Vol. 12, No.1: 1–8
May 2023
EISSN: 2541-1969
ISSN: 2338-0950
https://bestjournal.untad.ac.id/index.php/ejurnalfmipa

Natural Science
Journal of Science and Technology

Original article

Formulation and Antioxidant Activity Spray Gel Black Grape Seed Ethanol Extract

I Komang Tri Musthika[1]*, Gusti Ayu Dewi Lestari[1]

[1] Sekolah Tinggi Farmasi Mahaganesha, Jl. Tukad Barito Timur 57, Denpasar 80225 Bali, Indonesia

Keywords:
Black grapefruit seed extract; Antioxidant activity; IC50; Physical assays

Article history:
Received 28 November 2022
Received in revision form 06 January 2023
Accepted 03 January 2023
Published 31 May 2023

Abstract

This study aims to conduct the antioxidant activity test of black grapefruit seed ethanolic. extracts and spray gel formulation. Black grapefruit (*Vitis vinifera* L.), The main flavonoid compounds (procyanidolic oligomers) that have antioxidant activity in black grape seeds, are reported to trigger vascular endothelial growth factors along with fibroblast agents. To produce more collagen fibers in accelerating healing. This research started with the maceration using 96% ethanol solvent and an evaporation process. The extract's antioxidant activity was determined using the 1,1-diphenyl-2-picrylhydrazil (DPPH) method. Furthermore, the extracts were formulated into spray gel with variations of carbopol 904, ethanol 96%, glycerine, TEA, methylparaben, fragrance, aquadest, and extract concentrations. Spray gel was tested for antioxidant activity and physical properties, including organoleptic, homogeneity, pH, viscosity, spread ability, adhesion, and spraying pattern. The results showed that spray gel black grapefruit seed ethanolic extracts the best antioxidant activity evaluation results were given by formula 3 an IC50 value of 104.659 ppm. Furthermore, the results of the physical evaluation showed that the best black grapefruit seed ethanol extract was the third formula with 5% concentrations, produce slightly brown preparation, characteristic of viscous grapefruit liquid, homogeneous, meets the requirements of pH, viscosity, spraying pattern and viscosity dispersion.

INTRODUCTION

Grapes or *Vitis vinifera* L. is a very popular fruit with wide varieties. Grapes contain various nutrients, such as carbohydrates, fiber, vitamins, minerals, anthocyanins, tannins, flavonoids, non-flavonoid compounds, and other phytochemical compounds. Phytochemical compounds in grapes have a significant role in health, one of which is as an antioxidant (Syafriana et al. 2020; Asri, 2015). Several studies have shown that the grape plant has several benefits for the skin. Another study reported that grape seed extract could increase activity against free radicals to look younger and healthier (Huber et al. 2021). The main flavonoid compounds (procyanidolic oligomers) that have antioxidant activity in grape seeds are reported to trigger vascular endothelial growth factors along with fibroblast agents. To produce more collagen fibers in accelerating healing (Hemmati et al. 2015). Resveratrol compounds are reported to have anti-inflammatory, Anti-cancer, and antioxidant properties (Nayak et al. 2010). Natural antioxidants are found in foods (fruits, vegetables, and plants), and antioxidants are substances that can prevent or

*Coresponding Author: I Komang Tri Musthika. Email address: thre.komang@gmail.com
DOI: https://dx.doi.org/10.22487/25411969.2022.v11.i2. 16172
This is an open access article under the CC BY-NC-SA license (https://creativecommons.org/licenses/by-nc-sa/4.0/)
How to Cite: Musthika & Lestari. "Formulation and Antioxidant Activity Spray Gel Black Grape Seed Ethanol Extract" *Natural Science: Journal of Science and Technology*. Vol. 12, No. 1: 1–8, May 2023.

slow down the occurrence oxidation process. In low concentrations, this substance can slow down and stop the oxidation process that causes the formation of free radicals and causes damage (proteins and nucleic acids), and triggers various types of diseases such as cancer and premature aging (Asri, 2015; Ghouila et al. 2017).

