NASKAH PUBLIKASI

UJI STABILITAS FORMULASI TABLET EFFERVESCENT DARI BEE POLLEN LEBAH KELULUT *(TRIGONA SP)* DENGAN ASAM SITRAT DAN NATRIUM BIKARBONAT

FORMULATION AND EVALUATION OF EFFERVESCENT TABLET FROM KELULUT BEE POLLEN (TRIGONA SP) WITH CITRIC ACID AND SODIUM BICARBONATE

Alfin Syahrian Dwi Nugraha[1], Paula Mariana Kustiawan [2*]

DISUSUN OLEH

ALFIN SYAHRIAN DWI NUGRAHA

1911102415008

PROGRAM STUDI S1 FARMASI

FAKULTAS FARMASI

UNIVERSITAS MUHAMMADIYAH KALIMANTAN TIMUR

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Uji Stabilitas Formulasi Tablet Effervescent dari Bee Pollen Lebah Kelulut (Trigona Sp) dengan Asam Sitrat dan Natrium Bikarbonat

Formulation and Evaluation of Effervescent Tablet from Kelulut Bee Pollen (Trigona Sp) with Citric Acid and Sodium Bicarbonate

Alfin Syahrian Dwi Nugraha[1], Paula Mariana Kustiawan [2*]

Disusun Oleh

Alfin Syahrian Dwi Nugraha

1911102415008

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LEMBAR PERSETUJUAN

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DISUSUN OLEH :

ALFIN SYAHRIAN DWI NUGRAHA

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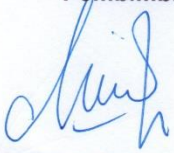
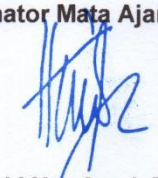


Paula Mariana Kustiawan.,M.Sc.,Ph.D
NIDN. 1114038901

Mengetahui

Koordinator Mata Ajar Skripsi



apt. Rizki Nur Azmi, M. Farm
NIDN. 1102069201

LEMBAR PENGESAHAN

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ALFIN SYAHRIAN DWI NUGRAHA

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Penguji 1	Penguji 2
Chaerul Fadly Mochtar Luthfi, M.Biomed	Paula Mariana Kustiawan, M.Sc., Ph.D.
NIDN. 1115099202	NIDN. 1114038901

Mengetahui,

Ketua

Program Studi S1 Farmasi

apt. Ika Ayu Mentari, M. Farm

NIDN. 1121019201

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Formulation And Evaluation Of Effervescent Tablet From Kelulut Bee Pollen *(Trigona Sp)* With Citric Acid And Sodium Bicarbonate

Title (Times New Roman front 14 **Bold**)

Paula Mariana Kustiawan*, Alfin Syahrian Dwi Nugraha

Author (S) (Times New Roman front 11 **Bold**)

Department of Pharmacy, Universitas Muhammadiyah Kalimantan Timur, Samarinda, East Kalimantan, Indonesia**.**

Author (S) Affiliation (Times New Roman front 10)

*Corresponding author:
Department of Pharmacy,
Universitas Muhammadiyah Kalimantan Timur,
l. Ir. H. Juanda No. 15, Sidodadi, Kec. Samarinda Ulu,
City of Samarinda, East Kalimantan 75124.
E-mail address: pmk195@umkt.ac.id
Tel: 081349568120

ABSTRACT:
(Times New Roman front 11 **Bold Capital**)

Content (Times New Roman front 10)

