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Phytochemical screening, stability test formulation and physical gel ethanol extract of Jatropha leaves (*Jatropha curcas L.*) as a gel compress preparation for post-ischemic stroke patients

Detección fitoquímica, formulación de pruebas de estabilidad y extracto de etanol en gel físico de hojas de Jatropha (*Jatropha curcas L.*) como preparación de compresas de gel para pacientes con accidente cerebrovascular posisquémico

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SUMMARY

Introduction: *Stroke is one of the diseases that cause death and impact serious health problems. The inflammatory response that appears in ischemic stroke will affect the progression of the stroke. This study examines the ethanol extract of Jatropha leaves (Jatropha curcas L.) as a gel compress preparation in post-ischemic stroke patients.*
Methods: *The research design was experimental with a randomized post-test only control group design. The sample was extracted with 96 % ethanol as solvent. Jatropha leaf samples (Jathropa curcas L.) were blended until smooth and weighed as much as 500 g in a 1 000 mL glass beaker. After that, 96 % ethanol was added to the procedure and poured into the extraction vessel. This study used a phytochemical screening test.*
Results: *The results of the pH test of Formula I with a concentration of 5 % were repeated three times, and the average pH was 5.03. Formulation II with 10 % concentration was repeated three times. The average pH was 5.04. Formulation III with a concentration of 15 % was repeated three times, and the average pH was 5.02. Jatropha leaf extract did not change the pH of the preparation. The results of the normality test of formulations I, II, and III had a significance value of more than 0.05, so it was said that there was no significant difference. The homogeneity results obtained a significant influence of more than 0.05, so there is no significant difference. Therefore, it was considered stable in the homogeneity parameter. While the formulation of the gel preparation stability test results was obtained organoleptic observations on all gel preparations showed that the observations before and after storage did not have significant changes.*
Conclusion: *The results of the phytochemical screening of Jatropha (Jatropha curcas L.) leaves did not contain chemical compounds of alkaloids, flavonoids, and saponins. However, it contains chemical compounds such as polyphenols and free terpenoids/steroids.*

Keywords: *Jatropha leaf extract, phytochemical screening, physical gel, stability test formulation.*

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RESUMEN

Introducción: *El ictus es una de las enfermedades que provocan la muerte y repercuten en graves problemas de salud. La respuesta inflamatoria que aparece en el ictus isquémico condicionará la progresión del ictus. Este estudio examina el extracto de etanol de las hojas de Jatropha (Jatropha curcas L.) como una preparación de compresas de gel en pacientes con accidente cerebrovascular posisquémico.*
Métodos: *El diseño de la investigación fue experimental con un diseño de grupo de control aleatorio posterior a la prueba. La muestra se extrajo con etanol al 96 % como solvente. Las muestras de hojas de Jatropha (Jathropa curcas L.) se mezclaron hasta que quedaron suaves y pesaron hasta 500 g en un vaso de precipitados de vidrio de 1 000 mL. Después de eso, se añadió etanol al 96 % al procedimiento y se vertió en el recipiente de extracción. Este estudio utilizó una prueba de detección fitoquímica.*
Resultados: *Los resultados de la prueba de pH de Fórmula I con una concentración de 5 % se repitieron tres veces, y el pH promedio fue de 5,03. La formulación II con una concentración del 10 % se repitió tres veces. El pH medio fue de 5,04. La formulación III con una concentración del 15 % se repitió tres veces y el pH medio fue de 5,02. El extracto de hoja de Jatropha no cambió el pH de la preparación. Los resultados de la prueba de normalidad de las formulaciones I, II y III tuvieron un valor de significación superior a 0,05, por lo que se dijo que no había diferencia significativa. Los resultados de homogeneidad obtuvieron una influencia significativa de más de 0,05, por lo que no existe una diferencia significativa. Por lo tanto, se consideró estable en el parámetro de homogeneidad. Mientras que la formulación de la preparación de gel, los resultados de las pruebas de estabilidad obtenidas, las observaciones organolépticas en todas las preparaciones de gel mostraron que las observaciones antes y después del almacenamiento no tuvieron cambios significativos.*
Conclusión: *Los resultados del tamizaje fitoquímico de las hojas de Jatropha (Jatropha curcas L.) no presentaron compuestos químicos de alcaloides, flavonoides y saponinas. Sin embargo, contiene compuestos químicos como polifenoles y terpenoides/esteroides libres.*

Palabras clave: *Extracto de hoja de Jatropha, cribado fitoquímico, gel físico, formulación de prueba de estabilidad.*

INTRODUCTION

Stroke is one of the biggest health problems today. Stroke is the second leading cause of death and the third leading cause of disability worldwide (1-3). Stroke sufferers attack not only old age but also the young and still productive (4,5). The World Health Organization (WHO) estimates that 70 % of strokes occur in low- and middle-income countries, accounting for 87 % of stroke-related disability deaths yearly (1). There was an increase in stroke cases by 7 % in 2013 (6) to 10.9 % in 2018 in Indonesia (7). The impact of stroke causes long-term disability, so this disease needs attention given the increasing prevalence and resulting in patient morbidity and mortality. It is also the single most common cause of disability. More than 250 000 people were living with disability due to stroke. Based on the study conducted for seven years on more than 20 000 people, 425 stroke sufferers and more than 100 000 experienced stress in their lives (8).