Antioxidant preparations are available in creams, gels, ointments, and tablets, as well as in the form of serum. One of the serums is in the form of a spray gel. The advantage of serum is that it has a high concentration of active ingredients so that the effect is absorbed more quickly by the skin and has a viscosity that is not too high (Izadpanah et al., 2019). Spray preparations in gel form can last a long time when applied to the skin due to the presence of a gelling agent. One of the widely used gelling agents is Carbopol. This polymer is stable, the resulting gel is clear, has a stable viscosity even when stored for a long time, and does not irritate the skin. Viscosity of 5-50 dPs is the ideal viscosity for spray gel preparations (Anindhita & Oktaviani, 2020).

This study aims to determine the antioxidant activity of grape seed extract, formulate extracts, test physical activity, and measure the antioxidant activity of the preparation in spray gelpreparations. The selection of spray gel dosage forms aims to: make it easier for users to use and to maintain the stability of the active substance so that it remains guaranteed because antioxidants are compounds that are easy to undergo oxidation. In addition, the spray delivery system can improve the active ingredient delivery more efficiently.

MATERIALS AND METHODS

This research was conducted in the sterile and non-sterile pharmaceutical technology laboratory, Mahaganesha High School of Pharmacy, [city]. The tools used in this research were the glass tools, analytical balance, Viscometer VT-06 – RION, Hana pH meter, and spectrophotometer UV/Vis. The materials used in this research were ethanol 96%, carbopol 904, glycerine, TEA, methylparaben, aquadest, fragrance, and grapefruit seed. Black grapefruit was obtained from a black grapefruit market in Denpasar city, Bali Province. Black grapefruit species was identified at the National Research and Innovation Agency (BRIN), Bali, Indonesia.

Plant Preparation

Grape fruit seeds are collected, cleaned, and drained. The seed was then dried in the drying cabinet at a temperature of ± 60°C until dry and then stored in plastic bags to prevent the effects of moisture.

Extraction

Preparation of grapefruit seed ethanolic extract was done by maceration. A total of 130 g of powder Simplicia was put into maceration bottles, covered with 90 parts of ethanol, and then closed, and left for 2 hours, and placed in the ultrasonic cleaner. Macerate was obtained and then evaporated at low temperature and pressure to receive the dried extract (Nisak, 2016).

Gel Formulation

Preparations were made based on the standard formula of Carbopol gel base as follows (Puspita et al. 2020).

Table 1. Standard formula

No	Ingredient	1st Formula (%)	2nd Formula (%)	3rd Formula (%)
1	Ethanol extract	1	2	3
2	Carbopol	0.5	0.5	0.5
3	TEA	0.5	0.5	0.5
4	Propyleneglycol	10	10	10
5	Methylparaben	0.18	0.18	0.18
6	Propylparaben	0.02	0.02	0.02
7	Oleum citri	0.5	0.5	0.5
8	Aquadest ad	100	100	100

The modified formula paraben ingredient was replaced with only methylparaben, as glycerin canserve as a skin moisturizer. The weight of carbopol 904 was also reduced to 0.3% since the concentrations of carbopol 904 above 0.3% obtained a very thick gel mass. Antioxidant formula gel preparations with the variation of concentration of ethanol extracts of black grapefruit seed made

with three formulas (Table 1). Modification to the standard formula is as follows:

Materials were weighed following the weighting of each formula into beaker glass filled with aquadest and newly added carbopol 904 while crushing until a transparent mass was formed. Furthermore added respectively: ethanol of 96%; glycerin; methylparaben; TEA; extract, and fragranceuntil homogeneous so that the obtained gel preparations with an overall weight of each formula of 100 g, and stirred until homogeneous.

Evaluation of Spray Gel

Preparations Evaluation of the preparations carried out in this study consisted of organolepticexamination (color, odor, and dosage form), homogeneity examination, viscosity measurement, pH measurement, adhesion test, spreadability test, spray pattern check, and stability test (Cycling Test).

Antioxidant Activity Test

The test was continued by testing the antioxidant activity using the 2,2-Diphenyl-1-picrilhydrazil (DPPH). Antibody activity was tested by measuring the absorbance value using a UV-Vis spectrophotometer. Test solutions were prepared to test antioxidant activity in several concentrations, namely 20, 40, 60, 80, 100, and 120 ppm. It was done because the researchers wanted to know the effect of the concentration of grape seed ethanol extract on reducing free radicals. All concentrations were mixed with 40 ppm DPPH solution and then left for 60 minutes in a room without light to prevent decomposition (Nazliniwaty et al. 2016).

