Formulation And Evaluation Of Telang Flower (*Clitoria Ternatea* L.) Extract Gel Preparation With Tragacanth As Gelling Agent And Antioxidant Activity Test

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Received: 25 January 2024; Accepted: 30 March 2024; Published: 31 March 2024

Abstract

Telang flower has antioxidant activity as a scavenger of free radicals. Formulation in gel form can facilitate its use as a cosmetic preparation. This study aims to determine the characteristics of telang flower extract gel at different concentrations of tragacanth as a gelling agent and its antioxidant activity.Gel formula of telang flower extract with different concentration levels of tragacanth, namely 3%, 4%, and 5%. Gel evaluation includes organoleptic test, homogeneity, pH, spreadability, stickiness, and viscosity. The best formula will be tested for antioxidant activity.Based on the gel characteristics of telang flower extract, F3 has good physical properties, namely pH value of 7.28 ± 0.06, viscosity of 2133.3 ± 23.09 cP, spreadability of 6.05 ± 0.13 cm, and stickiness of 1.17 ± 0.07 seconds. The telang flower extract exhibited an IC50 value of 71.125 ppm, classifying it as strong antixodant. The IC50 value of telang flower extract gel was 92.867 ppm.

Keywords: *Antioxidant, gel, gelling agent, telang flower, tragacant*

INTRODUCTION

Skin is an organ that protects the human body from external influences and supports one's appearance, so it needs to be cared for. Free radicals can damage the skin, leading to the appearance of wrinkles, scales, dryness, and cracks. One of the free radical scavengers is an antioxidant compound (Septiani et al., 2012). Part of the telang plant that has the activity of antioxidants is the telang flower, which functions as a radical scavenging agent, an inhibitor of lipid peroxidation, and other free radical mediation processes (Riswanto et al., 2022). Based on previous research, it is said that telang flower extract has very strong antioxidant activity, with an IC50 of 41.36 ppm (Nadia et al., 2022). The utilization of telang flowers can be developed in the formulation of pharmaceutical preparations in the form of gel preparations.

The advantage of using a gel is that it can provide good adhesion and is easy to rinse with water (Valentina and Saryanti, 2023). Gel preparations require a gelling agent to form a gel. There are various types of gelling agents that are commonly used, such as hydroxypropyl methylcellulose (HPMC). In this study, tragacanth was chosen as a gelling agent because tragacanth is included in the natural polysaccharide gum class. Tragacanth has the ability to form gels and produce less sticky mucilage. Tragacanth is more suitable for external medicinal use such as gels, lotions, pastes and creams. The use of tragacanth as a gelling agent in gel mask preparations showed that gel mask preparations met the physical quality of the preparation with fairly stable organoleptic test results and an appropriate pH. The gel mask preparation exhibited clear and translucent gelcharacteristics and maintained a stable pH during storage for two weeks at room temperature (Nuri et al., 2021).

RESEARCH METHODOLOGY

Material

The materials used were dried telang flowers (Surakarta, Indonesia) that had been determined at the UPT Laboratorium of Setia Budi University with Number 76E/DET/UPT- LAB/18.08/2023, ethanol 96% (Cipta Kimia, Indonesia), tragacanth (Griya Mandiri, Indonesia), distilled water, glycerin, TEA, and propylenglycol, DPPH powder (E-Merk pa), magnesium powder (Mg), hydrochloric acid (HCl), sulfuric acid (H2SO4), FeCl 10% (Chemistry Laboratory, Faculty of Pharmacy UMS, Indonesia).

Extraction of telang flower

The extraction of telang flower was done by maceration. A total of 500 mg of dry simplicia powder was immersed in 5000 ml of 96% ethanol, or a ratio of 1:10. Simplicia is left for 72 hours and stirred occasionally. The extract was filtered using a Buchner funnel and Whatman paper to obtain filtrate. Next, remaceration was carried out with 96% ethanol solvent in as much as 3500 mL and left for 1x24 hours. The filtrate was concentrated using a rotary evaporator (Heidolph) and heated using a waterbath (Memmert) until a thick extract was obtained.

Flavonoid identification

Add 40 mg of extract to 100 ml of hot water, boil for 5 minutes and filter. In 5 ml of filter, add 0.05 mg of Mg powder and 1 ml of concentrated HCl. A shift in the hue of the solution to red, yellow, or orange indicates a positive outcome (Cahyaningsih *et al.*, 2019).