In stroke patients, one of the disabilities is paralysis of one side or part of the body, difficulty speaking, and experiencing emotional disturbances caused by brain damage (9-12). Commonly, stroke patients cannot do activities independently, so they need help (13). One of these conditions is caused by post-ischemic stroke inflammation. The inflammatory response that appears in post-ischemic stroke will affect stroke progression. The inflammatory response that occurs in ischemic stroke will affect the progression of the stroke (14,15). This inflammatory response can increase the course of ischemic stroke by accelerating the development of the penumbral region of tissue at risk for infarction (16,17).

Cytokines TNF-α and IL-β play a role in the inflammatory process (18-20). The high risk of disability in stroke patients is associated with increased indicators of TNF-α cytokines and IL-1β because they affect infarct expansion (19,20). The health problems above are not solely the responsibility of the government but the active participation of the community, especially families who have family members with stroke. Families are needed to improve their family health status in accordance with the maintenance function (21,22). Efforts to improve health status and prevent disability in post-stroke patients can be conducted using Jatropha leaf extract to improve temperature, infarct volume, TNF-α, and IL-1β (23-25). Making jatropha leaf gel compresses is easy, and the ingredients are

relatively widely planted as fences. Families can do this manufacture to treat family members who have a stroke. This study aims to test the ethanol extract of Jatropha leaves (*Jatropha curcas L.*) as a gel compress preparation in post-ischemic stroke patients.

METHODS

Research Design

This research was an experimental study with a randomized post-test only control group design. This method was a research procedure to reveal a causal relationship between two or more variables by controlling the influence of other variables.

Research Sample Extraction

The sample was extracted with 96 % ethanol as solvent. Jatropha leaf samples (*Jathropa curcas L.*) were blended until smooth, weighed as much as 500 g, and put into a 1 000 mL glass beaker. Then, 96 % ethanol was added to the procedure and poured into the extraction vessel. The extraction container was closed and allowed to stand for 24 hours. After 24 hours, filter the Jatropha leaf extract to obtain the filtrate on the first day. After the residual filtering of all the filtrate was finished, it was allowed to stand for 24 hours. The results of all the filtrate were combined, and then in a rotavapor with the appropriate temperature, the remaining filtrate was until it became a thick extract.

Research Sample Partition

The dried extract (*Jathropa curcas L.*) that has been obtained was weighed. Ethyl acetate was added, put into an Erlenmeyer glass, stirred with a magnetic stirrer, then centrifuged, left for a while until there was the separation of the soluble ethyl acetate and insoluble ethyl acetate layers, then removed and stored in a separate container. The insoluble acetate extract was added with ethyl acetate. Do as before until the ethyl acetate solvent was clear.

Gel Preparation

The gel preparation was applied using a gel base (carbopol 940 and hydroxy propyl methyl cellulose (HPMC) developed with 70°C distilled water in a beaker, stirred until swelled. Triethanolamine (TEA) was mixed into the base and then homogenized. Added methylparaben, which was added to the mixture. It was previously dissolved with 3 mL of distilled water at 90°C and homogenized. Next, dissolved ethanol extract of jatropha leaf (*Jatropha Curcas L.)* into glycerin, then put into the base little by little, homogenized. Then the remaining water was added. After that, it was homogenized.

Phytochemical Screening Test

A. Screening for Alkaloid Group Compounds

Identification by thin layer chromatography (TLC)

1. Extract as much as 0.3 g plus 2 mL of 96 % ethanol, stir until dissolved, then add 5 mL of HCL 2N, and heat over a water handler for 2-3 minutes, stirring the sauce.
2. After cooling, add 0.3 g of NaCl, stir well, and filter.
3. Fitrates were added with 5 mL HCl 2N. Then, filtrates were added with concentrated ammonium hydroxide (NH_4OH) until the solution became alkaline, then extracted with 5 mL of water-free chloroform in a test tube.
4. The chloroform phase (bottom) was taken with a pipette, collected, and ready for examination by TLC test.

Stationary phase: Kiesel gel GF 254

Mobile phase: Ethyl acetate: methanol: water (6:3:1)

Stain viewer: Dragendorph rectifier

If an orange color appeared, it indicated the presence of alkaloids in the extract.

B. Screening for Terpenoid Compounds

Identification by TLC

1. A little extract plus some 2 mL of n-hexane, vortexed for 3 minutes, smeared on the stationary phase
2. This thin-layer chromatography test used:

   Stationary phase: Kiesel gel GF 254

   Mobile phase: n-hexane – ethyl acetate (4: 1)

   Spot appearance: Sulfuric acid anisaldehyde

The presence of terpenoids/steroids was indicated by the occurrence of a red/purple color.