Since the beginning of human history, bee honey has been used by humans. However, there are also other products such as bee pollen (BP), royal jelly, propolis, and beeswax. Previous research has identified pollen as consisting of amino acids, lipids, flavinoids, micronutrients and contains many fat-soluble vitamins such as vitamins A, E and D, as well as water-soluble vitamins such as vitamins B1, B2, B6 and C4. The method in this study uses alkaline granulation which requires an oven process for 24 hours. the use of a combination of sodium bicarbonate with citric acid as an effervescent. Formulation 3 has an average moisture content of 0.5696 ± 0.6154%, formulation 3 had an average flow rate of 0.67 ± 0.02054 g/sec, the average compressibility in formulation 1 is 0.046 ± 0.0452%. Overall it is also known that formulation 2 has the smallest dissolution time compared to other formulations. The effect of the combination of citric acid and sodium bicarbonate used in the formulation of effervescent tablets from bee pollen on the physical quality of the tablets, namely friability, hardness, and dissolving time, the higher levels of citric acid and sodium bicarbonate used do not have a significant effect on friability, hardness, and time dissolving effervescent tablets from bee pollen from kelulut bees *(trigona sp)*

KEYWORDS: Kelulut bee (*trigona sp*), Bee polen, Cefdinir, Effervescent , combination of citric acid and sodium bicarbonate.
(Times New Roman front 11 **Bold Capital**)

Content (Times New Roman front 10 [at least 5 key words])

INTRODUCTION :

Apart from the disadvantages of delayed absorption and prolonged onset caused by slow dissolution, solid oral pharmacological molecular formulations have their own significance. Additionally, the lack of stability of the drug in liquid oral form limits its delivery[1]. The dissolution of oral formulations has been improved with the application of so many changing methods. Among these, effervescent pills are a viable alternative dosage type[2] .

Since the beginning of human history, bee honey[3] has been used by humans[4]. However, there are also other products such as bee pollen (BP), royal jelly, propolis, and beeswax[5]. The most common type of bee that produces honey but does not sting is the kelulut bee. In Indonesia, there are several types of kelulut bees, including klanceng, teweul, Lilin, galo-galo, and ketap[6]. *Trigona sp* is a type of kelulut bee. Kelulut bees have very significant differences compared to body shape and their products with other strap-producing honey[7].

Kelulut Bees Produce More Honey About 5,8 kilograms each year, with a more sour taste and increased propolis. Larger than similar bees[8]. Bee pollen is one of the results of flower pollen agglutination; it is made by worker honey bees with nectar and salivary substances and stored at the entrance to the hive as well as pouches and leets on the bees' feet[8,5]. Previous research has identified pollen as consisting of amino acids[9], lipids, flavinoids, micronutrients and contains many fat-soluble vitamins such as vitamins A[10], E[11] and D, as well as water-soluble vitamins such as vitamins B1, B2, B6[12] and C[13]. Due to the presence of phenolic substances with anti-oxidant activity[14], the effect is beneficial to health[15].

Bee pollen is also still considered as a bee product that has utility The low one. Matter this is also proven by the absence pharmaceutical preparations or formulations for bee pollen. Based on p this, it is necessary to do the formulation on bee pollen of kelulut bees (*Trigona sp*) for take advantage of its antioxidant[16] properties has. Nowadays, drug formulation materials Nature is only limited to simple forms and less fun like shape conventional capsules, syrups and tablets. Form pharmaceutical preparations such as these would make someone feel like taking drugs and giving birth deep saturation tendency consume it[17]. On this basis, development of the potential of local natural materials like bee pollen bees kelulut into something standardized[18] pharmaceutical preparations as well interesting to use ease in marketing One pleasant pharmaceutical preparations is an effervescent tablet preparation. Effervescent tablets[19] have advantages, including a pleasant taste fun, refreshing effect, can mask the bitter taste of the active ingredients and easy to use[20]. Effervescent preparations, in contrast to other conventional preparations, not only have the potential to maintain the stability of the active ingredients for a longer period of time because they are in dry form, but they can also hasten the body's assimilation of the active ingredients[21]. Therefore, in this study optimization of the formulation of Effervescent bee pollen from bee kelulut *(Trigona sp*) was carried out, then physical tests of the granules were carried out including tests of moisture content, flow properties and angle of repose, tests of real incompressible specific gravity and comparability. As well as tablet physical tests including organoleptic tests, friability tests, hardness tests, and tablet dissolving time tests.