Organoleptic Test

Examination methods: Observations of each organoleptic formula were done by Looking at the changesin shape, color, odor, and texture of the preparation during storage (Asri, 2015).

Homogeneity

Examination methods: Observations of the homogeneity of each formula were done by applying a certain number of preparations on a piece of transparent glass and covered with glass objects, then observed. Trials must demonstrate a homogeneous composition and no visible presence of grain (Asri, 2015).

Table 2. Modification formula

Ingredient	1st Formula (% w/w)	2nd Formula (% w/w)	3rd Formula (% w/w)
Black grapefruit seed	1	2	5
Ethanol 96%	20	20	20
Carbopol 904	0.3	0.3	0.3
TEA	0.2	0.2	0.2
Methylparaben	0.2	0.2	0.2
Glycerin	1	1	1
Fragrance	qs	qs	qs
Aquadest ad	100	100	100

Determination of pH

The pH determination was done using a pH meter as follows: The tool was first calibrated using standard encompasses solution is neutral (pH 7.01), and the pH of the key covers acidic (pH 4.01) to position theneedle indicates the pH price above. The electrode was washed with distilled water and dried with a paper tissue. A sample was created in concentrations of 1% that weighs 1 gram of material diluted withdistilled water to 10 ml in a container, and then the electrode was dipped in the solution (Puspita et al. 2020).

Determination of Viscosity

The viscosity determination was done by using a viscometer RION as follows: A sample was created in100 grams, and then using the spindle, was dipped in the solution, set the spindle number and speed. The viscosity is shown in the viscometer screen (Puspita et al. 2020).

Spreadability Test

Weighed as much as 0.5 g of spray gel ethanol extract of black grapefruit seed was placed in the middle of a scaled round glass. On top of the preparation was placed another round glass that had beenweighed and then allowed to stand for 1 minute, and the diameter of the distribution was recorded. Adda load weighing 50 grams on a cover glass and let stand for 1 minute, then record the diameter of the spread (Martono & Suharyani, 2018; Laurentia, 2019).

Adhesion Test

The spray gel's adhesiveness was tested by putting the 0.05-gram gel on the object glass that the areahad determined. Then put another glass object on top of the gel and press with a load of 1 kg for 5 minutes after its pack is released. Next, note when the two glass objects are removed (Anindhita & Oktaviani, 2020).

RESULTS AND DISCUSSION

Spray gel preparations that have been formulated are subjected to organoleptic tests in the formof color, odor, and texture of the trial to see the possibility of physical instability of the preparation during the storage process, color stability, aroma, and texture. The results of organoleptic testing on spray gel preparations can be seen in Table 3.

The results of the evaluation of the physical properties and physical stability of the homogeneity examination stated that all formulas show homogeneous results after storage for three weeks. The result showed the ingredients used in the spray gel mixed perfectly (Asri, 2015).

Table 3. Character comparison among species of the Pithemera pacifica-group

Spray Gel		Color	Odor	Texture
F 1	Week 1	Slightly yellow brown	Grape	Viscous liquid
	Week 2	Brown	Grape	Viscous liquid
	Week 3	Brown	Grape	Viscous liquid
F 2	Week 1	Yellow-brown	Grape	Viscous liquid
	Week 2	Brown	Grape	Viscous liquid
	Week 3	Brown	Grape	Viscous liquid
F 3	Week 1	Light brown	Grape	Viscous liquid
	Week 2	Brown	Grape	Viscous liquid
	Week 3	Brown	Grape	Viscous liquid

