

BUKTI KORESPONDENSI
JURNAL NASIONAL TERAKREDITASI KEMENRISTEKDIKTI PERINGKAT 2

Judul artikel : Formulation and Characterization of Peel-Off Gel Mask Containing Secang (*Caesalpinia sappan* L.) Wood Extract with Strong Antioxidant Activity
 Jurnal : Jurnal Jamu Indonesia (JJI)
 Edisi : Tahun 2025, Vol 10, No.2 Halaman 121-125
 Penerbit : TropBRC IPB University
 Penulis : Intan Martha Cahyani, Tan Tanando Tanzaq, Ruth Ditya Agustina, Kemala Endar Setiawati

Tabel Tahapan Publikasi Artikel

No	Tahapan Publikasi	Tanggal
1	Manuscript Submission	12 Mei 2025
2	Editor Decision Manuscript ID JJI-403 – Sent to Review	12 Mei 2025
3	Editor Decision: Revisions Required and reviewer comment	13 Mei 2025
4	Submit first revised manuscript	13 Mei 2025
5	Editor’s comments on first revised manuscript	15 Mei 2025
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8	APC Payment request from JJI editorial	15 Mei 2025
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12	Confirmation of Revision – Figure 2 Adjustment and Unit Correction	16 Mei 2025
13	Response to Revision Confirmation	16 Mei 2025
14	Manuscript Proof for Correction	17 Mei 2025
15	Response to Proof of Manuscript for Correction	17 Mei 2025
16	Article Published Vol 10 issue 2 (19 Mei 2025) on website https://jamu-journal.ipb.ac.id/index.php/JJI/article/view/403 https://jamu-journal.ipb.ac.id/index.php/JJI/article/view/403/205	19 Mei 2025

1. Manuscript Submission

← → ↻ https://stifar.ac.id:2096/cpsess9066917119/3rdparty/roundcube/?_task=mail&_mbox=INBOX.spam ☆

Import bookmarks... Article In Press 2025 | ... Webmail Login

intanmartha@stifar.ac.id

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ojs@journalnotification.com 2025-05-16 18:37

Confirmation of Revision – Figure 2 Adjust...

ojs@journalnotification.com 2025-05-16 14:26

Copyediting Revision Request – "Peel Off ...

ojs@journalnotification.com 2025-05-15 15:24

- Payment Request
- Article Acceptance Notification – "Peel Off...
- Editor Decision-cek revisi dikomentar yah
- Editor Decision Manuscript ID JJI-403 – S...
- Submission Acknowledgement
- Comments for the Editor

Messages 1 to 9 of 9 1

Submission Acknowledgement

From ojs@journalnotification.com on 2025-05-12 12:32

Details Headers Plain text

Intan Martha Cahyani:

Thank you for submitting the manuscript, "Peel Off Gel Mask Secang Wood Extract as an Antioxidant: Formulation and Characterization" to Jurnal Jamu Indonesia. With the online journal management system that we are using, you will be able to track its progress through the editorial process by logging in to the journal web site:

Submission URL: <https://jamu-journal.ipb.ac.id/index.php/JJI/authorDashboard/submission/403>
Username: intanmarthac

If you have any questions, please contact me. Thank you for considering this journal as a venue for your work.

Indonesian Journal of Jamu (*Jurnal Jamu Indonesia*)

<https://jamu-journal.ipb.ac.id/index.php/JJI/index>

2. Editor Decision Manuscript ID JJI-403 – Sent to Review

← → ↻ https://stifar.ac.id:2096/cpsess9066917119/3rdparty/roundcube/?_task=mail&_mbox=INBOX.spam ☆

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- Payment Request
- Article Acceptance Notification – "Peel Off...
- Editor Decision-cek revisi dikomentar yah
- Editor Decision Manuscript ID JJI-403 – S...
- Submission Acknowledgement
- Comments for the Editor

Messages 1 to 9 of 9 1

Editor Decision Manuscript ID JJI-403 – Sent to Review

From ojs@journalnotification.com on 2025-05-12 13:59

Details Headers Plain text

Dear Intan Martha Cahyani,

We have reviewed your submission to *Jurnal Jamu Indonesia*, entitled:

"Peel Off Gel Mask Secang Wood Extract as an Antioxidant: Formulation and Characterization" (Manuscript ID: JJI-403)

We are pleased to inform you that your manuscript has passed the initial screening stage and meets the editorial requirements for further evaluation. Based on the similarity report, which shows a similarity index of 6%, we have decided to proceed with the **peer-review process**.

Your submission has now been forwarded to selected reviewers. You will be notified once the review process is complete and editorial decisions have been made.

You may track the progress of your submission at any time by logging into your author dashboard:

▶ <https://jamu-journal.ipb.ac.id/index.php/JJI/authorDashboard/submission/403>

We thank you for your submission and look forward to the reviewers' feedback on your manuscript.

Sincerely,

Dear Intan Martha Cahyani,

We have reviewed your submission to *Jurnal Jamu Indonesia*, entitled:

"Peel Off Gel Mask Secang Wood Extract as an Antioxidant: Formulation and Characterization" (Manuscript ID: JJI-403)

We are pleased to inform you that your manuscript has passed the initial screening stage and meets the editorial requirements for further evaluation. Based on the similarity report, which shows a similarity index of **6%**, we have decided to proceed with the **peer-review process**.

Your submission has now been forwarded to selected reviewers. You will be notified once the review process is complete and editorial decisions have been made.

You may track the progress of your submission at any time by logging into your author dashboard:

▶ <https://jamu-journal.ipb.ac.id/index.php/JJI/authorDashboard/submission/403>

We thank you for your submission and look forward to the reviewers' feedback on your manuscript.

Sincerely,
Prof. Waras Nurcholis
Editor-in-Chief
Jurnal Jamu Indonesia

3. Editor Decision: Revisions Required and reviewer comment

Notifications

Editor Decision

2025-05-13 04:55 PM

Dear Intan Martha Cahyani, Tan Tanando Tanzaq, Ruth Ditya Agustina, Kemala Endar Setiawati:

We have reached a decision regarding your submission to **Jurnal Jamu Indonesia**, "Peel Off Gel Mask Secang Wood Extract as an Antioxidant: Formulation and Characterization".

Our decision is: **Revisions Required**

Please revise your manuscript according to the **Jurnal Jamu Indonesia** guidelines (<https://drive.google.com/file/d/1qHEPhEkhwI2mmaOA3FP4nUUZVygjMwQY/view>) and incorporate the suggestions and recommendations provided by the reviewers. The revised manuscript must be submitted within **3 days**.

When submitting your revision, please ensure the following:

1. **Highlight all revised sections in yellow** within the manuscript.
2. **Provide a separate response letter** addressing the reviewers' comments, detailing how each suggestion has been incorporated or explaining any deviations.

← → ↻ <https://jamu-journal.ipb.ac.id/index.php/JJI/authorDashboard/submission/403> ☆

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Jurnal Jamu Indonesia

← Back to Submissions

WOOD Extract as an Antioxidant: Formulation and Characterization".

Our decision is: **Revisions Required**

Please revise your manuscript according to the **Jurnal Jamu Indonesia** guidelines (<https://drive.google.com/file/d/1qHEPhEkhwi2mmaOA3FP4nUUZVygiMwQY/view>) and incorporate the suggestions and recommendations provided by the reviewers. The revised manuscript must be submitted within **3 days**.

When submitting your revision, please ensure the following:

1. **Highlight all revised sections in yellow** within the manuscript.
2. **Provide a separate response letter** addressing the reviewers' comments, detailing how each suggestion has been incorporated or explaining any deviations.