MATERIALS AND METHODS:

Materials

Tools used Analytical balance (CHQ), moisture analyzer (ohaus), oven (memmert), mortar and stamper, stopwatch, hardness tester, funnel flowability tester, tapped density tester (linux), friabilator tester (guoming), baking sheet, mesh sieve 12 and 16, glassware (iwaki), tablet printer (wipro).

The ingredients used are citric acid, sodium bicarbonate, PVP (Polyvinylpyrrolidone), sucrose, PEG (Polyethylene glycol) 6000, lactose, Airosyl, and 96% ethanol.

Method

Table 1. The Effervescent Tablet Formulation Of Bee Pollen Bee Kelulut *Tigona Sp*

Materials	**FI (%)**	**FII (%)**	**FIII (%)**
Bee Polen	12,5	12,5	12,5
Citric Acid	12,5	15	17,5
Sodium Bicarbonate	25,5	30,6	35,7
Airosyl	12,5	12,5	12,5
Pvp	1	1	1
Sucrose	7,5	7,5	7,5

PEG 6000	10	10	10
Lactose	Ad 100	Ad 100	Ad 100

Effervescent tablets were prepared under special conditions of 25% relative humidity at 20-25°C by wet granulation method. Granules are made separately between acid granules and alkaline granules. First, prepare the tools and materials and weigh all the materials to be used. Then for the sour component, add the bee pollen (which has been in the oven for 2 hours at 50°C) as an active substance mixed with citric acid as a source of acid, sucrose as a sweetener, some lactose as a filler and some PVP as a binder. dripped with 96% ethanol to form banana breaking. Then sieved with sieve mesh no. 12 and dried in an oven at ±50°C for ±18 hours. The dried granules were sifted again using a mesh sieve no. 16. As for the basic component, add sodium bicarbonate as a base source mixed with the remaining lactose as a filler and the remaining PVP as a binder, then drip with 96% ethanol until the banana breaks. Then sieved with a mesh sieve no.12 and dried in an oven at ±50°C for ±18 hours. The dried granules were sifted again using a mesh sieve no. 16[22].

Effervescent Granule Moisture Content Test

Granule moisture test was carried out to see the water content in the granule. Air content that is too high in the granules can cause the granules to not flow properly when the tablets are printed because they can stick to the punch and die. Meanwhile, if the moisture content of the granule is too low, it will cause the tablet to become brittle, because the bonding power between the particles in the tablet is low[23]. The good moisture content for effervescent granule preparations according to BPOM is ≤10%[24].

Test The Properties Of Flow And Rest Angle Of Effervescent Granules

In a good flow rate test, the requirements are > 10g/sec[25]. The angle of repose is the maximum angle that the granule surface forms with the horizontal surface during rotation. When the angle of repose is less than or equal to 30° it usually indicates that the material can flow freely. If the angle is greater or equal to 40° it usually has poor flow. A granule has good flow properties if it has a repose angle of 25-45°[22].

Test Real Density, Density and Compressibility (Tap Density)

The compressibility index test has the objective of knowing the flow properties and density of the granules as well as the decrease in each volume due to impact. A good compressibility test is if it meets the requirements <20%[25].

Organoleptic Effervescent Tablets

Organoleptic is a test carried out by looking directly at the appearance of the effervescent tablet. Observations made include shape, smell, and color[26]. The shape and color obtained are the same as one another[27].

Tablet Friability Test

This friability test aims to determine the tablet's ability to withstand shocks without collapsing during manufacturing, packaging, shipping and use to consumers[28]. A good tablet has a standard friability value of no more than 1%. The use of binder also affects the fragility of tablets, generally solid and thick tablets are stronger than thin tablets[29].

Tablet Hardness Test

The hardness of effervescent tablets reflects the strength of the tablets as a whole[30]. Hardness is used as a measure of compressing pressure, the greater the pressure exerted when printing effervescent tablets, the harder the tablet will be. Hard tablets generally have a longer disintegration time (more difficult to crush)[31]. Generally the requirements for tablet hardness range from 4-8 kg, this weight has been considered as the limit for producing satisfactory tablets[32]. The mechanical strength tablets from each formulation was determined using the Hardness Continuous tablet hardness tester[19].