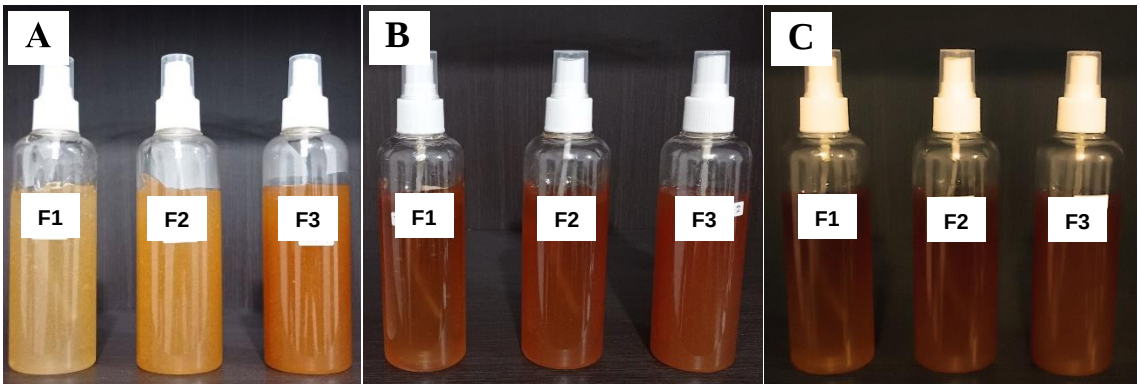

Figure 3. Colour of spray gel. A. Spray gel week 1. B. Spray gel week 2. C. Spray gel week 3

The results of the evaluation of the physical properties and physical stability of the homogeneity examination stated that all formulas show homogeneous results after storage for three weeks. The result showed the ingredients used in the spray gel mixed perfectly (Asri, 2015).

Viscosity value can be used as an assessment of the stability of a preparation. The higher the viscosityvalue, the higher the resistance to flow (Manurung & Sudrajad, 2019). The viscosity results producedfrom all tested formulas are stable in storage and still fall within the range of 500-5000 cPa.s or 5–50 dPa.s. This result aligns with the viscosity criteria that spray gel preparations must have (Kamishita et al. 1992). If the viscosity is less than 500 cPs, it will cause the preparation to drip modifier when sprayed from the spray applicator. If the viscosity is more than 5000 cPs, it will cause the particle size of the sprayed preparation will become irregular and large so that it is less spread on the skin surface or mucous membranes. Viscosity affects preparation consistency. The greater the viscosity of

the preparation, the pump delivery, and the pattern the spraying is getting smaller because the thicker the preparation, the more difficult it will be sprayed, which causes the spray pattern that is formed to get smaller (Puspita et al. 2020).

Table 4. The homogenity test. Spray gel F1 (extract black grapefruit seed 1%), F2 (extract black grapefruit seed 2%), and F3 (extract black grapefruit seed 5%)

Concentration	Spray Gel	Result
F1	Week 1	Homogenous
	Week 2	Homogenous
	Week 3	Homogenous
F2	Week 1	Homogenous
	Week 2	Homogenous
F3	Week 3	Homogenous
	Week 1	Homogenous
	Week 2	Homogenous
	Week 3	Homogenous

A suitable pH for the skin is between 4.5–6.5. The pH of the preparation should not be too acidicbecause it can cause skin irritation. If the pH is too alkaline, it can cause scaly skin or even irritation occurs, while if it is above the skin pH, it can cause the skin to feel slippery and dry quickly and can affect skin elasticity (Rahayu et al. 2016). Therefore, the pH obtained for the spray gel preparation during the storage period did not change and met the quality requirements for a suitable pH for the skin. Based on the tests carried out, the trial is still in the pH value range, which is within the safe limit for topical preparations, which is around 4.5–6.5 (Puspita et al. 2020).

Table 5. Viscosity measurement result

Concentration	Spray Gel	Viscosity (dPa.s ± SD)
F1	Week 1	46.83 ± 0.29
	Week 2	43.33 ± 0.58
	Week 3	48.17 ± 0.29
F2	Week 1	40.33 ± 0.58
	Week 2	40.50 ± 0.50
F3	Week 3	43.00 ± 0.00
	Week 1	12.67 ± 0.58
	Week 2	11.67 ± 0.58
	Week 3	12.00 ± 0.50