Identification of saponins

In the amount of 40 mg extract, added 10 ml of water, and it was boiled for 1 minute, then added 2 drops of HCl 1 N. If the formed foam remains stable for ± 7 minutes, then the extract shows positive results containing saponins (Cahyaningsih *et al.*, 2019).

Table 1. Gel formula of telang flower extract with tragacanth as gelling agent

	F1	F2	F3
Telang flower extract	1 g	1 g	1 g
Tragacanth	3 g	4 g	5 g
Glycerin	10 g	10 g	10 g
Propylene glycol	5 g	5 g	5 g
Methylparaben	0.15 g	0.15 g	0.15 g
Distilled water ad	100 g	100 g	100 g

Identification of terpenoids

Ten milliliters of water were used to dissolve one hundred milligrams of extract. Next, 3 drops of concentrated HCl and 1 drop of concentrated H_2SO_4 were added to 2 milliliters. The reddish-purple hue created indicated a positive outcome (Cahyaningsih *et al.*, 2019).

Identification of tannins

A total of 40 mg of thick extract was dissolved in 4 ml of water, then 2 ml was taken and 1 ml of 10% $FeCl_3$ was added. The formation of a dark blue or greenish black color indicated a positive reaction (Cahyaningsih *et al.*, 2019).

Gel formulation of telang flower extract

The telang flower extract gel was made with 3%, 4%, and 5% gelling agent content (Error! Reference source not found.). Gel preparation began with swelling the gelling agent in 50 ml of hot water, then added with the extract (Mixture 1). Methyl paraben was dissolved in a little water, and then glycerin and propylene glycol were added (Mixture 2). The two mixtures were mixed slowly, and 100 ml water was added and stirred homogeneously.

Characterization of telang flower extract gel formulation

Organoleptic test

These characteristics are carried out by visual observation of the shape, color, and smell of the gel preparation (Shabrina and Nurwaini, 2023).

Homogeneity test

A total of 0.5 g of gel was applied to a glass object and observed with the naked eye. It is declared homogeneous if there are no coarse particles. All measurements were carried out in triplicate (Forestryana *et al.*, 2022).

pH test

A total of 0.5 g of gel was dissolved in 50 ml of distilled water. Measurements were carried out using a pH meter (OHAUS). All measurements were carried out in triplicate (Putri and Anindhita, 2022).

Viscosity test

The gel preparation is put into a beaker glass and the rotor is installed on the test equipment. The thing to pay attention to is that the rotor was immersed in gel preparation. The numbers that appear until they stabilize was read. All measurements were carried out in triplicate (Putri and Anindhita, 2022).

Spreadability test

A total of 0.5 g of gel preparation was placed on the spreadability device, and covered with glass. Weights of 250 g were applied and allowed to stand for 1 minute, then the diameter was measured (Farhan *et al.*, 2023).

Stickiness test

A 0.25 g sample was placed between 2 glass objects on the stickiness test device, then a 1 kg load was pressed for 5 minutes, the load was removed and an 80 gram load was applied to the device and the gel release time was recorded (Hafid et al., 2019).

Antioxidant activity test of telang flower extract gel.

Preparation of 0.1 mM DPPH solution

A total of 3.9 mg of DPPH powder was put into a 100.0 ml volumetric flask, and added 96% ethanol until the limit mark was reached and shaken homogeneously.

Determination of the maximum wavelength of DPPH standard solution

A total of 3 ml of 0.1 mM DPPH solution was put into a 5.0 ml volumetric flask, and 96% ethanol was added until the limit was reached and homogenized. Then the solution was poured into a cuvette, and the absorbance at a wavelength of 515-520 nm was read using a UV-Vis spectrophotometer (Shimadzu UV-1280).

DPPH blank solution

A total of 3 ml of 0.1 mM DPPH solution was put into a 5.0 ml volumetric flask, and 96% ethanol was added until the limit mark. The solution was allowed to stand for 30 minutes, then poured into a cuvette, and the absorbance at a wavelength of 516 nm was read using a UV-Vis spectrophotometer (Shimadzu UV-1280).