Once the revisions are complete, please upload the revised manuscript and the response letter to the submission system.

We appreciate your cooperation and look forward to receiving your revised submission.

Best regards,

Prof. Waras Nurcholis
Editor-in-Chief
Jurnal Jamu Indonesia

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4. Submit first revised manuscript

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Revisions Q Search Upload File

▶	3454 Data.xlsx	May 15, 2025	Other
▶	3452 SECOND REVISION_INTAN MARTHA CAHYANI Peel Off Gel Mask Secang Wood Extract as an Antioxidant.docx	May 15, 2025	Article Text
▶	3446 Responses to Reviewers Comments-JJI_INTAN MARTHA CAHYANI.docx	May 13, 2025	Other
▶	3445 REVISI_INTAN MARTHA CAHYANI Peel Off Gel Mask Secang Wood Extract as an Antioxidant.docx	May 13, 2025	Article Text

Review Discussions Add discussion

Name	From	Last Reply	Replies	Closed
No Items				

5. Editor's comments on first revised manuscript

← → ↻ <https://jamu-journal.ipb.ac.id/index.php/JJI/authorDashboard/submission/403> ☆

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Jurnal Jamu Indonesia
— Back to Submissions

Dear Intan Martha Cahyani, Tan Tanando Tanzaq, Ruth Ditya Agustina, Kemala Endar Setiawati:

We have reached a decision regarding your submission to **Jurnal Jamu Indonesia**, "Peel Off Gel Mask Secang Wood Extract as an Antioxidant: Formulation and Characterization".

Our decision is: **Revisions Required**

Please revise your manuscript according to the **Jurnal Jamu Indonesia** guidelines (<https://drive.google.com/file/d/1qHEPhEkhwI2mmaOA3FP4nUUZVygjMwQY/view>) and incorporate the suggestions and recommendations provided by the reviewers. The revised manuscript must be submitted within **1 days**.

When submitting your revision, please ensure the following:

1. **Highlight all revised sections in yellow** within the manuscript.
2. **Provide a separate response letter** addressing the reviewers' comments, detailing how each suggestion has been incorporated or explaining any deviations.

Once the revisions are complete, please upload the revised manuscript and the response letter to the submission system.

We appreciate your cooperation and look forward to receiving your revised submission.

Best regards,

Prof. Waras Nurcholis
Editor-in-Chief

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Confirmation of Revision – Figure 2 Adjust...

ojs@journalnotification.com 2025-05-16 14:26

Copyediting Revision Request – "Peel Off ...

ojs@journalnotification.com 2025-05-15 15:24

• Payment Request

ojs@journalnotification.com 2025-05-15 15:22

• Article Acceptance Notification – "Peel Off..."

ojs@journalnotification.com 2025-05-15 05:44

• Editor Decision-cek revisi dikomentar yah

ojs@journalnotification.com 2025-05-12 13:59

• Editor Decision Manuscript ID JJI-403 – S...

ojs@journalnotification.com 2025-05-12 12:32

• Submission Acknowledgement

ojs@journalnotification.com 2025-05-12 12:32

• Comments for the Editor

REVISI_INTAN+MARTHA+CAHYANI+Peel+Off+Gel+Mask+Secang+Wood+Extract+a... (~734 KB)

Dear Intan Martha Cahyani, Tan Tanando Tanzaq, Ruth Ditya Agustina, Kemala Endar Setiawati:

We have reached a decision regarding your submission to **Jurnal Jamu Indonesia**, "Peel Off Gel Mask Secang Wood Extract as an Antioxidant: Formulation and Characterization".

Our decision is: **Revisions Required**

Please revise your manuscript according to the **Jurnal Jamu Indonesia** guidelines (<https://drive.google.com/file/d/1qHEPhEkhwI2mmaOA3FP4nUUZVygjMwQY/view>) and incorporate the suggestions and recommendations provided by the reviewers. The revised manuscript must be submitted within **1 days**.

When submitting your revision, please ensure the following:

1. **Highlight all revised sections in yellow** within the manuscript.
2. **Provide a separate response letter** addressing the reviewers' comments, detailing how each suggestion has been incorporated or explaining any deviations.

Once the revisions are complete, please upload the revised manuscript and the response letter to the

Messages 1 to 9 of 9 1

6. Submit second revised manuscript

The screenshot shows the author dashboard for Jurnal Jamu Indonesia. The page title is "Jurnal Jamu Indonesia" and the URL is "https://jamu-journal.ipb.ac.id/index.php/JJI/authorDashboard/submission/403". The dashboard includes a "Revisions" section with a search bar and an "Upload File" button. A table lists four revisions:

Revision ID	File Name	Date	Type
3454	Data.xlsx	May 15, 2025	Other
3452	SECOND REVISION_INTAN MARTHA CAHYANI Peel Off Gel Mask Secang Wood Extract as an Antioxidant.docx	May 15, 2025	Article Text
3446	Responses to Reviewers Comments-JJI_INTAN MARTHA CAHYANI.docx	May 13, 2025	Other
3445	REVISI_INTAN MARTHA CAHYANI Peel Off Gel Mask Secang Wood Extract as an Antioxidant.docx	May 13, 2025	Article Text

Below the revisions is a "Review Discussions" section with an "Add discussion" button. The table below it is currently empty, showing "No Items".

7. Article Acceptance Notification

The screenshot shows an email inbox for "intanmartha@stifar.ac.id". The selected email is titled "Article Acceptance Notification – 'Peel Off Gel Mask Secang Wood Extract as an Antioxidant: Formulation and Characterization'". The email content is as follows:

Dear Intan Martha Cahyani,

We are pleased to inform you that your manuscript entitled "Peel Off Gel Mask Secang Wood Extract as an Antioxidant: Formulation and Characterization" has been **accepted for publication** in **Jurnal Jamu Indonesia**, following a thorough peer review and editorial assessment.

Your article has met the required standards for scientific quality, originality, and relevance to the journal's scope. It will proceed to the **production stage (layout and typesetting)** after the required publication fee has been **successfully paid**.

Please make the payment as per the instructions provided on our journal's website or the payment invoice. Once your payment is confirmed, your article will enter the final processing stage.

If you have any questions regarding payment or the next steps, please do not hesitate to contact us. Thank you for choosing Jurnal Jamu Indonesia as the venue for your research.

Regards,
Prof. Dr. Waras Nurcholis, SSI, MSi
Editor-in-Chief

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Jurnal Jamu Indonesia
— Back to Submissions

Article Acceptance Notification - "Peel Off Gel Mask Secang Wood Extract as an Antioxidant: Formulation and Characterization"

2025-05-15 03:22 PM

Dear Intan Martha Cahyani,

We are pleased to inform you that your manuscript entitled "Peel Off Gel Mask Secang Wood Extract as an Antioxidant: Formulation and Characterization" has been **accepted for publication** in **Jurnal Jamu Indonesia**, following a thorough peer review and editorial assessment.

Your article has met the required standards for scientific quality, originality, and relevance to the journal's scope. It will proceed to the **production stage (layout and typesetting) after the required publication fee has been successfully paid.**

Please make the payment as per the instructions provided on our journal's website or the payment invoice. Once your payment is confirmed, your article will enter the final processing stage.

If you have any questions regarding payment or the next steps, please do not hesitate to contact us. Thank you for choosing Jurnal Jamu Indonesia as the venue for your research.

Regards,

8. APC Payment request from JJI editorial

← → ↻ https://stifar.ac.id:2096/cpsess9066917119/3rdparty/roundcube/?_task=mail&_mbox=INBOX.spam ☆

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intanmartha@stifar.ac.id

Select Threads Options Empty Refresh

Reply Reply all Forward Delete Archive Not junk Mark More

Payment Request

From ojs@journalnotification.com on 2025-05-15 15:24
Details Headers Plain text

Dear Authors,

Congratulations, your article has been accepted for publication in **Jurnal Jamu Indonesia**.