C. Screening of Flavonoid Group Compounds

1. A sample of 0.2 g was dissolved in 10 mL of 96 % ethanol using an ultrasonic vibrator.
2. Testing by thin layer chromatography method
3. The ethanol extract was spotted on the TLC plate as much as 25μL
4. This thin-layer chromatography test uses:

   Stationary phase: Kiesel gel GF 254. thin layer

   Mobile phase: $CHCI_3$: Acetone: As. Format (6:6:1)

   The appearance of stains: Ammonia vapor, UV 366 nm, and 254 nm

The presence of flavonoids was indicated by the appearance of intensive yellow colors with the appearance of ammonia vapor stains.

D. Polyphenol Screening

1. Amount of 0.3 g extract plus 10 mL of hot distilled water, stirred and allowed to come to room temperature, then added 3-4 drops of 10 % NaCl, stirred, and filtered
2. The filtrate is divided into 3 IA and IB

   Ferric chloride Test

IA is dripped with 2 % $FeCI_3$ solution. If it is blackish green, it indicates the presence of phenolic compounds

Testing using the Thin Layer Chromatography Method

1. IB is used for examination with TLC

2. This thin-layer chromatography test uses:

   Stationary phase: Kiesel gel GF 254 thin layer

   Mobile phase: ethyl acetate – methanol – Formic acid (16:4:1)

   Spot appearance: $FeCl_3$ 2 %, UV 366 nm and 254 nm

3. The presence of polyphenols is indicated by the appearance of brown to black spots with the appearance of $FeCl_3$ stains.

E. Screening of Saponin Group Compounds

Foam Test

1. A sample solution of 0.3 g is added with 10 mL of water and shaken vigorously for 30 seconds.
2. The foam test is considered positive for saponins if there is a stable foam for more than 30 min with a fruit height of 1-10 cm above the surface, and when 1 drop of 2N hydrochloric acid is added, the foam does not disappear.

   Gel Preparation Stability Test

1. Organoleptic Observations

   The organoleptic examination included shape, color, and odor, which were observed using the five senses before and after the accelerated storage treatment at 4ºC and 40ºC for 48 hours in 6 cycles.

2. Gel Preparation Stability Test

a. pH measurement

PH was measured using a pH meter before and after the accelerated storage treatment at 4°C and 40°C for 48 hours in 6 cycles.

b. Spreadability Test

   1 gram of gel was carefully placed on a glass or transparent plastic, then covered with other parts and used a weight on it with a load of 0 g, 5 g, 10 g, 20 g, 30 g, 50 g, 100 g, and 200 g. Formula 1 (5 % concentration) was repeated twice, and the diameter was measured 1 minute before and after the accelerated storage treatment at 4°C and 40°C for 48 h in 6 cycles of 1 gram of gel. Furthermore, Formula 2 (10 % concentration) was repeated twice, and the diameter was measured 1 minute before and after the accelerated storage treatment at 4°C and 40°C for 48 h in 6 cycles of 1 g of gel. And Formula 3 (15 % concentration) was

repeated twice, and the diameter was measured 1 minute before and after the accelerated storage treatment at 4°C and 40°C for 48 h in 6 cycles of 1 g of gel.

c. Homogeneity Test

As much as 1 g of the gel has been made and is smeared on the slide. Then it was bolted with another slide and seen whether the base was homogeneous and whether the surface was smooth evenly before and after the accelerated storage treatment at 4°C and 40°C for 48 h in 6 cycles.

RESULTS

The results of the phytochemical screening of Jatropha leaves (*Jathropa curcas L.*) were obtained as follows:

Results of Screening for Alkaloid Group Compounds

The appearance of an orange stain in the TLC test treated with Dragendorph reagent indicates the presence of alkaloids. Although in the picture, in samples 6-22 there is no orange stain, the sample does not contain alkaloids (Figure 1).

Notes:

Stationary phase: Kiesel gel GF 254

Mobile phase: Ethyl acetate: methanol: water

Figure 1. Stain Appearance: Dragendorph's Reagent.

Screening Results for Terpenoid/Steroid Group Compounds

A red stain in the TLC test of samples 6-22 indicates the presence of free terpenoid/steroid group compounds. In the picture, it can be seen that the sample has purple stains. The sample contains free terpenoids/steroids (Figure 2).

Notes:

Stationary phase: Kiesel gel GF 254

Mobile phase: n-heksana: etil (4:1)

Figure 2. Stain Appearance: Sulfuric Acid Anisaldehyde Reactor.

Results of Screening for Flavonoid Group Compounds

TLC Screening Results Sample 6-22

The appearance of intensive yellow stains in the TLC test indicates the presence of flavonoid compounds. Although in the picture, it can be seen that samples 6-22 did not show an intensive yellow stain, the sample did not contain flavonoids (Figure 3).