Effervescent Tablet Dissolving Time Test

The key factor in an effervescent system is the visual effect during melting and the appearance of the effervescent tablet carbonation process in the solution, hence the dissolving time of effervescent tablets is the most crucial parameter[33]. The dissolving time of effervescent tablets ranges from 60-120 seconds[26]

RESULT:

Physical Examination Of Granules For Moisture Content

Table 2. Granule Moisture Content

Formulation	(X±SD)	Information
1	0,4923 ± 0,3749	Qualify
2	0,779 ± 0,8180	Qualify
3	0,5696 ± 0,6154	Qualify

Granule moisture test was carried out to see the water content in the granule. Water content that is too high in the granules can cause the granules to not flow properly when the tablets are printed because they can stick to the punch and die[34]. Based on table 2, the average moisture content of formulation 1 is 0.4923 ± 0.3749%, formulation 2 averages 0.779 ± 0.8180%, formulation 3 has an average moisture content of 0.5696 ± 0.6154%. These results indicate that the three formulas have met the requirements for the moisture content test, namely ≤10[24].

Flow Properties Test

Table 3. Flow Properties

Formulation	(X±SD)	Information
1	0,913 ± 0,08806	not eligible
2	0,68 ± 0,024944	not eligible
3	0,67 ± 0,02054	not eligible

Based on table 3, the average flow properties in formulation 1 were 0.913 ± 0.08806 g/second, formulation 2 had an average flow rate of 0.68 ± 0.024944 g/second, formulation 3 had an average flow rate of 0.67 ± 0.02054 g/sec. These results indicate that the three formulas do not meet the flow properties test requirements of >10g/second[25].

Compressibility Test

Table 4. Compressibility Test

Formulation	(X±SD)	Information
1	0,046 ± 0,0452	Qualify
2	1,43 ± 0,0825	Qualify
3	2,05 ± 0,3852	Qualify

The compressibility index measures the tendency of a powder to compact. Drug packaging capacity is assessed based on volume changes resulting from rearrangement of packaging during tapping[35].Good compressibility percent test that is if it meets the requirements <20%[25]. This experiment was carried out with the compressibility index, the granules were put in a volume measuring cup (V1). The measuring cup containing the granules is placed on the tapping tool, tapped 300 times and the volume is measured (V2) then the granules are weighed. The experiment was carried out three times for each formulation. Based on table 4, the average compressibility in formulation 1 is 0.046 ± 0.0452%, formulation 2 has an average of 1.43 ± 0.0825%, formulation 3 has an average compressibility of 2.05 ± 0.3852% . These results indicate that the three formulas have met the compressibility test requirements.

Organoleptic Effervescent Tablets

Evaluation of unique attributes such as touch and texture, as well as color, smell, shape and taste is called organoleptic assessment. These observations can be used to deduce most material identification, purity, and quality[35].

Table 5. Organoleptic *Effervescent* Tablets

Organoleptic	**Observation**		
	F1	**F2**	**F3**
Form	**Round**	**Round**	**Round**
Color	**Yellowish White**	**Yellowish White**	**Yellowish White**
Smell	**Special Honey**	**Special Honey**	**Special Honey**


(F1)


(F2)


(F3)

Tablet Dissolving Time Test

Table 6. Tablet Dissolving Time Test

Formulation	(X±SD)	Information
1	2,62 ± 0,3309	Qualify
2	1,43 ± 0,0825	Qualify
3	2,05 ± 0,3852	Qualify

Based on table 5, it is obtained that the average dissolving time in formulation 1 is 2.62 ± 0.3309 minutes, formulation 2 has an average of 1.43 ± 0.0825 minutes, formulation 3 has an average dissolving time of 2.05 ± 0. 3852 minutes. These results indicate that the three formulas have fulfilled the dissolution time test requirements, which range from 60-120 seconds[36]. Overall it is also known that formulation 2 has the smallest dissolution time compared to other formulations.