The publication fee is **IDR 2,750,000 (fast track 2,000,000 and English article improvement IDR 750,000)**. Please transfer the payment to:

Bank Name: Bank Mandiri
Account Holder: WARAS NURCHOLIS
Account Number: 1330025002254

The payment deadline is **five calendar days** from the date of this email.

Once payment is made, please confirm by uploading the proof of payment in the **OJS Jurnal Jamu Indonesia System** using the **Add comments** tab, and also send it via email to wnurcholis@apps.ipb.ac.id.

We are pleased to inform you that **Jurnal Jamu Indonesia** is currently accredited **SINTA 2** (see [SINTA profile](#)) and is **under evaluation for indexing in Scopus** (see [progress here](#)).

Your quick response will help us to publish your article in the upcoming issue.

← → ↻ https://stifar.ac.id.2096/cpsess9066917119/3rdparty/roundcube/?_task=mail&_mbox=INBOX.spam ☆

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intanmartha@stifar.ac.id

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Confirmation of Revision – Figure 2 Adjust... 📎

ojs@journalnotification.com 2025-05-16 14:26

Copyediting Revision Request – "Peel Off ... 📎

ojs@journalnotification.com 2025-05-15 15:24

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ojs@journalnotification.com 2025-05-15 15:22

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• Editor Decision-cek revisi dikomentar yah 📎

ojs@journalnotification.com 2025-05-12 13:59

• Editor Decision Manuscript ID JJI-403 – S...

ojs@journalnotification.com 2025-05-12 12:32

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ojs@journalnotification.com 2025-05-12 12:32

• Comments for the Editor

Messages 1 to 9 of 9 1 > >>

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Your quick response will help us to publish your article in the upcoming issue.

Thank you for your valuable contribution.

Regards,
Waras Nurcholis
Editor-in-Chief
Jurnal Jamu Indonesia

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Jurnal Jamu Indonesia

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Workflow

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Dear Authors,

wnurcholis
2025-05-15 03:22
PM

Congratulations, your article has been accepted for publication in **Jurnal Jamu Indonesia**.

The publication fee is **IDR 2,750,000 (fast track 2,000,000 and English article improvement IDR 750,000)**. Please transfer the payment to:

Bank Name: Bank Mandiri
Account Holder: WARAS NURCHOLIS
Account Number: 1330025002254

The payment deadline is **five calendar days** from the date of this email.

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We are pleased to inform you that **Jurnal Jamu Indonesia is currently accredited SINTA 2** ([see SINTA profile](#)) and is **under evaluation for indexing in Scopus** ([see progress here](#)).

Your quick response will help us to publish your article in the upcoming issue.

Thank you for your valuable contribution.

Regards,

Discussion

Closed

9. APC Payment Confirmation

Browser address bar: https://stifar.ac.id:2096/cpsess9066917119/3rdparty/roundcube/?_task=mail&_mbox=INBOX.Sent

Webmail Login

intanmartha@stifar.ac.id

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Inbox 2 Search...

- Waras Nurcholis 2025-05-16 18:51
- Re: Confirmation of Revision – Figure 2 Ad...
- Waras Nurcholis 2025-05-16 15:37
- Re: Copyediting Revision Request – "Peel ...
- Waras Nurcholis 2025-05-16 15:21
- Re: Copyediting Revision Request – "Peel ...
- wnurcholis@apps.ipb.ac.id 2025-05-15 16:26
- **Proof of Payment**
- IJPRA Journal 2024-03-30 12:54
- Re: 8100 Processing Pharmaceutical Grad...
- IJPRA Journal 2024-03-30 12:52
- Re: 8100 Processing Pharmaceutical Grad...
- IJPRA Journal 2024-03-30 12:42
- Re: 8100 Processing Pharmaceutical Grad...
- IJPRA Journal 2024-03-28 16:56
- Re: Confirmation from Account : 8100

Messages 1 to 13 of 13 1

Proof of Payment

To wnurcholis@apps.ipb.ac.id on 2025-05-15 16:26

Details Headers

Bukti APC INTAN MARTHA CAHYANI.pdf (~39 KB)

Daer Prof. Waras Nurcholis
Editor-in-Chief
Jurnal Jamu Indonesia

Attached proof of payment publication manuscript "Peel Off Gel Mask Secang Wood Extract as an Antioxidant: Formulation and Characterization"

Regards,
Intan Martha Cahyani

Browser address bar: <https://jamu-journal.ipb.ac.id/index.php/JJI/authorDashboard/submission/403>

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Jurnal Jamu Indonesia

Back to Submissions

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email to wnurcholis@apps.ipb.ac.id.

We are pleased to inform you that **Jurnal Jamu Indonesia** is currently accredited **SINTA 2** (see [SINTA profile](#)) and is under evaluation for indexing in Scopus (see [progress here](#)).

Your quick response will help us to publish your article in the upcoming issue.

Thank you for your valuable contribution.

Regards,
Waras Nurcholis
Editor-in-Chief
Jurnal Jamu Indonesia

Daer Prof. Waras Nurcholis
Editor-in-Chief
Jurnal Jamu Indonesia

intanmartha
2025-05-15 04:20
PM

Attached proof of payment publication manuscript "Peel Off Gel Mask Secang Wood Extract as an Antioxidant: Formulation and Characterization"

Regards,
Intan Martha Cahyani

Bukti APC INTAN MARTHA CAHYANI.pdf

10. Copyediting Revision Request from editor JJI

The screenshot shows an email client interface for 'intanmartha@stifar.ac.id'. The inbox on the left lists several messages, with the selected one being a 'Copyediting Revision Request - "Peel Off ..."'. The main content area displays the email from 'ojs@journalnotification.com' dated 2025-05-16 14:26. The subject is 'Copyediting Revision Request - "Peel Off Gel Mask Secang Wood Extract as an Antioxidant: Formulation and Characterization"'. The email body is addressed to 'Kepada Yth. Intan Martha Cahyani dan Rekan Penulis di Tempat' and begins with 'Dengan hormat,'. The main text states: 'Kami sampaikan bahwa naskah Bapak/Ibu berjudul: "Formulasi dan Karakterisasi Masker Gel Peel-Off Mengandung Ekstrak Kayu Secang (Caesalpinia sappan L.) dengan Aktivitas Antioksidan yang Kuat" telah melalui proses penyuntingan oleh tim editor Jurnal Jamu Indonesia dan telah dilakukan sejumlah perbaikan dari sisi bahasa, struktur ilmiah, konsistensi istilah, serta format sitasi dan daftar pustaka sesuai gaya APA Edisi ke-7. Selain itu, penyajian data pada tabel dan gambar juga telah disesuaikan dengan standar penulisan jurnal ilmiah.'