Notes:

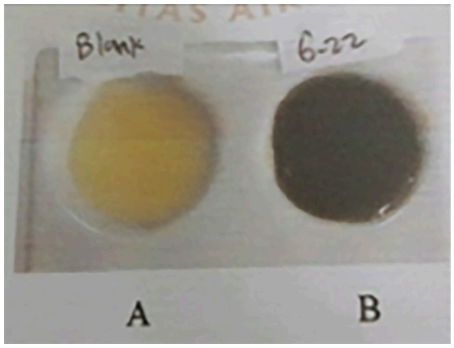
Stationary phase: Kiesel gel GF 254

Mobile phase: Butanol: Glacial acetic acid: Water (4:15)

Figure 3. Stain Viewer: Ammonia Steam, UV 366 nm & 254 nm.

Results of Screening for Compounds of Polyphenols and Tannins

Samples 6-22 appeared with dark blue-green stains after being dropped with 2 % $FeCl_3$ solution, so samples 6-22 showed polyphenols (Figure 4).



Notes:

A:IA(Blanko) solution

B: IA + FeCl3 2 % solution

Figure 4. A dan B Solutions.

TLC test

The appearance of brown to black spots on the TLC test indicates the presence of polyphenol group compounds. Although in the picture, samples 6-22 showed blackish stains, the samples contained polyphenols (Figure 5).

Notes:

Stationary phase: Kiesel gel GF 254

Mobile phase: ethyl acetate: methanol: formic acid (16:4:1)

Figure 5. Stain Viewer: $FeCl_3$ 2 %, UV 366 nm & 254 nm Reactor.

Results of Screening for Saponin Group Compounds

The solution produces foam that lasts more than 30 minutes on the foam test, indicating the presence of saponin group compounds. The figure shows that the sample solution 6-22 does not produce foam that lasts more than 30 minutes (Figure 6).

Phytochemical screening of Jatropha leaves (*Jathropa Curcas L.*) showed that the samples contained terpenoids/steroids and polyphenols but did not contain flavonoids, saponins, and alkaloids. Tables 1-4 showed formulas I, II, and III based on organoleptic observations, pH test results, normality test, and homogeneity test. The formulation test and physical stability test of Jatropha leaf extract gel (*Jathropa curcas L.*) were as follows:

Figure 6. Saponin Group Compound Sample Solution.

In Table 1 it can be seen that the results of organoleptic observations showed that the ethanol extract of Jatropha Curcas (*Jatropha curcas L.*) leaves with HPMC base in each formula had the same organoleptic, which had a semi-solid form and was easy to apply with a dark green color with a distinctive aromatic smell. The addition of concentration in the formula did not affect the gel preparation organoleptically in shape, color, or smell. This statement can also be seen in Figure 6 below.

Table 1

Organoleptic Observations

Preparation	Form	Colour	Scent
Formula I	Semi-solid	Dark green	Special Extract
Formula II	Semi-solid	Dark green	Special Extract
Formula III	Semi-solid	Dark green	Special Extract

Information: Formula I: Concentration 5 %, Formula II: Concentration 10 %, Formula III: Concentration 15 %

Table 2 shows the gel pH test results for each formula. Starting from the results of pH testing on the base formula, which is controlled so that it does not contain extract, replication 1 is worth 5.04, replication 2 is 5.05, and replication 3 is 5.07, with an average of 5.05 and SD ± 0.01. The pH test results on formula 1, which contains extracts with a concentration of 5 %, replication 1 worth 5.02, replication 2 worth 5.06, replication 3 worth 5.01, with an average of 5.03 and SD ± 0.02. The pH test results on formula 2, which contains extracts with a concentration of 10 %, replication 1 worth 5.00, replication 2 worth 5.05, replication 3 worth 5.07, with an average of 5.04 and SD ± 0.03. The results of the pH test on formula 3 contained an extract with a concentration of 15 %, 1 replication 5.01, 2 replications 5.05, and 3 replications 5.02, with an average of 5.02 and SD ± 0.02.

Table 2

pH Test Results

Formula	pH			
	Replication n1	Replication n2	Replication n3	Average ± SD
Basis	5.04	5.05	5.07	5.0533 ± 0.0153
Formula 1	5.02	5.06	5.01	5.0300 ± 0.0265
Formula 2	5.00	5.05	5.07	5.0400 ± 0.0361
Formula 3	5.01	5.05	5.02	5.0267 ± 0.0208

From Table 3, the pH data normality test using Shapiro-Wilk was carried out on the basis group with a significant value of 0.637, the formula I group with a significant value of 0.363, the formula II group with a significant value of 0.537 and the formula III group with a significant value of 0.463. This shows that the normality test conducted on all groups shows a significant value >0.05, which means that the distribution of values between all groups shows a normal distribution because there is no significant difference in the base group, formula I group, formula II group, and formula III group. So the next analysis is continued with parametric.

Table 3

Tests of Normality

	Formula	Kolmogorov-Smirnova Statistic	df	Sig.	Shapiro-Wilk Statistic	Df	Sig.
pH	Basis	0.253	3	.	0.964	3	0.637
	F1	0.314	3	.	0.893	3	0.363
	F2	0.276	3	.	0.942	3	0.537
	F3	0.292	3	.	0.923	3	0.463

a. Lilliefors Significance Correction

From Table 4, the homogeneity test was carried out on the basis group with a significant value of 0.380, the formula I group with a significant value of 0.840, the formula II group with a significant value of 0.840 and the formula III group with a significant value of 0.415. This shows that the homogeneity test conducted on all groups shows a significant value > 0.05, which means that the distribution of values between all groups shows a homogeneous distribution of values because it does not show significant differences, so it is considered stable in the homogeneity parameter, both before and after storage. So, the next analysis is continued with parametric.