The adhesion test aims to determine the time needed for the spray gel to adhere to the skin. The longer the spray gel is attached to the skin surface, the better it will be because the effect will be more significant. The results of the stickiness test of the spray gel ethanol extract of grape seeds F1, F2, and F3 showed good adhesion below 10 seconds (Puspita et al. 2020). The spreadability test aims to determine the ability of the spray gel preparation to spread when applied to the skin. Good spreadability causes the contact between the active substances in the spray gel preparation and the skin to become wider so that absorption into the skin increases. The spreadability test results on grape seed ethanol extract spray gel preparations F1, F2 and F3 showed good spreadability following the requirements for good spreadability of topical preparations, around 5–7 cm (Rahayu et al. 2016)

Table 6. pH measurement result

Concentration	Spray Gel	pH ± SD
F1	**Week 1**	6.39 ± 0.01
	Week 2	6.40 ± 0.01
	Week 3	6.40 ± 0.01
F2	Week 1	6.48 ± 0.01
	Week 2	6.46 ± 0.02
F3	Week 3	6.43 ± 0.04
	Week 1	6.25 ± 0.02
	Week 2	6.24 ± 0.01
	Week 3	6.25 ± 0.02

Table 7. Adhesion and spreadability test

Concentration	Adhesion test ± SD	Spreadability test ± SD
F1	5.01 ± 0.19	2.29 ± 0.01
	5.07 ± 0.20	2.09 ± 0.01
	5.05 ± 0.35	2.03 ± 0.06
F2	5.09 ± 0.14	2.17 ± 0.06
	5.05 ± 0.62	2.01 ± 0.02
F3	5.05 ± 0.26	2.03 ± 0.06
	5.05 ± 0.36	2.08 ± 0.14
	5.03 ± 0.38	2.07 ± 0.12
	5.00 ± 0.18	2.05 ± 0.05

The results of the observation of the cycling test on the spray gel preparation showed stable results, and no phase separation occurred. Observation of the cycling test is carried out to test the product for the possibility of crystallization or cloudiness. The test was carried out by storing the creamat 4°C for 24 hours and then transferring it to the oven at 40 ± 2°C for 24 hours. This treatment is calledone cycle. This cycle is carried out six times to clarify the changes that occur (Yusuf et al. 2021).

Table 8. Cycling test

Concentration	Cycling test-0	Cycling test-6
F1	Stable (No phase separation occurs)	Stable (No phase separation occurs)
F2	Stable (No phase separation occurs)	Stable (No phase separation occurs)
F3	Stable (No phase separation occurs)	Stable (No phase separation occurs)

Examination of the spray pattern aims to evaluate the quality of the spray applicator used. The spray gel preparation is sprayed at a distance of 3, 5, and 15 cm on a sheet of white paper. The spraying distance is directly proportional to the diameter of the spraying pattern of the preparation. The greater the spraying distance, the greater the resulting spraying pattern. The spraying patterns of the three formulas tend to produce rounded and spreading patterns. The pattern shows the effectiveness of the applicator used from the gel preparation formula for each spraying (Puspita et al. 2020).

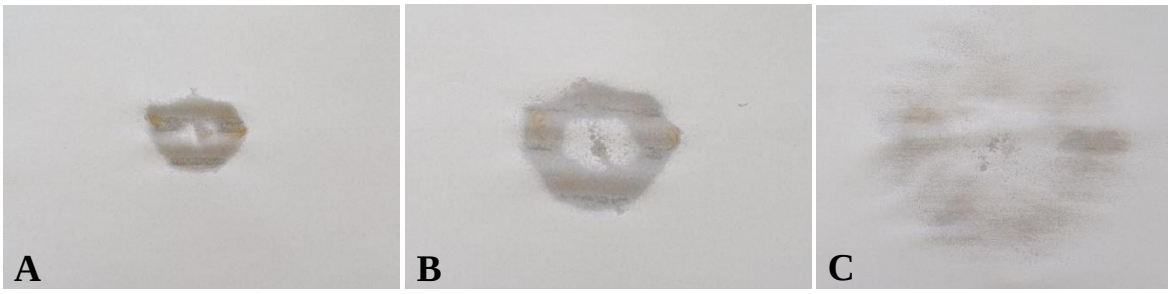

Figure 2. Spray Pattern Week 1. A. Formula 1st with 3, 5 and 15 cm range of spray gel. B. Formula 2nd with 3,5 and 15 cm range of spray gel. C. Formula 3rd with 3, 5 and 15 cm range of spray gel.