The screenshot shows a reply email from 'ojs@journalnotification.com' dated 2025-05-16 18:37. The subject is 'Confirmation of Revision - Figure 2 Adjust...'. The main content area displays the reply from 'Waras Nurcholis', Editor of 'Jurnal Jamu Indonesia', with email 'wnurcholis@apps.ipb.ac.id'. The reply text is: 'perbaikan dari sisi bahasa, struktur ilmiah, konsistensi istilah, serta format sitasi dan daftar pustaka sesuai gaya APA Edisi ke-7. Selain itu, penyajian data pada tabel dan gambar juga telah disesuaikan dengan standar penulisan jurnal ilmiah. Sehubungan dengan hal tersebut, kami mohon konfirmasi persetujuan dari penulis untuk melanjutkan naskah ini ke tahap layout dan produksi. Bila terdapat catatan atau keberatan, mohon disampaikan secara tertulis melalui email dalam waktu maksimal 1 (satu) hari kalender sejak surat ini dikirimkan. Apabila tidak ada tanggapan hingga batas waktu yang ditentukan, maka kami anggap penulis telah menyetujui hasil penyuntingan dan proses layout akan segera dilakukan. Demikian kami sampaikan. Atas perhatian dan kerja sama Bapak/Ibu, kami ucapkan terima kasih. Hormat kami, Waras Nurcholis Editor Jurnal Jamu Indonesia Email: wnurcholis@apps.ipb.ac.id'. At the bottom, there is a note: 'Reply to this comment at #403 Cahyani et al. or unsubscribe from emails sent by Jurnal Jamu Indonesia.'

← → ↻ <https://jamu-journal.ipb.ac.id/index.php/JJI/authorDashboard/submission/403> ☆

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Workflow

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Copyediting Revision Request - "Peel Off Gel Mask Secang Wood Extract as an Antioxidant: Formulation and Characterization"

Participants

Waras Nurcholis (wnurcholis)
Intan Martha Cahyani (intanmarthac)

Messages

Note	From
<p>Kepada Yth. Intan Martha Cahyani dan Rekan Penulis di Tempat</p> <p>Dengan hormat,</p> <p>Kami sampaikan bahwa naskah Bapak/Ibu berjudul:</p> <p>"Formulasi dan Karakterisasi Masker Gel Peel-Off Mengandung Ekstrak Kayu Secang (<i>Caesalpinia sappan</i> L.) dengan Aktivitas Antioksidan yang Kuat"</p>	wnurcholis 2025-05-16 02:25 PM

Submission

Closed

← → ↻ <https://jamu-journal.ipb.ac.id/index.php/JJI/authorDashboard/submission/403> ☆

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- Subject:** Re: Copyediting Revision Request – "Peel Off Gel Mask Secang Wood Extract as an Antioxidant: Formulation and Characterization"
- Date:** 2025-05-16 15:21
- Attachments:** 403_Cahyani et al. _editor improved.docx (~303 KB)
- Content:**

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The data in figure 2 does not match the data in the excel that we sent, please adjust it.

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- Journal:** Jurnal Jamu Indonesia
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 - Y-axis unit of figure 2 (ppm) please change to (mg/mL)

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1 **Peel Off Gel Mask Secang Wood Extract as an Antioxidant: Formulation and**
2 **Characterization**

3 **Masker Gel Peel Off Ekstrak Kayu Secang sebagai Antioksidan : Formulasi dan**
4 **Karakterisasi**

5
6 **Intan Martha Cahyani^{1*}, Tan Tanando Tanzaq¹, Ruth Ditya Agustina¹, Kemala Endar Setiawati¹**

7 ¹Stifar Yayasan Pharmasi, Letjend Sarwo Edie Wibowo KM 1, Semarang, 50192, Indonesia

8 *Corresponding Author: intanmartha@stifar.ac.id, +6281310901499

9 **Abstract**

10 Secang wood contains active compounds of the flavonoid group, namely brazilin, brazilin, 3'-
11 O-methylbrazilin, sappanin chalcone, and sappan calchone which can be used as primary
12 antioxidants or secondary antioxidants. Antioxidants are compounds that can inhibit
13 oxidation reactions by binding reactive free radicals. Increasing the value of the benefits of
14 secang wood as an antioxidant can be done by developing a topical preparation formulation.
15 Peel-off gel mask is the right topical preparation because in addition to maintaining skin
16 health, it can also increase effectiveness and comfort during use. The study aims to determine
17 the formula of a peel-off gel mask with secang wood extract as an antioxidant with good
18 characteristics. The formulation of the peel-off gel mask was made with a concentration of
19 secang wood extract of 2.5%; 5% and 7.5% using sodium carboxymethyl cellulose, polyvinyl
20 alcohol and propylene glycol as a base. The preparation of the peel-off gel mask with secang
21 wood extract produced was then tested with several parameters to determine the physical
22 characteristics and antioxidant activity. The results showed that the higher the concentration
23 of secang wood extract, the more significant the effect (p-value <0.05) on increasing viscosity,
24 adhesiveness and drying time and can reduce pH, spreadability and IC₅₀ value. The antioxidant
25 activity of all formulas is included in the strong category with the IC₅₀ value of the three
26 formulas respectively being 88, 71 µg/mL; 81.58 µg/mL and 79.04 µg/mL.

27
28 **Keywords:** Secang wood, Formulation, Peel off gel mask, Antioxidants, Physical characteristics

29 **Abstrak**

30 Kayu secang mengandung senyawa aktif golongan flavonoid yaitu brazilin, brazilin, 3'-O-
31 metilbrazilin, sappanin chalcone, dan sappan calchone yang dapat digunakan sebagai
32 antioksidan primer maupun antioksidan sekunder. Antioksidan merupakan senyawa yang
33 dapat menghambat reaksi oksidasi dengan mengikat radikal bebas yang reaktif. Peningkatan
34 nilai manfaat kayu secang sebagai antioksidan dapat dilakukan dengan pengembangan
35 formulasi sediaan topikal. Masker gel peel-off merupakan sediaan topikal yang tepat karena
36 selain dapat menjaga kesehatan kulit juga dapat meningkatkan efektivitas dan kenyamanan
37 saat penggunaan. Penelitian bertujuan untuk mengetahui formula masker gel peel off ekstrak
38 kayu secang sebagai antioksidan dengan karakteristik yang baik. Formulasi masker gel peel
39 off dibuat dengan konsentrasi ekstrak kayu secang 2.5%; 5% dan 7.5% menggunakan natrium
40 karboksimetil selulosa, polivinil alkohol dan propilen glikol sebagai basis. Sediaan masker gel
41 peel off ekstrak kayu secang yang dihasilkan selanjutnya dilakukan pengujian dengan
42 beberapa parameter untuk mengetahui karakteristik fisik dan aktivitas antioksidan. Hasil
43 menunjukkan semakin tinggi konsentrasi ekstrak kayu secang berpengaruh signifikan (p-value
44 < 0,05) pada peningkatan viskositas, daya lekat dan waktu mengering serta dapat

45 menurunkan pH, daya sebar dan nilai IC₅₀. Aktivitas antioksidan semua formula termasuk
46 dalam kategori kuat dengan nilai IC₅₀ ketiga formula berturut-turut adalah 88.71 µg/mL; 81.58
47 µg/mL dan 79.04 µg/mL.

48
49 **Kata Kunci:** Kayu secang, Formulasi, Masker gel peel off, antioksidan, karakteristik fisik

50 **1. Introduction**

51 Air pollution is currently experiencing a significant increase, reaching 20%. Low air
52 quality can have a negative impact because long-term exposure can cause health problems
53 (Wahdaningsih et al., 2015). One of the mechanisms is the occurrence of oxidative stress in
54 the body. The high level of air pollution today can cause the formation of free radicals so it
55 needs to be balanced with natural antioxidant intake to prevent oxidative damage which is a
56 trigger for various diseases, especially skin disorders (Widowati, 2011). Flavonoids are natural
57 compounds that have the ability as antioxidants by inhibiting the formation of free radicals
58 hydroxyl, peroxide, alkoxyl, superoxide anions, oxygen singkets and hydrogen peroxide (Utari,
59 2017).