Tablet Hardness Test

Table 7. Tablet Dissolving Time Test

Formulation	(X±SD)	Information
1	2,56 ± 0,6086	Qualify
2	3,228± 0,3872	Qualify
3	4,344 ± 0,4460	Qualify

Hardness is used as a measure of compressing pressure, the greater the pressure exerted when printing effervescent tablets, the harder the tablet will be. Generally the requirements for tablet hardness range from 4-8 kg, this weight has been considered as the limit for producing satisfactory tablets[32]. The experiment was carried out by measuring the hardness scale of each tablet formulation using a hardness tester for 5 repetitions. Based on table 7, it was obtained that the average tablet hardness in formulation 1 was 2.56 ± 0.6086 kg, formulation 2 had an average of 3.228 ± 0.3872 kg, formulation 3 had an average tablet hardness of 4.344 ± 0.4460 kg, which was formula 2 and formula 3. These results indicate that of the three formulas that have met the requirements for the tablet hardness test, which ranges from 4-8 kg, this weight has been considered as the limit for producing satisfactory tablets[32].

Tablet Friability Test

Table 8. Tablet Dissolving Time Test

Formulation	(X±SD)	Information
1	0,327 ± 0,1593	Qualify
2	0,506 ± 0,2465	Qualify
3	0,385 ± 0,2027	Qualify

This friability test aims to determine the tablet's ability to withstand shocks without collapsing during manufacturing, packaging, shipping and use to consumers. Good tablets have a standard friability value of no more than 1%, generally solid and thick tablets are stronger than thin tablets[29]. Based on table 8, the average friability of tablets in formulation 1 is 0.327 ± 0.1593%, formulation 2 has an average of 0.506 ± 0.2465%, formulation 3 has an average fragility of tablets of 0.385 ± 0.2027%. These results indicate that the three formulas have fulfilled the tablet friability test requirements.

CONCLUSION:

The effect of the combination of citric acid and sodium bicarbonate used in the formulation of effervescent tablets from bee pollen on the physical quality of the tablets, namely friability, hardness, and dissolving time, the higher levels of citric acid and sodium bicarbonate used do not have a significant effect on friability, hardness, and time dissolving effervescent tablets from bee pollen from kelulut bees *(trigona sp)*

CONFLICT OF INTEREST:

The authors have no conflicts of interest regarding this investigation**.**

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REFERENCES:

1. Mishra, B., Biswal, P. K., Pani, N. R. & Dixit, P. K. In-vitro Characterization and Pharmacokinetic investigation of self-Micro-Emulsifying Tablets of Cinnarizine. *Res. J. Pharm. Technol.* **10**, 3492 (2017).
2. govind, A. *et al.* Formulation and Evaluation of Mouth Dissolving Tablets of Deflazacort. *Asian J. Pharm. Technol.* **6**, 91 (2016).
3. Aishwarya, S. S., Gowri, V. & Chellathai, D. D. Honey a Therapeutic Trial in Osteosarcoma. *Res. J. Pharm. Technol.* **12**, 2929 (2019).
4. Kalia, P., Kumar, N. R. & Harjai, K. Preventive effect of Honey bee propolis on Salmonella enterica serovar Typhimurium infected BALB/c mice: A Hematological Study. *Res. J. Pharm. Technol.* **13**, 3389 (2020).
5. Feás, X., Vázquez-tato, M. P., Estevinho, L., Seijas, J. A. & Iglesias, A. Organic Bee Pollen: Botanical Origin, Nutritional Value, Bioactive Compounds, Antioxidant Activity and Microbiological Quality. 8359–8377 (2012) doi:10.3390/molecules17078359.
6. Priawandiputra, W. *et al. Lebah Tanpa Sengat (Stingless Bees) di Desa Perbatasan Hutan*. *ZSL Indonesia* (2020).
7. Jebaraj, A. S. & Gopinath, P. Antibacterial Activity of Honey Against Clinical Isolates of Pseudomonas aeruginosa. *Res. J. Pharm. Technol.* **9**, 1174 (2016).
8. Putri, D., Yusuf, M., Kawareng, A. T. & Indriyanti, N. Phytochemical Screening and Antioxidant Activity Test of Kelulut Bee Propolis (Heterotrigona itama) Ethanol Extract. *Proc. Mul. Pharm. Conf* 237–241 (2021).
9. Wardani, E., Harahap, Y., Mun'im, A. & Bahtiar, A. Evaluation of the combination of Kemuning Leaves Extracts and Simvastatin on Blood fatty acids and amino acids of Hyperlipidemic Model Rats. *Res. J. Pharm. Technol.* 2076–2080 (2021) doi:10.52711/0974-360X.2021.00368.
10. Mokkapati, A., Nagumantri, R. K., Pydi, C. B., Chintala, R. & Rentala, S. Docking Studies of Piperine-Vitamin a Conjugate to Study the Increase in Bioavailability of Vitamin A. *Res. J. Pharm. Technol.* **10**, 2189 (2017).
11. Nasir, A. S. & Jaffat, H. S. Symbiotic effect of sodium selenite and vitamin E against lithium carbonate induced brain toxicity in male rats. *Res. J. Pharm. Technol.* **10**, 1661 (2017).
12. Almakaiev, M. S., Dvinskikh, N. V., Almakaieva, L. G. & Kryvanych, O. V. Development of a combined solution of pyrimidine nucleotides with vitamin B6. *Res. J. Pharm. Technol.* 6228–6234 (2021) doi:10.52711/0974-360X.2021.01078.
13. Al-Salem, H. S., Bhat, R. S., Al-Ayadhi, L. & El-Ansary, A. Therapeutic potency of bee pollen against biochemical autistic features induced through acute and sub-acute neurotoxicity of orally administered propionic acid. *BMC Complement. Altern. Med.* **16**, 1–10 (2016).
14. Karki, D., Kulkarni, G. S., Swamy, S. & Sheeba, F. Formulation and Evaluation of Mucoadhesive Buccal Tablets of Curcumin and its Bioavailability Study. *Res. J. Pharm. Technol.* **10**, 4121 (2017).
15. Nurdianah, H. F., Ahmad Firdaus, A. H., Eshaifol Azam, O. & Wan Adnan, W. O. Antioxidant activity of bee pollen ethanolic extracts from Malaysian stingless bee measured using DPPH-HPLC assay. *Int. Food Res. J.* **23**, 403–405 (2016).
16. Prabha, S. B., Rao, M. & Kumar, M. R. R. Evaluation of in vitro Antioxidant, Antibacterial and Anticancer activities of leaf extracts of Cleome rutidosperma. *Res. J. Pharm. Technol.* **10**, 2492 (2017).
17. Julianti, T., Mentari, I. A., Wikantyasning, E. R., Azzahra, S. & Hairunisa, I. Formulasi dan Uji Antioksidan Formula Granul Effervescent Ekstrak Kulit Buah Pulasan (Nephelium mutabile Blume). *J. Pharmascience* **9**, 287 (2022).
18. Raval, M., Patel, M., Gamit, K., Patel, K. & Gupta, S. N. A Pilot Study on Evaluation of Standardized Ayurveda formulation Ashwagandhadi lehya as Aphrodisiac and in treatment of Oligospermia. *Res. J. Pharm. Technol.* **12**, 2383 (2019).
19. Mishra, B., Mohanty, B. & Barik, C. S. Formulation Development and Evaluation of Direct compressed Cefpodoxime proxetil Effervescent Tablets. *Res. J. Pharm. Technol.* **12**, 2695 (2019).
20. Allen, L. V. *The Art, Science, and Technology of Pharmaceutical Compounding, 5th Edition*. (The American Pharmacists Association, 2016). doi:10.21019/9781582122632.
21. Patel, S. G., & Siddaiah, M. Journal of Drug Delivery and Therapeutics Formulation and evaluation of effervescent tablets : a review. Journal of Drug Delivery and Therapeutics. **8(6)**, **296**–, (2018).
22. Siregar. Teknologi Farmasi Sediaan Tablet Dasar-Dasar Praktis. Penerbit EGC. Penerbit EGC, Bandung, Hlm. 34, 268,272-281, 288 (2010).
23. Surya, T. Formulasi Tablet Effervescent Antioksidan ekstrak Kulit Manggis (Garcinia mangostana L.) Dengan Kombinasi Asam Sitrat-Asam Tartrat. (2015).
24. RI, B. Surat Edaran No. HK 04.4.42.11.15.1490. Jakarta: Badan POM RI. (2015).
25. Putra, D. J. . Penggunaan Polivinill Pirolidon (PVP) sebagai Bahan Pengikat pada Formulasi Tablet Ekstrak Daun Sirih (Piper betle L.). *J. Farm. Udayana, 8 14-21*. (2019).
26. BPOM. Peraturan Kepala Badan Pengawas Obat Dan Makanan Republik Indonesia Nomor 12 Tahun 2014 Tentang Persyaratan Mutu Obat Tradisional. *Jakarta* (2014).
27. Santosa, L. Formulasi Granul Effervescent Sari Buah Jambu Mete (Annacardium OcidentaleL.). (2017).
28. Patel, D., Patel, U., Shukla, M., Bhimani, B. & Patel, G. Formulation and Evaluation of Immediate Release Tablet of Simvastatin. *Res. J. Pharm. Technol.* **13**, 421 (2020).
29. Syukri, Y. Pemilihan Bahan Pengisi untuk Formulasi Tablet Ekstrak Buah Mahkota Dewa (Phaleria macrocarpa Boerl). J. *Sains Farm. Klin.* (2018).
30. Hadisoewignyo, L., Fudholi, A. Sediaan Solida. Pustaka Belajar, Yogyakarta. (2013).
31. Syamsia. Sifat fisik Tablet dihydroartemisinin-piperaquin (DHP) Sediaan Generik dan Sediaan dengan Nama