Table 4

Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
pH	Based on Mean	1.169	3	8	0.380
	Based on Median	0.278	3	8	0.840
	Based on the Median and with adjusted df	0.278	3	6.000	0.840
	Based on trimmed mean	1.068	3	8	0.415

From Table 5, to determine the stability of pH, One Way ANOVA test was carried out on all groups showing a significant value of 0.607 > 0.05 which means that there is no difference between the four groups, namely the base group, the formula group I, the formula group II and the formula group III. So that it can be interpreted that the pH of the gel preparation of Jatropha leaf extract (*Jatropha curcas L.*) for compresses is in a stable condition. Based on the tables above, castor leaf extract did not change the pH of the preparation. In addition, the pH value of all preparations did not differ by about 5 (Table 5).

Table 5

One-Way ANOVA Test
pH

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.001	3	0.000	0.646	0.607
Within Groups	0.005	8	0.001		
Total	0.007	11			

Spreadability Test Results

Based on tables 6-9 and Figures 7-9 showed the test results related to formulas 1-3.

Based on Table 6 the results of the dispersion test can be seen in formula 1 replication 1 with a concentration of 5 % without being given a load that is to produce a dispersion of 1 cm, given a load of 5 g which produces a dispersion of 1.4 cm, given a load of 10 g which produces a dispersion of 1.5 cm, given a load of 20 g which produces a spread power of 1.8 cm, is given a load of 30 which produces a scattering power of 2 cm, is given a load of 50 which produces a scattering power of 2.2 cm, is given a load of 100 g which produces a scattering power of 2.3 cm, and is given a load of 200 g which produces power spread 2.4 cm. The results of the dispersion test in formula 1 replication 2 with a concentration of 5 % without being given a load that is to produce a spread power of 1.5 cm, given a load of 5 g which produces a spread of 1.7 cm, given a load of 10 g which produces a dispersion power of 1.8 cm, given a load of 20 g, namely produces a spread of 1.9 cm, is given a load of 30 which produces a scattering power of 2.1 cm, is given a load of 50 which produces a scattering power of 2.4 cm, is given a load of 100 g which produces a scattering power of 2.7 cm, and is given a load of 200 g which produces a scattering power of

2.7 cm. In Table 6 it can be seen that replication 2 with a load of 100 g and 200 g had a good dispersion of 2.7 cm.

Table 6

Formula 1

Weight (g)	Spread Diameter F1-1 (cm)	Spread Diameter F1-2 (cm)
0	1	1.5
5	1.4	1.7
10	1.5	1.8
20	1.8	1.9
30	2	2.1
50	2.2	2.4
100	2.3	2.7
200	2.4	2.7

Based on the equation of the regression line, the dispersive power test profile is shown in Figure 7. From the test results on the dispersion of the gel, it was found that the equation for the dispersion power was obtained, namely in RI, it was obtained y = 0.0114 cm/g + 1.3935, and at R2, it was obtained y = 0.0115 cm/g + 1.6601. This means that the increasing load is directly proportional to the diameter of the spread power. The graph shows the Slope R1 value = 0.0114 cm/g and the Slope R2 value = 0.0115 cm/g. It can be explained that the average increase of one gram of load can increase the dispersion diameter of 0.0114 in formula 1 R1 while the average increase of 1 gram of load can increase the dispersion diameter of 0.0115 in formula 1 R2.

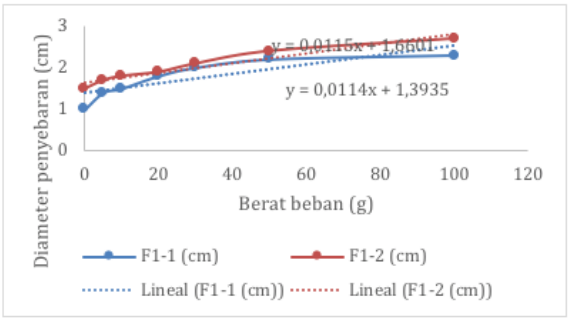


Figure 7. Graph of the relationship between the weight of the load and the diameter of the dispersion of Formula 1.