60 Secang wood contains active compounds of the flavonoid group which can be used as
61 primary antioxidants or secondary antioxidants. The presence of brazilin components in
62 secang wood has the effect of protecting the body from poisoning due to free radicals (Rina
63 et al., 2012). Has reliable antioxidant power with a higher antioxidant index than commercial
64 antioxidants (BHT and BHA) so it has the potential as a free radical scavenging agent
65 (Sugiyanto et al., 2013). Secang wood extract has been proven effective as an antioxidant with
66 an IC₅₀ value of 74,44 µg/mL (Tanzaq et al., 2019).

67 Mask is one of the cosmetics for facial skin care. However, the use of masks is generally
68 less efficient. The demands of market needs with today's lifestyle are not only effective but
69 easy, comfortable and flexible in their use. Peel off gel mask is the result of the development
70 of facial skin care products that can answer these challenges (Ningsih et al., 2016). Peel off
71 gel mask is a type of facial mask that has the advantage of being easy to remove or lift like an
72 elastic membrane (Rahmawanty et al., 2015). Several studies have proven that peel off gel
73 mask preparations can increase the effectiveness of antioxidants, including Paedaria fotida
74 extract (Eka et al., 2022), areca seed extract (Dwi Mulyani et al., 2023), red spinach leaves
75 extract (Welly et al., 2022) and mangrove leaves extract (Hasibuan et al., 2024).

76

2. Methods**2.1 Materials and Tools**

The materials used in this study were secang wood, ethanol 96% (Merck), Sodium Carboxymethyl Cellulose (CMC Na), Polyvinil Alcohol (PVA), propilenglicol, vitamin C dan 1,1-difenil-2-pikrilhidrazil (DPPH) .

The tools used in this study were rotary evaporator (Heidolph), alat-alat gelas (Pyrex), pH meter (Hanna Instrument pH 210 Microprocessor), viskometer (Brookfield DV-I Prime), and spektrofotometer UV-Vis mini 1240 (Shimadzu).

2.2 Sengon Wood Extraction

The extraction method used is maceration by soaking secang wood powder using 96% ethanol solvent with a ratio of 1:10. Extraction is carried out for 3x24 hours. The filtrate obtained is then evaporated with a rotary evaporator until a thick extract is obtained (Tanzaq et al., 2019).

2.3 Formulation of Peel Off Gel Masker Secang Wood Extract

Peel-off gel mask of secang wood extract was made by developing PVA and CMC Na (Table 1) in hot distilled water until fully expanded. PVA mass plus expanded propylene glycol and CMC Na was stirred until homogeneous. Ethanol extract of secang wood was added little by little into the peel-off gel mask base, distilled water was added until the weight of the preparation was 100% and stirred until homogeneous (Cahyani et al., 2025).

2.4 Physical Characterization Evaluation of Peel Off Gel Mask Secang Wood Extract**Organoleptic**

Observations were made on the color, odor, and dosage form of the Peel Off Gel Mask Secang Wood Extract (Syam et al., 2021).

Homogeneity

Observations are made by preparing a number of preparations on object glass (Cahyani & Putri, 2017). All particles are evenly dispersed on the object glass indicating a homogeneous preparation (Syam et al., 2021)

pH

The pH meter electrode is dipped into the preparation until the display on the device shows a constant pH value (Andini et al., 2017). Results that match the skin pH (4.5-6.5) can increase acceptability when used (Silvia et al., 2021).

108 Viscosity

109 The viscosity of the preparation was measured using a Brookfield spindle 64 viscometer
110 at a speed of 1.0 rpm (Cahyani & Putri, 2017). At a viscosity of 2000-50000 cps indicates a
111 good peel-off gel mask (SNI 16-4399-1996: 1).

112 Spreadability

113 Observations were made on the spreading ability of 0.5 grams of the preparation placed
114 in the middle of the spreading power tester, then covered with a glass plate that had
115 previously been weighed and its weight recorded, left for one minute. The spreading ability
116 is indicated by measuring the diameter of the four sides of the spread. Do the same steps for
117 each additional 50 grams of load above it until the diameter of the spread is constant(Cahyani
118 & Putri, 2017). The ideal spread of the peel off gel mask is 5-7 cm (Silvia et al., 2021).

119 Adhesion

120 0.25 g preparation on a glass object is given a load pressure of 100 grams for 5 minutes
121 and then placed on the adhesive strength tester. The adhesive strength is measured by
122 recording the time when the two glass objects are released. A time of more than 1 second
123 indicates good adhesive strength of the peel off gel mask (Syam et al., 2021).

124 Drying Time

125 0.1 g of the preparation is applied to the arm with an area of 2.5 x 2.5 cm, then the time
126 is observed until the preparation dries (Andini et al., 2017). standard drying time for a peel-
127 off gel mask is 15-30 minutes (Silvia et al., 2021).

128 2.5 Antioxidant Activity with DPPH (2,2-difenyl-1-picrylhydrazyl) Method

129 The test was carried out in several stages. First, determine the maximum wavelength of
130 the DPPH 30 solution $\mu\text{g/mL}$ with a UV-Vis spectrophotometer in the 400-800 nm region.
131 Determination of operating time is done by measuring the absorption at the maximum
132 wavelength obtained using a standard solution (vitamin C) and DPPH 30 solution $\mu\text{g/mL}$ at a
133 1:1 ratio for 60 minutes.

134 An amount of 0.05 grams of the preparation was dissolved in methanol up to 50 mL and
135 diluted to obtain sample solution concentrations of 60,70,80,100 and 120 $\mu\text{g/mL}$. For each
136 concentration, DPPH 30 solution was added $\mu\text{g/mL}$ at a ratio of 1:1 and absorbance
137 measurements were carried out using a UV-Vis spectrophotometer at a maximum
138 wavelength after being incubated at room temperature for the time obtained from the results

139 of determining the operating time. The same stage was also carried out on vitamin C solutions
140 with concentrations of 2.4,6,8,10 $\mu\text{g}/\text{mL}$ as a reference standard. Determine the IC_{50} value
141 from the results of measuring the absorbance of the sample solution and the reference
142 standard obtained (Maharani et al., 2022).

143

144

3. Results and Discussion

3.1 Physical Characterization Evaluation of Peel Off Gel Mask Secang Wood Extract

146 Traditionally, secang wood has many health benefits, including antibacterial, anti-
147 inflammatory, anti-diabetic, tuberculosis, malaria and tetanus (Setyowati et al., 2023). In
148 addition, it is also widely used in food and cosmetics as an antioxidant (Rajput et al., 2022).
149 Secang wood contains active compounds that are included in the flavonoid group, namely
150 brazilin, brazilin, 3'-o-methylbrazilin, sappanin, chalcone, and sappan chalcone. Brazilin in
151 secang wood has an antioxidant effect (Ngamwonglumert & Devahastin, 2023). For the
152 manufacture of secang wood extract, the maceration method using 96% ethanol (1:1) was
153 used. The peel-off gel mask has unique characteristics with the formation of a transparent,
154 elastic and easily removable film layer without rinsing which can increase the comfort of use
155 and the effectiveness of active compounds. Therefore, this study was designed to make a
156 peel-off gel mask of secang wood extract as an antioxidant F1 (2.5%) F2 (5%) and F3 (7.5%)
157 with the results of the physical characteristics test presented in Table 2.

158 Organoleptic and homogeneity testing aims to see the physical appearance and
159 distribution of each component of a preparation. Based on table 2, the results show that the
160 three formulas give the same results. The level of comfort of using a preparation is also
161 influenced by the pH of the preparation. The higher the concentration of secang wood extract,
162 the lower the pH of the preparation as seen in Figure 1a. This occurs because the ethanol
163 extract of secang wood has a pH that tends to be acidic (2-6) (Muslimin et al., 2024), so that
164 by adding the amount of secang wood extract, the pH of the preparation will decrease. The
165 pH value of secang wood extract can affect the color of the peel-off gel mask preparation
166 produced. This effect is caused because the stability of brazilin is greatly influenced by its
167 acidity level where at pH 2-5 (yellow-orange), pH 6-7 (pink) and pH > 7 (red-violet) where the
168 degradation results of brazilin into brazilein which is red in color (Rina et al., 2017).