Dagang yang Beredar di Kotamadya jayapura. (2017).
32. Ramadhani, R. Formulasi Tablet Effervescent Ekstrak Kulit Buah Delima Putih (Punica granatum L. Var. Album) dengan Variasi Asam Sitrat dan Asam Tartrat. *Progr. Stud. Farm. Fak. Ilmu Kesehatan, Univ. Darussalam Gontor* (2018).
33. Ansar. Optimasi formula dan gaya tekan terhadap tekstur dan kelarutan tablet effervescent buah markisa. *J. Teknol. Pertan. 12(2), 109–114.* (2011).
34. Surya, T. Formulasi Tablet Effervescent Antioksidan ekstrak Kulit Manggis (Garcinia mangostana L.) Dengan Kombinasi Asam Sitrat-Asam Tartrat,. *Univ. Muhammadiyah Surakarta.* (2015).
35. Ragade, S. M., Bari, M. M. & Barhate, S. D. Formulation and Evaluation of Candesartan Cilexetil Mouth Dissolving Tablet by using Natural Superdisintegrant. *Asian J. Pharm. Res.* **8**, 136 (2018).
36. BPOM. Pedoman Uji Disolusi dan Tanya Jawab. *Angew. Chemie Int. Ed. 6(11), 951–952.* 5–24 (2014).

SURAT KETERANGAN ARTIKEL PUBLIKASI

بِسْمِ اللَّهِ الرَّحْمَٰنِ الرَّحِيمِ

Assalamu'alaikum Warahmatullahi wabarakatuh

Saya yang bertanda tangan dibawah ini :

Nama	: Paula Mariana Kustiawan M.Sc.,Ph.D
NIDN	: 1114038901
Nama	: Alfin Syahrian Dwi Nugraha
NIM	: 1911102415008
Fakultas	: Farmasi
Program Studi	: S1 Farmasi

Menyatakan bahwa artikel yang berjudul "Formulation And Evaluation Of Effervescent Tablet From Kelulut Bee Pollen (*Trigona Sp*) With Citric Acid And Sodium Bicarbonate" telah di submit pada *Research Journal of Pharmacy and Technology* pada tahun 2023.