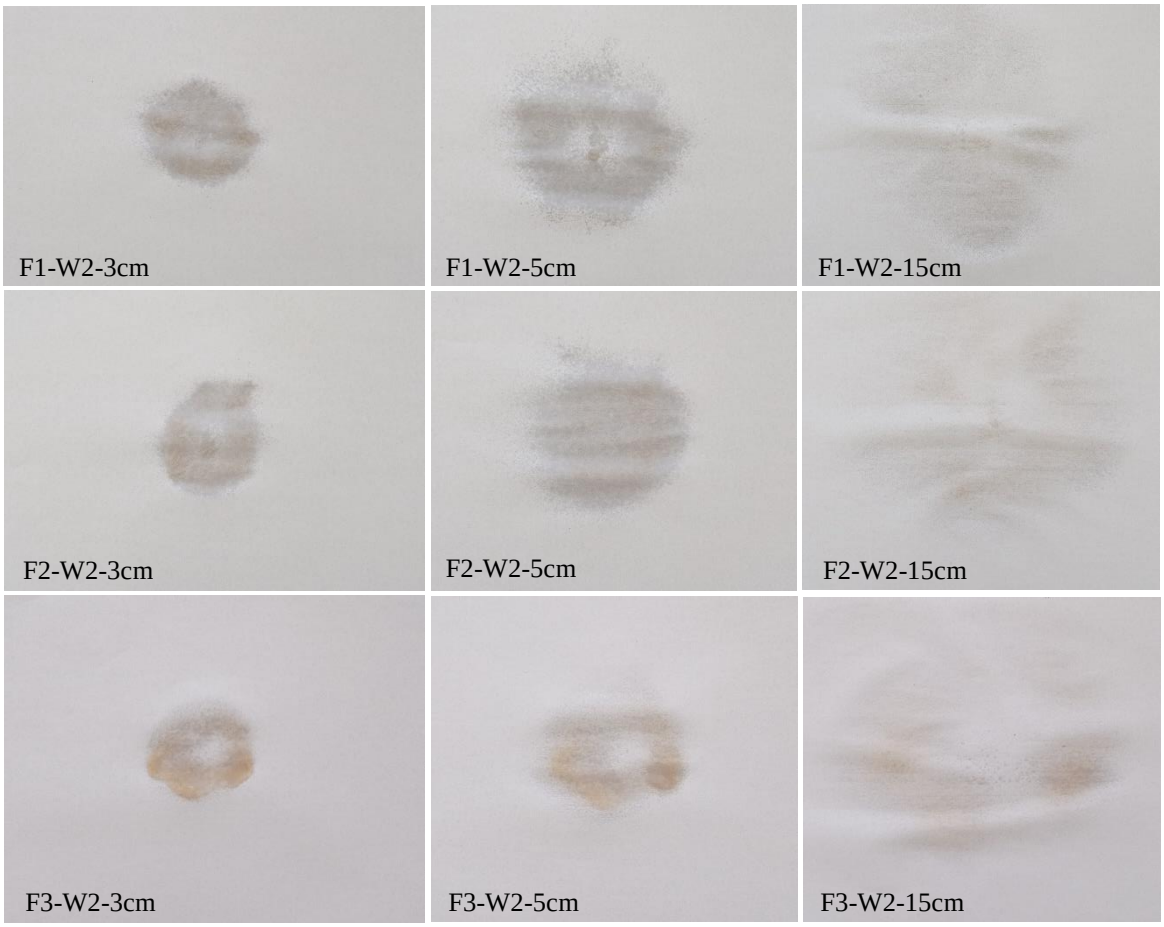

Figure 3. Spray Pattern Week 2. F1: Formula 1st with 3, 5 and 15 cm range of spray gel. F2: Formula 2nd with 3, 5 and 15 cm range of spray gel. F3: Formula 3rd with 3, 5 and 15 cm range of spray gel