169 The results of the viscosity test showed an increase that was proportional to the
170 increase in the concentration of secang wood extract in the peel-off gel mask formula (Figure
171 1b). The thick concentration of secang wood extract showed high resistance so that it would
172 affect the resistance of the preparation to flow. The viscosity of the preparation is closely
173 related to the spreadability, adhesion and drying time. The higher the viscosity, the lower the
174 spreadability (Figure 1c) and the higher the adhesion (Figure 1d) of the preparation because
175 high resistance indicates a stronger bond between particles which causes water to be trapped
176 and dry longer (Figure 1e) (Cahyani et al., 2025).

177 **3.2 Antioxidant Activity of Peel Off Gel Mask Secang Wood Extract**

178 Test results all formulas showed antioxidant activity included in the strong category
179 as indicated by the IC₅₀ value (Table 2) so it can be said that the selection of the peel off gel
180 mask preparation is right and the resulting formula can maintain the stability of the active
181 compound. The increase in antioxidant activity is indicated by a decrease in the IC₅₀ value
182 along with the increase in extract concentration (Figure 2). This is because the higher the
183 concentration of sengon wood extract, the higher the brazilin content in the peel off gel mask
184 preparation. Brazilin, in addition to playing a role in the color produced, is also a flavonoid
185 with high antioxidant activity and is widely used in natural skin care (Faizah et al., 2023).
186 Brazilin is a flavonoid with the ability to ward off free radicals and can inhibit enzymes
187 responsible for the production of free radicals (Hu et al., 2008)

188

189 **4. Conclusion**

190 Increasing the concentration of secang wood extract has a significant effect (p-value
191 <0.05) on increasing the viscosity, adhesiveness and drying time and can reduce pH,
192 spreadability and IC₅₀ value. The antioxidant activity of all formulas is included in the strong
193 category with the IC₅₀ values of the three formulas respectively being 88, 71 µg/mL; 81.58
194 µg/mL and 79.04 µg/mL. Peel off gel mask preparation formula with good characteristics and
195 strong antioxidant activity at a concentration of 7.5% secang wood extract.

196

197 **5. References**

198 Andini, T., Yusriadi, Y., & Yuliet, Y. (2017). Optimasi Pembentuk Film Polivinil Alkohol dan
199 Humektan Propilen Glikol pada Formulasi Masker Gel Peel Off Sari Buah Labu Kuning
200 (Cucurbita moschata Duchesne) sebagai Antioksidan. *Jurnal Farmasi Galenika (Galenika*
201 *Journal of Pharmacy)*, 3(2), 101–108.

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- 202 Cahyani, I. M., Hanhadyanaputri, E. S., Wulan, A. H., & Sulistyarini, I. (2025). Optimization
203 Formula of Kolang-Kaling (Arenga Pinnata.) Peel Off Gel Mask with Combination PVA-
204 CMC Na As Gelling Agent on Simplex Lattice Design. *Media Farmasi Indonesia*, 20(1), 67–
205 75. <https://doi.org/10.53359/mfi.v20i1.316>
- 206 Cahyani, I. M., & Putri, I. D. C. (2017). Efektivitas Karbopol 940 Dalam Formula Masker Gel
207 Peel-Off Ekstrak Temu Giring (Curcuma heyneana Val & Zipp). *Journal of Pharmaceutical
208 and Medicinal Sciences*, 2(2), 48–51.
- 209 Dwi Mulyani, A., Rahayu, P., Aini, N., Purnamasari, D., Mulyani, A. D., Farmasi, J., & Mulyani,
210 A. D. (2023). Formulasi dan Evaluasi Mutu Fisik Sediaan Masker Gel Peel-Off Ekstrak Biji
211 Pinang (Areca Catechu L.) Sebagai Antioksidan. *Indonesian Journal of Pharmaceutical
212 Education*, 3(3), 2775–3670. <https://doi.org/10.37311/IJPE.V3I3.22033>
- 213 Eka, R., Susanti, E., & A'yun, Q. (2022). Formulation and Antioxidant Activity of Peel Off Gel
214 Mask from Paederia Foetida Extract. *JKPK (Jurnal Kimia Dan Pendidikan Kimia)*, 7(1), 12–
215 19. <https://doi.org/10.20961/JKPK.V7I1.45798>
- 216 Faizah, U. N., Maula, N. N., Mustika, R. A., & Wahyuni, S. (2023). Potensi Senyawa Antioksidan
217 Yang Terkandung Dalam Kayu Secang (Caesalpinia sappan) Untuk Perawatan Kulit Alami.
218 *Symbiotic: Journal of Biological Education and Science*, 4(1), 41–49.
219 <https://doi.org/10.32939/SYMBIOTIC.V4I1.90>
- 220 Hasibuan, N. E., Azka, A., Basri, & Mujiyanti, A. (2024). Aktivitas Antioksidam dan Karakteristik
221 Masker Gel Peel Off dari Ekstrak Daun Mangrove (Avicennia marina). *Jurnal Pengolahan
222 Hasil Perikanan Indonesia (JPHPI)*, 2(9), 42–55.
223 <https://doi.org/http://dx.doi.org/10.17844/jphpi.v27i9.52083>
- 224 Hu, J., Yan, X., Wang, W., Wu, H., Hua, L., & Du, L. (2008). Antioxidant Activity In Vitro of Three
225 Constituents from Caesalpinia sappan L. *Tsinghua Science & Technology*, 13(4), 474–479.
226 [https://doi.org/10.1016/S1007-0214\(08\)70076-2](https://doi.org/10.1016/S1007-0214(08)70076-2)
- 227 Maharani, N. P. D. S., Cahyani, I. M., & Hanhadyanaputri, E. S. (2022). Optimization of Polyvinyl
228 Alcohol (PVA) and Glycerin in Kolang Kaling Peel-Off Gel Mask Formula (Arenga pinnata.).
229 *Journal of Food and Pharmaceutical Sciences*, 2022(3), 746–753.
230 <https://doi.org/10.22146/JFPS.5718>
- 231 Muslimin, M. K., Rahayuningsih, E., & Mindaryani, A. (2024). Optimasi proses metilasi
232 brazilein hasil ekstrak kayu secang (Caesalpinia sappan linn) sebagai bahan pewarna
233 merah alami untuk tekstil. *Jurnal Rekayasa Proses*, 18(2), 89–99.
234 <https://doi.org/10.22146/JREKPROS.82068>
- 235 Ngamwonglumlert, L., & Devahastin, S. (2023). Brazilein as an alternative pigment: Isolation,
236 characterization, stability enhancement and food applications. *Food Chemistry*, 398,
237 133898. <https://doi.org/10.1016/J.FOODCHEM.2022.133898>
- 238 Ningsih, W., Firmansyah, F., & Fitri, H. (2016). Formulasi Masker Peel Off dengan Beberapa
239 Konsentrasi Ekstrak Etanol Buah Naga Super Merah (Hylocereus costaricensis (F.A.C
240 Weber) Britton & Rose). *Scientia: Jurnal Farmasi Dan Kesehatan*, 6(1), 18.
241 <https://doi.org/10.36434/SCIENTIA.V6I1.37>
- 242 Rahmawanty, D., Yulianti, N., & Fitriana, M. (2015). Formulasi dan Evaluasi Masker Wajah
243 Peel-Off Mengandung Kuersetin dengan Variasi Konsentrasi Gelatin dan Gliserin. *Media
244 Farmasi: Jurnal Ilmu Farmasi*, 12(1), 17–32. <https://doi.org/10.12928/MF.V12I1.3019>
- 245 Rajput, M. S., Nirmal, N. P., Nirmal, S. J., & Santivarangkna, C. (2022). Bio-actives from
246 Caesalpinia sappan L.: Recent advancements in phytochemistry and pharmacology.
247 *South African Journal of Botany*, 151, 60–74.
248 <https://doi.org/10.1016/J.SAJB.2021.11.021>