Based on Table 7 the results of the dispersion test can be seen in formula 2 replication 1 with a concentration of 10 % without being given a load, which produces a spread power of 1.2 cm, given a load of 5 g, which produces a dispersion of 1.4 cm, given a load of 10 g, which produces a dispersion of 1.5 cm, given a load of 20 g which produces a scattering power of 1.6 cm, is given a load of 30 which produces a scattering power of 1.7 cm, is given a load of 50 which produces a scattering power of 1.9 cm, is given a load of 100 g which produces a scattering power of 2.1 cm, and is given a load of 200 g which produces power spread 2.3 cm. The results of the dispersion test in formula 2 replication 2 with a concentration of 10 % without being given a load that is producing a spread power of 1.2 cm, given a load of 5 g which produces a spread of 1.3 cm, given a load of 10 g which produces a spread of 1.4 cm, given a load of 20 g, namely produces a spread of 1.6 cm, is given a load of 30 which produces a scattering power of 1.9 cm, is given a load of 50 which produces a scattering power of 2.1 cm, is given a load of 100 g which produces a scattering power of 2.2 cm, and is given a load of 200 g which produces a scattering power of 2.2 cm. Table 7 shows replication 2 with a load of 100 g and 200 g had a good dispersion of 2.2 cm.

Table 7

Formula 2

Weight (g)	Spread Diameter F2-1 (cm)	Spread Diameter F2-2 (cm)
0	1.2	1.2
5	1.4	1.3
10	1.5	1.4
20	1.6	1.6
30	1.7	1.9
50	1.9	2.1
100	2.1	2.2
200	2.3	2.2

Based on the regression line equation, the dispersion test profile is shown in Figure 8. From the test results, the dispersion power of the gel obtained the equation of dispersion power, namely in RI obtained y = 0.0082 cm/g + 1.3775

and at R2 obtained y = 0.0103 cm/g + 1.3562. This means that the increase in load is directly proportional to the diameter of the spreading power. The graph shows the slope value of R1 = 0.0082 cm/g and the slope value of R2 = 0.0103 cm/g. It can be explained that an average increase of one gram of load can increase the dispersion diameter by 0.0082 cm/g in formula 1 R1 while an average increase of 1 gram of load can increase the dispersion diameter by 0.0103 cm/g in formula 1 R2.

Slope R1 = 0.0082, Slope R2 = 0.0103.

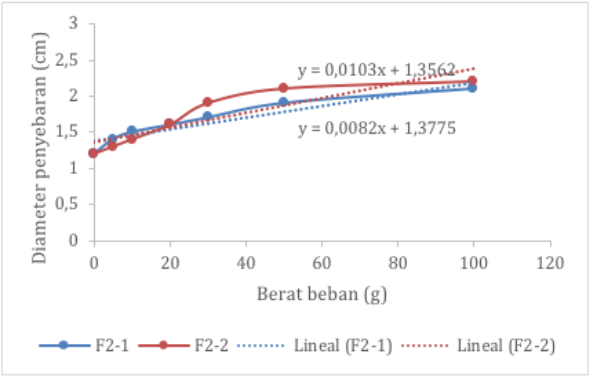


Figure 8. Graph of the relationship between the weight of the load and the diameter of the dispersion Formula 2.

Based on Table 8, the results of the dispersion test can be seen in formula 3 replication 1 with a concentration of 15 % without being given a load that produces a dispersion power of 0.9 cm, is given a load of 5 g which produces a dispersion of 1.3 cm, is given a load of 10 g which produces a spread of 1.4 cm, given a load of 20 g which produces a scattering power of 1.7 cm, is given a load of 30 which produces a scattering power of 1.9 cm, is given a load of 50 which produces a scattering power of 2.2 cm, is given a load of 100 g which produces a scattering power of 2.3 cm, and is given a load of 200 g which produces power spread 2.4 cm. The results of the dispersion test in formula 3 replication 2 with a concentration of 15 % without being given a load that is producing a spread power of 1.1 cm, given a load of 5 g which produces a spread of 1.4 cm, given a load of 10 g which produces a dispersion of 1.5 cm, given a load of 20 g, namely produces dispersion of 1.6 cm, is given a load of 30 which produces a scattering power of 1.8 cm, is given a load of 50 which produces a scattering power of 1.9 cm, is given a load of 100 g, which produces a scattering power of 2.0 cm, and is given a load of 200 g, which produces a scattering power of 2.2 cm. Table 8 shows that replication 2 with a load of 200 g had a good dispersion of 2.2 cm.

Table 8

Formula 3

Weight (g)	Spread Diameter F3-1	Spread Diameter F3-2
0	0.9	1.1
5	1.3	1.4
10	1.4	1.5
20	1.7	1.6
30	1.9	1.8
50	2.2	1.9
100	2.3	2.0
200	2.4	2.2

Based on the regression line equation, the scatter power test profile is shown in Figure 9. From the results of the gel dispersibility test, the dispersion power equation was obtained, namely in RI, it was obtained y = 0.0076 cm/g + 1.3797, and at R2, it was obtained y = 0.0126 cm/g + 1.2849. This means that the increase in load is directly proportional to the diameter of the spreading power. The graph shows the slope value of R1 = 0.0076 cm/g and the slope value of R2 = 0.0103 cm/g. It can be explained that an average increase of one gram of load can increase the dispersion diameter by 0.0076 cm/g in formula 1 R1 while an average increase of 1 gram of load can increase the dispersion diameter by 0.0126 cm/g in formula 1 R2.