Table 9. The spray pattern of spray gel grapefruit seed extract ethanol

Formula	Range (cm)	Week 1	Week 2	Week 3
F1	3	Spread	Spread	Spread
	5	Spread	Spread	Spread
	15	Spread	Spread	Spread
F2	3	Spread	Spread	Spread
	5	Spread	Spread	Spread
	15	Spread	Spread	Spread
F3	3	Spread	Spread	Spread
	5	Spread	Spread	Spread

Antioxidants can slow or prevent oxidation processes caused by free radicals. The method used for antioxidant testing in grape seed ethanol extract is the DPPH method. DPPH is a free radical that is stable at room temperature. The principle of this method is to measure the occurrence of color fading (violet to yellow) from DPPH radicals due to the presence of antioxidant compounds that can neutralizefree radical molecules (Syarifah et al. 2021). The DPPH method is based on the ability of antioxidants to inhibit free radicals by donating hydrogen atoms. This method is more straightforward, easier, and uses a small sample quickly. Based on the results of measurements with a spectrophotometer at the maximum wavelength of DPPH, which is 517 nm, the percentage of free radical scavengers is obtained, as shown in Table 10.

Table 10. Spray gel grapefruit seed extract ethanol IC50

Result	Sample IC50	Category
F1	1176,47 ± 8,96	Weak
F2	453,56 ± 6,92	Weak
F3	214,58 ± 3,33	Medium

The antioxidant test was repeated twice, made in various concentrations, so that researchers could find out the effect it had on reducing free radicals in the ethanol extract of the grape seeds beingtested. Based on the data, it can be seen that the highest DPPH free radical scavenging activity was found in the concentration of grape seed ethanol extract at F3 (weak), while for F1 and F2, the results were very weak. These results follow the literature. The greater the percentage of free radical scavenging, which means that there are more grape seed ethanol extract particles that dampen or stabilize free radicals. The greater the concentration, the greater the percent attenuation because the more significant the concentration of grape seed ethanol extract, the more grape seed ethanol extract particles are formed and reduce DPPH free radicals.

CONCLUSION

The ethanol extract of grapefruit seeds can be formulated as a spray gel and has good physical properties, pH, viscosity, adhesion, spreadability, and spray pattern. The spray gel is stable for cycling tests, and F3 is a formula that has a good IC50 value and physical evaluation test.

Declarations

Author contribution

All authors contributed equally as the main contributor to this study.

Funding statement

This research was supported by the Ministry of Education, Culture, Research and Technology.

Conflict of interest

The authors declare no known conflict of financial interest or personal relationships that could have appeared to influence the work reported in this paper.

Publisher's Note:

Faculty of Science – Tadulako University remains neutral with regard to jurisdictional claims and institutional affiliations.

ACKNOWLEDGEMENTS

The author would like to thank two anonymous reviewers for improving this manuscript.

REFERENCES

Anindhita, M. A., and Oktaviani, N. (2020). Formulasi Spray Gel Ekstrak Daun Pandan Wangi SebagaiAntiseptik Tangan. Ejournal Poltektegal, 9(1), 14–21.

Asri, V. T. D. M. S. E. P. (2015). Formulasi Gel Pencuci Wajah Mengandung Ekstrak Buah Anggur (VisitVinifera L.). In Prosiding Penelitian SPeSIA Farmasi.

Dewi, L. T., Adnyana, M. O., Mahdi, C., Prasetyawan, S., Srihardyastutie, A., and

Aulanni'am, A. (2018). Study of Antocyanins Activity from Purple Sweet Potato for Reducing Apoptotic Cells Expression of The Cerebellum On Ischemic Stroke Rats. The Journal of Pure and Applied Chemistry Research, 7(2), 94–99. https://doi.org/10.21776/ub.jpacr.2018.007.02.348

Ghouila, Z., Laurent, S., Boutry, S., Vander Elst, L., Nateche, F., Muller, R. N., and Baaliouamer, A. (2017). Antioxidant, antibacterial and cell toxicity effects of polyphenols Fromahmeur bouamer grape seed extracts. Journal of Fundamental and Applied Sciences, 9(1), 392.https://doi.org/10.4314/jfas.v9i1.24