BUKTI KORESPONDENSI MANUSCRIPT SUBMISSION

- 249 Rina, O., Sanusi, I., Abdidharma, Afrizal, Utami, C., & Widodo, Y. (2017). Stabilities Natural
250 Colorant of Sappan Wood (*Caesalpinia sappan* L.) for Food and Beverages in Various pH,
251 Temperature and Matrices of Food. *International Journal of Chemtech Research*, 10(1),
252 98–103.
- 253 Rina, O., W., C. U., & Ansori, A. (2012). Efektifitas Ekstrak Kayu Secang (*Caesalpinia Sappan* L.)
254 Sebagai Bahan Pengawet Daging. *Jurnal Penelitian Pertanian Terapan*, 12(3).
255 <https://doi.org/10.25181/JPPT.V12I3.215>
- 256 Setyowati, N., Masyhuri, Mulyo, J. H., Irham, & Yudhistira, B. (2023). The hidden treasure of
257 wedang uwuh, an ethnic traditional drink from Java, Indonesia: Its benefits and
258 innovations. *International Journal of Gastronomy and Food Science*, 31, 100688.
259 <https://doi.org/10.1016/J.IJGFS.2023.100688>
- 260 Silvia, B. ., Dewi, M. ., & Darusman, F. (2021). Studi Literatur Pengaruh Jenis dan Konsentrasi
261 Basis terhadap Karakteristik Masker Gel Peel Off. *Prosiding Farmasi*, 148–156.
- 262 Sugiyanto, R. N., Putri, S. R., Damanik, F. S., & Sasmita, G. M. A. (2013). Aplikasi Kayu Secang
263 (*Caesalpinia Sappan* L.) dalam Upaya Prevensi Kerusakan Dna Akibat Paparan Zat
264 Potensial Karsinogenik melalui Mnpce Assay. *Pekan Ilmiah Mahasiswa Nasional Program
265 Kreativitas Mahasiswa - Penelitian 2013*.
266 <https://www.neliti.com/id/publications/171018/>
- 267 Syam, N. ., Lestari, U., & Muhaimin. (2021). Formulasi Dan Uji Sifat Masker Gel Peel-Off dari
268 Minyak Sawit Murni dengan Basis Carbomer 940. *Indonesian Journal of Pharma Science*,
269 3(1), 42–55.
- 270 Tanzaq, T. tanando, Agustina, R. D., Setiawati, K. E., & Cahyani, I. M. (2019). Uji Aktivitas
271 Penangkapan Radikal DPPH (1,1-Diphenyl-2-Picrylhdrazyl) Ekstrak Etanol Kayu Secang
272 (*Caesalpinia sappan* L.). *Media Farmasi Indonesia*, 14(1), 1461–1465.
273 <https://mfi.stifar.ac.id/MFI/article/view/105/86>
- 274 Utari, F. D. (2017). Produksi Antioksidan dari Ekstrak Kayu Secang (*Caesalpinia sappan* L.)
275 Menggunakan Pengering Berkelembaban Rendah. *Jurnal Aplikasi Teknologi Pangan*,
276 6(3). <https://doi.org/10.17728/JATP.241>
- 277 Wahdaningsih, S., Budilaksono, W., & Fahrurroji, A. (2015). Uji aktivitas antioksidan fraksi n-
278 heksana kulit buah naga merah menggunakan metode 1,1-Difenil-2-Pikrilhidrazil. *Jurnal
279 Kesehatan Khatulistiwa*, 1(2), 115–136.
280 <https://doi.org/10.26418/JURKESWA.V1I2.42997>
- 281 Welly, S., Supriyanto, & Saraswati, M. (2022). Antioxidant Test and Peel-Off Mask Formulation
282 Extract of Red Spinning (*Amaranthus tricolor* L.) Leaves with Variations of Gelling Agent
283 Types. *Joseph (Journal of Pharmacy)*, 2(1), 42–55.
- 284 Widowati, W. (Wahyu). (2011). Uji Fitokimia Dan Potensi Antioksidan Ekstrak Etanol Kayu
285 Secang (*Caesalpinia Sappan* L.). *Maranatha Journal of Medicine and Health*, 11(1),
286 151615. <https://www.neliti.com/id/publications/151615/>
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Table 1. Formulation of Peel Off Gel Masker Secang Wood Extract

Material	Formula (%)		
	I	II	III
Secang Wood Extract	2,5	5	7,5
CMC Na	1,26	1,26	1,26
PVA	6,74	6,74	6,74
Propilenglikol	4	4	4
Aqua destilata ad	100	100	100

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Table 2. Characterization and Antioxidant Activity of Peel Off Gel Mask Secang Wood Extract

Evaluation	Formula		
	I	II	III
Organoleptic	Consistency thick and soft, colour orange, odor secang smell	Consistency thick and soft, colour orange, odor secang smell	Consistency thick and soft, colour orange, odor secang smell
Homogeneity	Homogeneous	Homogeneous	Homogeneous
pH	6.4 ± 0.16	5.85 ± 0.43	5.09 ± 0.35
Viscosity (cPs)	11986.4 ± 6.02	13992.6 ± 5.13	15993.2 ± 5.36
Spreadability (cm)	5.6 ± 0.19	5.18 ± 0.33	4.52 ± 0.33
Adhesion (secon)	3.5 ± 0.13	4.2 ± 0.16	4.85 ± 0.04
Drying Time (minute)	16.06 ± 0.39	17.88 ± 0.38	19.45 ± 0.40
IC ₅₀ (µg/mL)	88.71 ± 2.06	81.58 ± 3.60	79.04 ± 1.84

