitter. Although several studies have been carried out on rambutan peels, including Thitilertdecha, et al. (2010), phenolic components of rambutan peels include geraniin, corilagin, both of which are flavonoids, and elagic acid from the tannin group. Rambutan peel extract has an IC50 of 20, 39 µg / dl which means that with 20, 39 µg / dl can suppress 50% of DPPH free radicals (Wulandari and Lestari, 2012).

This study aims to utilize the rambutan (*Nephelium lappaceum* L.) peel as a health drink in the form of effervescent granules. Rambutan fruit peel which has been separated from the flesh of the fruit and its fine hair is washed clean and then made in the form of dried juice by adding 60% glucose to the juice of rambutan's peel. The purpose of adding glucose is so that the rambutan's peel liquid extract is easier to dry, in addition to overcoming the taste of the juice that is very tight. This mixture is then dried to obtain dried extract of rambutan fruit peel.

After obtaining dried extract of rambutan's peel, effervescent granules are made. In this research 3 effervescent granule formulas were made with variations in the amount of polyethylene glycol as a granule binder. The use of polyethylene glycol as a dry binder is preferred because of its crystal-shaped structure and its ability as a good dry binder especially when using dry granulation

methods. Polyethylene glycol 6000 in a concentration of 3% can be used as a lubricant or as a binder. When using polyethylene glycol 400 or 6000 in the formula, the quality of the granule is very good. In the pharmaceutical industry polyethylene glycol is used to dissolve water-insoluble drugs. The use of polyethylene glycol can also increase the spread of drugs in the body (Rowe, 2009). As an effervescent mix, citric acid, tartaric acid and sodium bicarbonate are used with the weight ratio adjusted according to the calculation of the acid-base reaction. Mannitol is added to the formula as a filler to meet the weight of the granule, the advantage is that it has a sweet taste that does not produce a sandy texture when the preparation has been dissolved.

For mixing effervescent granules, the dry method is used. The ingredients in the formula are not given liquids in the process of making granules to minimize the occurrence of acid-base reactions between the components of the effervescence. After being mixed with acids and bases the granule components are dislugged and sifted using mesh number 18. This is done so that the resulting granules have uniform size and uniform particle shape.

Effervescent granule quality tests were carried out through several physical quality tests, namely organoleptic test, moisture content test, flow velocity test and angle of repose, density test, dispersion time test and average pH test.

Organoleptic tests were carried out by observing the shape, color, taste and odor of the granule formula produced. Of the three formulas made by the three, they show the shape of particles, smell, taste and color are almost the same. Then proceed with the water content test to observe what water content is contained in the granule. The test results showed the water content for formulas A, B and C respectively were 0.64%, 0.24% and 0.38%. From these results it can be seen that the three formulas made meet the moisture content test requirements. The moisture content of effervescent granules with herbal ingredients is a maximum of 0.4-0.7% (Lestari & Natalia, 2007).

Flow velocity test is done to see if the formulated granules can flow well. Test results for formulas A, B and C respectively were 9.82 seconds, 8.22 seconds and 8.64 seconds. Good granule flow if the time needed to drain 100 grams granule 10 seconds (Anshory et al. 2008). Angle of repose test aimed to determine the ability of the granule to flow freely. The test results for formulas A, B and C are 29.98°, 29.98° and 29.98° respectively. If the angle of repose formed $\leq 30^\circ$ states that the preparation can flow freely, and if the angle formed $\geq 40^\circ$ states that the preparation has an unfavorable flow rate. From the value of the angle of repose it can indicate the acceptability of the flow properties possessed by a material (Ansel, 2012).

The True density test done to determine the quality of the granule by comparing the mass with the volume of the granule. The test results for formulas A, B and C are 0.8898 g/ml, 1.1183 g/ml and 1.5325 g/ml, respectively. Testing of dispersion time was carried out to determine the ability of the dissolution rate of granules in water. Test results for formulas A, B and C respectively were 128 seconds, 107 seconds and 112 seconds. These results all show that the time needed to dissolve the three granule formulas did not exceed 2 minutes. The time to dissolve effervescent granules ranges from 1-2 minutes. If the granule is well dispersed in water with a time of ≤ 5 minutes, then the preparation meets the requirements at the time of dissolution. (Anshory, et al., 2007). The solution produced from the granule formula was then tested for pH to see the pH suitability of the neutral pH solution. Test results for formulas A, B and C respectively were pH 6.91, pH 7.01 and pH 6.85.

All of the tests carried out on the rambutan effervescent granules all showed that the three granule formulas met the physical quality requirements of granules, and the formula with the best physical quality among the three was formula B. This is evident from the pH value closest to neutral pH, time the fastest dispersion, the most fast flow rate and the least water content. In the manufacture of PEG effervescent granules, it is preferred that the

effervescent granule formula is avoided by using wetting agents such as water or alcohol. Aside from being an anhydrous binder, PEG 6000 can improve the flow of granules and increase the dissolution of granules in the body.

Binder is a substance that is added to increase the cohesiveness or quality of bonds between the powder components in the formula. Polyethylene glycol can be used up to a concentration of 3% as a dry binder in granules. The choice of binder must be adjusted to the active substance and in the right amount in order to obtain the desired binding quality but does not affect the quality of the granule disintegration and dissolution of the active substance. From the research that has been done, it is obtained that PEG 6000 levels as the most optimal binder for the formula of granule effervescent sari dried rambutan fruit peel is at a concentration of 1.5%.

CONCLUSION

Based on the results of the research that has been done, it can be concluded:

1. Dried extract of rambutan (*Nephelium lappaceum* L.) peel can be formulated as health drinks in the form of effervescent granules.
2. The three granule formulas that have been made, granules with good physical quality are formula B using 6000 polyethylene glycol as much as 1.5%.

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