Measurement of antioxidant activity of telang flower extract and gel

The 1000 ppm extract and gel were prepared by weighing 10 mg of telang flower extract or gel into a 10.0 ml volumetric flask, which was dissolved using 96% ethanol until the limit was reached and homogenized. A 100, 200, 300, 400, and 500 µl of extract and gel were taken, and 3 ml of 0.1 mM DPPH solution and 96% ethanol were added until the limit was reached in a 5.0 ml volumetric flask. The solution was allowed to stand for 30 minutes and then the absorbance at a wavelength of 516 nm was read using a Uv-Vis spectrophotometer (Shimadzu UV-1280).

Determination of IC_{50} value

The IC_{50} value calculation is an inhibition of DPPH absorbance of 50% in the sample concentration. The percentage value of each concentration is then created by a regression curve y = bx + a.To calculate

the percentage yield value, use the formula (Sutrisna *et al.*, 2015) :

$$\% \text{ scavenging} = \frac{(\text{abs DPPh} - \text{abs sample})}{\text{abs DPPH}} \; x \; 100\% \quad (1)$$

RESULT AND DISCUSSION

Telang flower extract obtained from the maceration process amounted to 202.39 g with a yield of 40.47%. The characteristics of telang flower extract are that it is purplish blue, smells typical of telang flowers, and is viscous. The extract was then formulated into gel preparations. A condensed extract of telang flower was carried out using a tube reaction (Putri and Lubis, 2020). The research results indicated that telang flowers contained flavonoids, saponins, terpenoids, and tannins (**Table 2**)

preparations (4.5-8.0) and the pH was in accordance with the skin, namely 4.5-7.5 (Forestryana *et al.*, 2020). The results of the analysis using ANOVA obtained a p-value of 0.06 (p>0.05) which indicates that there is no significant difference between changes in pH value with increasing tragacanth concentration.

Viscosity in the range of 2000-4000 cP, is a good viscosity because the gel can spread well when applied (Purwati and Verryanti, 2016). Based on the test results, F3 met the requirements, while F1 and F2 did not meet the requirements. The results of the single factor ANOVA test obtained a p-value of 0.001 (p-value <0.05), which means that there was a significant difference between the concentration of gelling agent and viscosity. The difference was found in

Table 2. Evaluation results of telang flower extract gel preparation with tragacanth

Test Results	Formula		
	F1 (3%)	F2 (4%)	F3 (5%)
Color	Green	Green	Green
Smell	Typical tragacanth	Typical tragacanth	Typical tragacanth
Shape	Somewhat viscous	Somewhat viscous	Viscous
Homogeneity	Homogeneous	Homogeneous	Homogeneous
pH	7.43 ± 0.03	7.47 ± 0.12	7.28 ± 0.06
Viscosity (cP)	1133.3 ± 5.77	1300.0 ± 17.32	2133.3 ± 23.09
Spreadability (cm)	6.28 ± 015	6.13 ± 0.03	6.05 ± 0.13
Stickiness (s)	0.44 ± 0.06	0.71 ± 0.16	1.17 ± 0.07

Based on the organoleptical test, the gel base which was originally yellowish white with the addition of telang flower extract turned green, had a distinctive tragacanth odor and was thick (**Table 2**). While in the homogeneity test, all formulas were not found to have coarse particles so they were declared homogeneous. The pH test is important because it is related to the stability of the active substance and the comfort when applied to the skin. If the pH is too acidic, the skin can wrinkle and be damaged, if the pH is too alkaline, it will cause dry skin (Nurwaini and Hafidzatun Nasihah, 2018). Of the three formulas above, they were in the range of 7.28 - 7.43 (**Table 2**) so that they met the quality requirements of SNI 16-4399-1996 skin

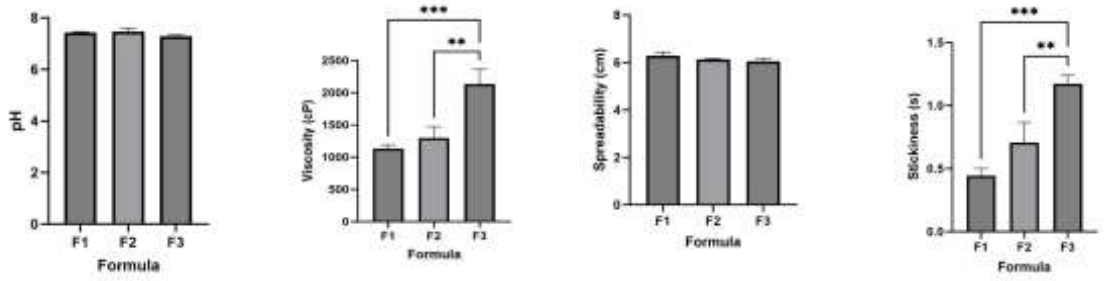
F1&F2 and F2&F3 (Error! Reference source not found.).