Hemmati, A. A. sgha., Foroozan, M., Houshmand, G., Moosavi, Z. B. eigo., Bahadoram, M., and Maram, N. S. hakib. (2015). The topical effect of grape seed extract 2% cream on surgery wound healing. Global Journal of Health Science, 7(3), 52–58. https://doi.org/10.5539/gjhs.v7n3p52

Huber, K. L., Fernández, J. R., Webb, C., Rouzard, K., Healy, J., Tamura, M., Stock, J. B., Stock, M., and Pérez, E. (2021). Agse: A novel grape seed extract enriched for pp2a activating flavonoids that combats oxidative stress and promotes skin health. Molecules, 26(21). https://doi.org/10.3390/molecules26216351.

Izadpanah, A., Soorgi, S., Geraminejad, N., and hosseini, M. (2019). Effect of grape seed extract ointment on cesarean section wound healing: A double-blind, randomized, controlled clinical trial.Complementary Therapies in Clinical Practice, 35(June 2018), 323–328. https://doi.org/10.1016/j.ctcp.2019.03.011

Kamishita, T., Miyaaki, T., and Okunp, Y. (1992). Spray Gel Base and spray gel preparation using thereof. United state patent application publication. 99(1), 283.

Laurentia, C. (2019). Efektifitas Sediaan Spray Gel Ekstrak Daun Iler (Plectranthus Scutellarioides (L) R. Br) Terhadap Bakteri Staphylococcus aureus dan Pseudomonas aeruginosa. In Universitas Atma Jaya Yogyakarta Fakultas Teknobiologi Program Studi Biologi Yogyakarta.

Martono, C., and Suharyani, I. (2018). Formulasi Sediaan Spray Gel Antiseptik dari Ekstrak Etanol Lidah Buaya (Aloe vera). Jurnal Farmasi Muhammadiya Kuningan, 3(1), 29–37.http://ojs.stikes-muhammadiyahku.ac.id/index.php/jurnalfarmaku/article/view/55

Nayak, B. S., Ramdath, D. D., Marshall, J. R., Isitor, G. N., Eversley, M., Xue, S., and Shi, J. (2010). Wound-healing activity of the skin of the common grape (Vitis Vinifera) variant, Cabernet Sauvignon. Phytotherapy Research, 24(8), 1151–1157. https://doi.org/10.1002/ptr.2999.

Nazliniwaty, Karsono, Zebua, N. F., and Nerdy. (2016). Antioxidant activity and antiaging gel formulation grapefruit peel (Citrus maxima Merr.) ethanolic extract. Der Pharmacia Lettre, 8(20), 84–94.

Nisak, K. (2016). Uji Stabilitas Fisik Dan Kimia Sediaan Gel Semprot Ekstrak Etanol Tumbuhan Paku. Puspita, W., Puspasari, H., and Restanti, N. A. (2020). Formulasi Dan Pengujian Sifat Fisik Sediaan Spray Gel Ekstrak Etanol Daun Buas-Buas (Premna Serratifolia L.). Jurnal Ilmiah Farmako Bahari, 11(2), 145. https://doi.org/10.52434/jfb.v11i2.798

Sifat, E., Dan, F., Iritasi, D., Lotion, S., and Atsiri, M. (2016). Evaluation of Physical Properties and Irritation Index of Lotion Containing Syzigium Aromaticum Clove Essential Oil At Various Concentration. Traditional Medicine Journal, 21(1), 1–5.

Syarifah, A., Budiman, A., and Nazilah, S. A. (2021). Formulation and Antioxidant Activity of Serum Gelof Ethyl Acetate Fraction From Musa x paradisiaca L. . Proceedings of the 4th International Conference on Sustainable Innovation 2020–Health Science and Nursing (ICoSIHSN 2020), 33, 310–315. https://doi.org/10.2991/ahsr.k.210115.066.

Yusuf, A. L., and Nugraha, D. (2021). Synerisis and Cycling Test the Sendok Leaf Extract Gel (Plantago Mayor L.) with Optimization of Variations of Gelling Agent Carbomer 940 Concentration. International Journal of Innovative Research in Medical Science, 6(12), 908–910. https://doi.org/10.23958/ijirms/vol06-i12/1294.