Demikian surat keterangan ini dibuat untuk dapat dipergunakan sebagai mana mestinya.

Wassalamu'alaikum Warahmatullahi wabarakatuh

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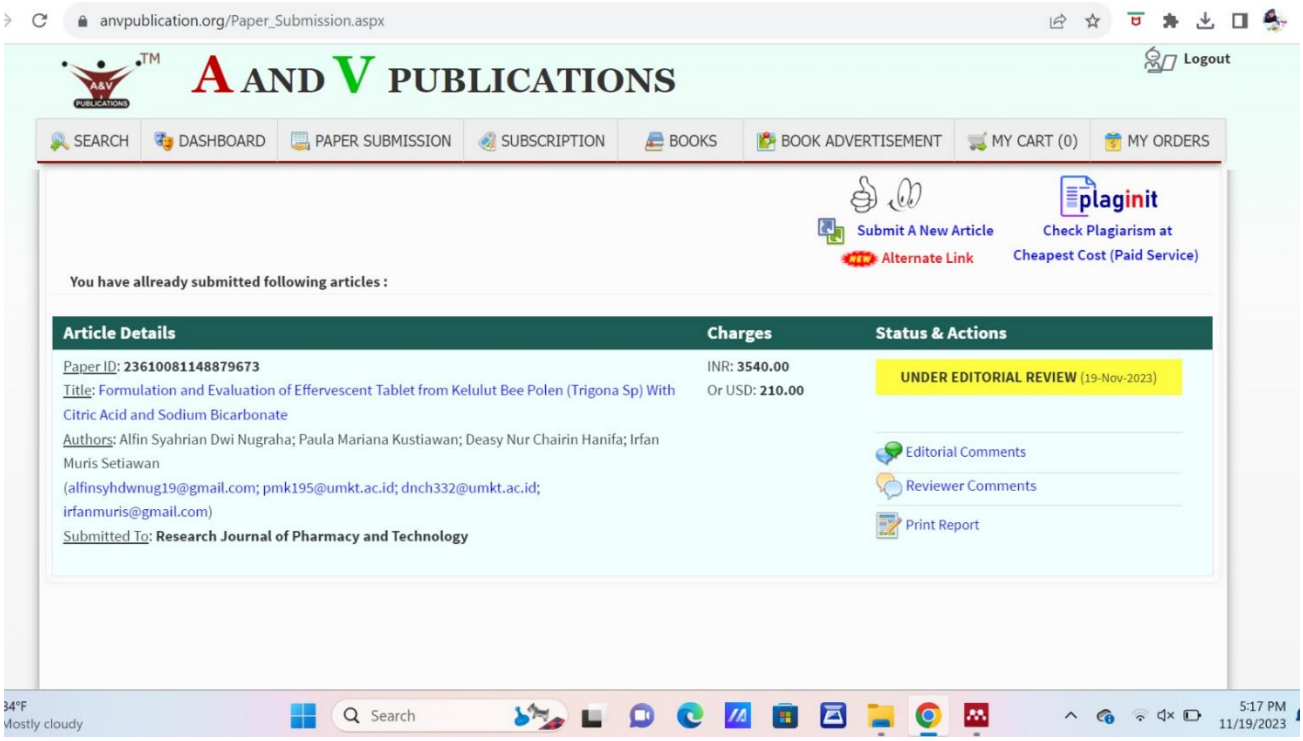
Alfin Syahrian Dwi Nugraha	Paula Mariana Kustiawan M.Sc.,Ph.D
NIM.1911102415008	NIDN. 1114038901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Authors: Alfin Syahrian Dwi Nugraha; Paula Mariana Kustiawan; Deasy Nur Chairin Hanifa; Irfan Muris Setiawan
(alfinsyhdwnug19@gmail.com; pmk195@umkt.ac.id; dnch332@umkt.ac.id; irfanmuris@gmail.com)
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