Spreadability affects the viscosity of the gel, the higher the viscosity, the smaller the diameter obtained. The higher the dispersive power, the easier it is to apply to the surface of the skin. A good gel has a

Table 3. Phytochemical screening results of telang flower extract

Testing	Observation	Result
Flavonoids	Yellow colored solution	+
Saponins	Forms a stable foam	+
Terpenoids	Formed red color	+
Tannins	Formation of greenish black color	+

(+) : contained the secondary metabolite compound.
(-) : did not contain these secondary metabolite compounds



(A) (B) (C) (D)

* indicates significant

Figure 1. Histogram of physical properties of telang flower gel: (A) pH, (B) viscosity, (C) spreadability, and (D) stickiness

dispersive power in the range of 5-7 cm (Nurwaini and Sari, 2019). Based on the test results, the three formulas met the requirements. Based on statistical analysis, single factor ANOVA testing obtained a p-value of 0.124 (p-value > 0.05), this indicates that increasing the concentration of gelling agent hads no significant relationship with dispersive power). Gels with high stickiness will stay on the skin longer so that the effectiveness of the therapy will be optimal. In the three formulas above, only F3 met the inherent power requirement of > 1 second (Nurwaini and Saputri, 2018). Based on the test, the higher the concentration of gelling agent, the higher the inherent power so that the better the gel preparation. Based on the ANOVA test obtained a p-value of 0.000 (p-<0.05) so that the tragacanth concentration had a significant difference with the inherent power. The difference was found in F1&F2 and F2&F3 (**Figure 1)**

The antioxidant activity test of telang flower extract was carried out using the DPPH method. Very strong antioxidants have an IC_{50} value of less than 50 ppm, a strong category with an IC_{50} value of 50-100 ppm, a moderate category if the IC_{50} is 151-200 ppm (Andriani and Murtisiwi, 2020). Based on the %inhibition value and concentration in telang flower extract, a linear regression equation y=0.528x+12.446 was obtained. Meanwhile, the gel of telang flower extract obtained linear regression y=0.566x-2.563. In this study, the IC_{50} value of telang flower extract was obtained at 71.125 ppm so that it included a strong category **(Figure 2**). The IC_{50} value of telang flower extract gel was obtained at 92.867 ppm. In previous studies, the results of the antioxidant activity test showed that the IC_{50} value of telang flower was 41.36 ppm and the IC_{50} value of vitamin C was 6.25 ppm (Andriani and Murtisiwi, 2020). The difference in the IC_{50} results of telang flower extract with previous research is due to differences in the

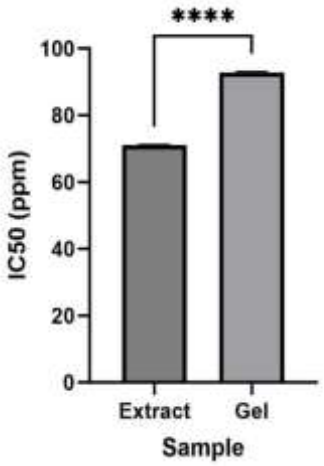


Figure 1. IC_{50} value of telang flower extract and gel of telang flower extract with tragacanth

altitude of the place of growth and differences in the concentration of ethanol used as a distiller.

Vitamin C is a water-soluble antioxidant. Vitamin C is used as a comparison compound in antioxidant activity tests because it has various properties including secondary antioxidants that can absorb free radicals, and has high antioxidant activity (Samodra *et al.*, 2023). Vitamin C has an IC_{50} value of 2.54 µg/ml (Purwati and Verryanti, 2016). The tragakan base telang flower extract gel has an IC_{50} value that was significantly different from the telang flower extract (**Figure 2**). Based on data analysis between the IC_{50} values of the extract and the gel using the unpaired t-test, the R^2 value of 0.9997 was obtained. The value of R^2 indicates a significant relationship between the solvent concentration and the observed scavenging percentage (Cahyaningsih *et al.*, 2019).

CONCLUSIONS

F3 (using 5% tragacanth as gelling agent) has good physical properties of the gel, namely pH value, viscosity, spreadability, and stickiness that meet the requirements. The IC_{50} values of the extracts and gels obtained were in the strong category.

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