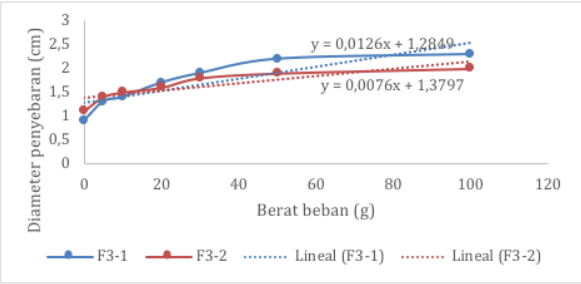


Figure 9. Graph of the relationship between the weight of the load and the diameter of the dispersion Formula 3.

Based on Table 9, the results of the dispersion test can be seen in formula 1 with a concentration of 5 % in replication 1 and replication 2 with a load of 100 g the average value of dispersion is 2.50±0.20. In formula 2 with a concentration of 10 % in replication 1 and replication 2 with a load of 100 g the average dispersion value was 2.15±0.05. In formula 3 with a concentration of 15 % in replication 1 and replication 2 with a load of 100 g the average dispersion value was 2.15±0.15.

Table 9

Formula 1-3

Formula	Spreadability Capacity on Load 100 g (cm)			Spreadability/Slope (cm/g)		
	R1	R2	Rerata	R1	R2	Rerta
F1	2.3	2.7	2.50±0.20	0.0114	0.0115	0.0114±0.0000
F2	2.1	2.2	2.15±0.05	0.0082	0.0103	0.0092±0.0010
F3	2.3	2.0	2.15±0.15	0.0126	0.0076	0.0101±0.0025

DISCUSSION

Phytochemical Screening

A phytochemical test was carried out as a qualitative preliminary test to determine the content of chemical compounds (secondary metabolites) in Jatropha (*Jatropha curcas L.*) leaves. Phytochemically tested ingredients in Jatropha (*Jatropha curcas L.*) leaves are alkaloids, flavonoids, saponins, steroids, terpenoids, phenols, and tannins (27). The results of the study (27) showed that the compounds contained in Jatropha leaf extract (*Jatropha curcas L.*), namely the positive (+) dry leaf test contained alkaloids and steroids. The positive (+) wet leaves contain alkaloids, steroids, and saponins. The compound is obtained from the extraction using methanol solvent and then tested with the reagents that have been determined.

In the results of the study, phytochemical screening showed that the content in *Jatropha curcas L.* leaves was polyphenols and terpenoids/free steroids but did not contain alkaloids, flavonoids, and saponins. This is contrary to the results of research (30) which showed that the results of the qualitative test of the class of compounds contained in the ethanol extract of *Jatropha* leaves by TLC showed that they contained flavonoids, tannins, and saponins. This situation is due to the different ethanol extracts.

The benefits of polyphenol content as antioxidant compounds that can minimize the risk of chronic disease, high levels of oxidants in the body neutralize free and harmful free radicals so that they can protect against oxidative stress. Besides being able to function as antioxidants, polyphenols have other benefits for the body, namely preventing anti-aging, being an anti-cancer, preventing the body from obesity, and increasing immunity and as an anti-inflammatory (28). And the content of free terpenoids/steroids has properties and the ability to protect humans from various diseases such as anticancer, antimicrobial, antioxidant, antithrombotic, boosting the immune system, anti-inflammatory, regulating blood pressure, lowering cholesterol, preventing heart disease, preventing vision problems, and regulate blood

sugar levels, menstrual disorders, skin disorders, liver damage and malaria (triterpenoids) (29).

Based on the results of research through phytochemical tests and supported by other studies that the content of compounds in Jatropha leaf extract (*Jatropha curcas L.*) can be used as alternative medicine or traditional medicine that is easily obtained around the home environment and one of them can reduce fever/anti-inflammatory. -inflammation whose utilization can be used as a compress.

Gel Physical Properties Test

In the study, it was found that organoleptic observations on all gel preparations showed that the observations before and after storage did not have a change, namely with a dark green color, a semi-solid form that was easy to apply, and the characteristic odor of the extract and the clear and transparent color appeared, this indicates that the observations in this parameter are said to be stable. Both before and after storage or the components in the preparation during storage do not experience a reaction between one material and another, so there are no signs of reaction from changes in color, appearance, shape, and odor.

This is in line with research (26). The results of organoleptic observations showed no significant changes. For color, odor, and color, it remains transparent as well as for the characteristic odor of carbopol and Na CMC which is getting weaker. The most influential factor in the change in color and odor is probably the temperature difference between the room temperature, refrigerator, and oven. For organoleptic observations, Jatropha (*Jatropha curcas L.*) leaves can be recommended as a compress because the texture is semi-solid, soft, and easy to apply on the skin and the color is dark green and refreshing and has a distinctive aroma.

pH or potential of hydrogen is the degree of acidity used to express the level of acidity or alkalinity of everything, including the skin. The pH level has a magnitude in the numbers 1-14. A solution is neutral at pH 7, if it is below 7 it is acidic and if it is above 7 it is basic. The pH of the body's skin is regulated by the sebaceous and sudoriferous glands, which secrete sebum to maintain skin elasticity and health. In the study, it was found that the pH test value of all preparations did not differ in the results, namely pH = 5. This is in accordance with research (26) showing the skin pH range at pH 5 is still safe to use. The pH of the preparation is very influential on the skin because if the pH of the gel is too acidic, irritation will occur on the skin, otherwise, if the pH is too alkaline it will cause dry scaly skin, another factor is the sensitivity of human skin which is different.

In the observational study of the normality test of Formulation I, Formulation II, and Formulation III, the significance value of the results showed no significant difference. So that the next analysis is carried out with parametric. This is in line with research (30). The normality test of the data according to Shapiro Wilk shows that the data is normally distributed.

The results of the homogeneity observation study showed that there was no significant difference, so it was considered stable in the homogeneity parameter, both before and after storage. This is based on the results obtained that there are no solid particles contained in the gel and the absence of gelling agents that are still clumping or uneven in the preparation. This is in line with research (26). The homogeneity test showed that all gel preparations showed good homogeneity, this was indicated when a number of gels were applied to a piece of glass, a homogeneous arrangement and no coarse grains were seen, meaning that it can be stated physically stable. So, when applied to the skin does not cause irritation. An important factor that needs to be considered in this test is when the gel is made by adding the ingredients little by little and sequentially.

Based on this, the formulation of a compress gel preparation of Jatropha leaf extract (*Jatropha curcas L.*) with ethanol solvent with different concentrations can be used as an alternative medicine/traditional medicine as a compress to reduce fever/anti-inflammatory.

The dispersion test of the preparation was carried out to determine the amount of force required for the gel to spread on the skin or to determine the ability to spread the gel preparation when applied to the skin. The results of the dispersion test of Formula I are easier to spread than Formula 2 and Formula 3.

This shows that in line with research (26) the two formulas have dispersion values that vary/ do not spread easily because they are influenced by changes in temperature so the dispersion values obtained to change. The possibility of spreading is small because after leaving the oven or refrigerator the temperature is not allowed to be at room temperature, which is ideally left to stand for 4 - 6 hours. This is also due to the use of a gelling agent with a high concentration so that the dispersion is small.

An ischemic stroke, caused by a decrease in cerebral blood flow, will result in a decrease in blood flow in the penumbra area, which in turn will result in complex cascades such as excitotoxicity and oxidative stress in the ischemic neuron area. This cascade activates microglia and releases proinflammatory cytokines such as TNF-α, IL-1β, and IL6. These cytokines have the potential to induce an inflammatory reaction by recruiting and infiltrating neutrophils, monocytes, and T cells to the lesion site. In the infarct core area, cells die (necrosis) and will release damage-associated molecule patterns (DAMPs), which will then be detected by immune cells such as natural killer (NK) cells (1). So, in the study, Jatropha leaf extract (*Jathropa curcas L.*) was formulated into a compress gel preparation because this dosage form is easy to use and spreads on the skin faster. In addition, the gel has soothing, moisturizing properties and easily penetrates the skin so that it provides a healing effect and is very effective in compressing Jatropha leaf extract (*Jathropa curcas L.*) in ischemic stroke patients with inflammation and inflammation due to the content in Jatropha leaves (*Jathropa curcas L.*) contains polyphenols and free terpenoids/ steroids. The benefits of polyphenol content as antioxidant compounds can minimize the risk of chronic disease. High levels of oxidants in the body neutralize harmful and free radicals so that they can protect against oxidative stress. Besides being able to function as antioxidants, polyphenols have other benefits for the body, namely preventing anti-ageing, an anticancer, preventing the body from obesity, and increasing immunity and anti-inflammatory. The content is free of terpenoids/steroids. It has properties and the ability to protect humans from various diseases such as anticancer, antimicrobial, antioxidant, and antithrombotic, boosting the immune system, anti-inflammatory, regulating blood pressure, lowering cholesterol, preventing heart disease, preventing vision problems, and regulating blood sugar levels, menstrual disorders, skin disorders, liver damage and malaria (triterpenoids). The basic contribution to the field of nursing is that the results of this study can be used as one of the nursing interventions of appropriate technology in the health sector to provide health services for the recovery of stroke patients. Ischemic because giving jatropha leaf extract gel compresses can prevent the expansion of the infarct so that the stroke patient does not have a re-attack that becomes more severe and eventually causes disability.

CONCLUSION

The phytochemical screening of Jatropha leaf extract showed that the sample contained terpenoid/steroid compounds and polyphenols but did not contain flavonoid, saponin, and alkaloid compounds. Formulation test and physical stability test of Jatropha leaf extract gel (*Jathropa curcas L.*) based on organoleptic observations of all the formula preparations in semi-solid form, dark green color, and characteristic odor of the extract. The study's results recommend further research on gel compresses in experimental animals and post-ischemic stroke patients. The use of jatropha leaves in treating fever has not been maximized, because its use is less practical if it has to be prepared and given directly in the form of leaf sheets. Therefore, it is necessary to develop a formula that can facilitate its use, such as a compressed gel. This dosage form is easier to use and spreads on the skin more quickly.

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