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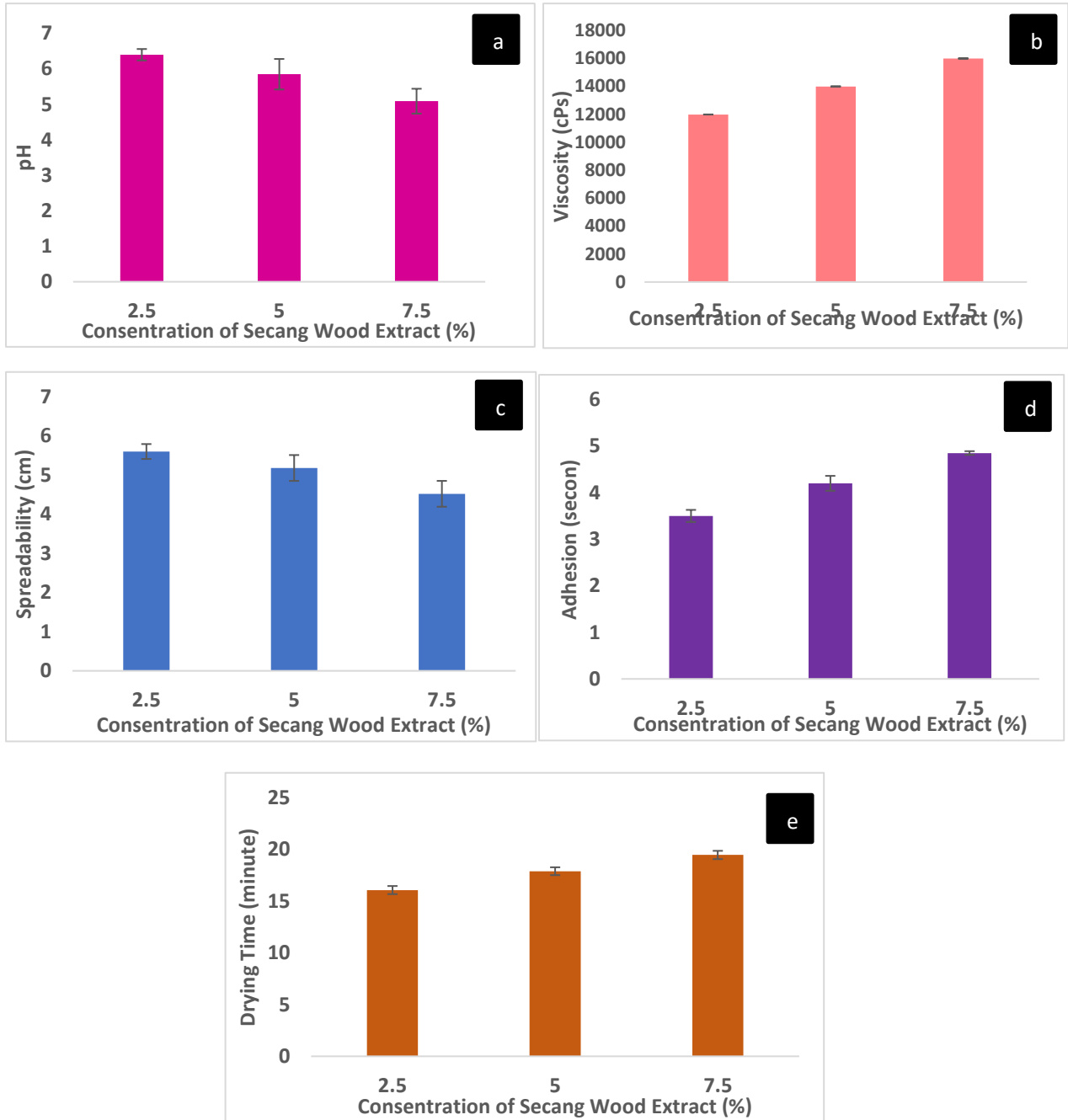


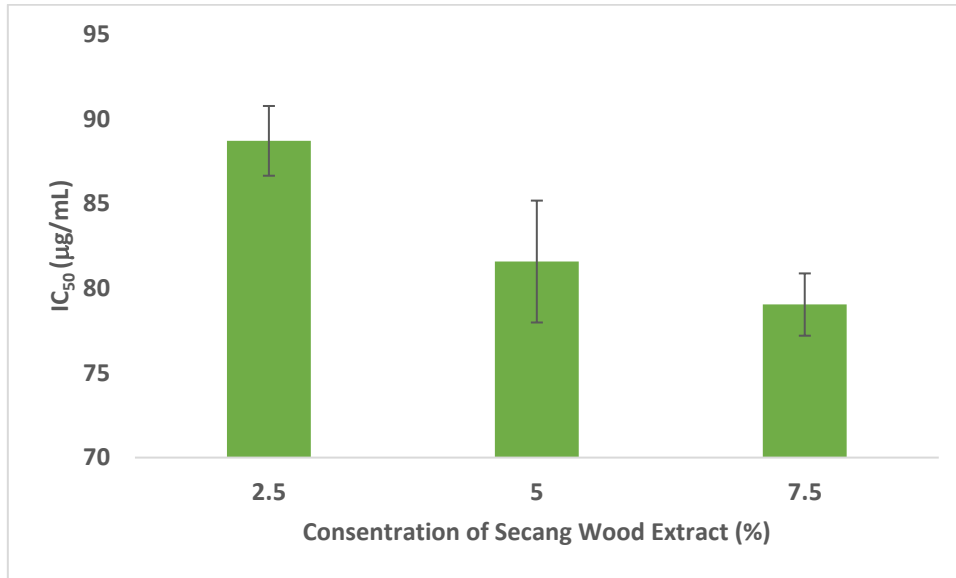
Figure 1. Characterization of Peel Off Gel Mask Secang Wood Extract: (a) pH, (b) Viscosity, (c) Spreadability, (d) Adhesion and (e) Drying Time

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Figure 2. Antioxidant activity (IC₅₀) of Peel Off Gel Mask Secang Wood Extract

BUKTI KORESPONDENSI CATATAN REVIEWER 1

1 Peel Off Gel Mask Secang Wood Extract as an Antioxidant: Formulation and 2 Characterization

3 Masker Gel Peel Off Ekstrak Kayu Secang sebagai Antioksidan : Formulasi dan 4 Karakterisasi 5

6 Abstract

7 Secang wood contains active compounds of the flavonoid group, namely brazilin, brazilin, 3'-
8 O-methylbrazilin, sappanin chalcone, and sappan chalcone which can be used as primary
9 antioxidants or secondary antioxidants. Antioxidants are compounds that can inhibit
10 oxidation reactions by binding reactive free radicals. Increasing the value of the benefits of
11 secang wood as an antioxidant can be done by developing a topical preparation formulation.
12 Peel-off gel mask is the right topical preparation because in addition to maintaining skin
13 health, it can also increase effectiveness and comfort during use. The study aims to determine
14 the formula of a peel-off gel mask with secang wood extract as an antioxidant with good
15 characteristics. The formulation of the peel-off gel mask was made with a concentration of
16 secang wood extract of 2.5%; 5% and 7.5% using sodium carboxymethyl cellulose, polyvinyl
17 alcohol and propylene glycol as a base. The preparation of the peel-off gel mask with secang
18 wood extract produced was then tested with several parameters to determine the physical
19 characteristics and antioxidant activity. The results showed that the higher the concentration
20 of secang wood extract, the more significant the effect (p-value <0.05) on increasing viscosity,
21 adhesiveness and drying time and can reduce pH, spreadability and IC₅₀ value. The antioxidant
22 activity of all formulas is included in the strong category with the IC₅₀ value of the three
23 formulas respectively being 88, 71 µg/mL; 81.58 µg/mL and 79.04 µg/mL.
24

25 Keywords: Secang wood, Formulation, Peel off gel mask, Antioxidants, Physical characteristics

26 Abstrak

27 Kayu secang mengandung senyawa aktif golongan flavonoid yaitu brazilin, brazilin, 3'-O-
28 metilbrazilin, sappanin chalcone, dan sappan chalcone yang dapat digunakan sebagai
29 antioksidan primer maupun antioksidan sekunder. Antioksidan merupakan senyawa yang
30 dapat menghambat reaksi oksidasi dengan mengikat radikal bebas yang reaktif. Peningkatan
31 nilai manfaat kayu secang sebagai antioksidan dapat dilakukan dengan pengembangan
32 formulasi sediaan topikal. Masker gel peel-off merupakan sediaan topikal yang tepat karena
33 selain dapat menjaga kesehatan kulit juga dapat meningkatkan efektivitas dan kenyamanan
34 saat penggunaan. Penelitian bertujuan untuk mengetahui formula masker gel peel off ekstrak
35 kayu secang sebagai antioksidan dengan karakteristik yang baik. Formulasi masker gel peel
36 off dibuat dengan konsentrasi ekstrak kayu secang 2.5%; 5% dan 7.5% menggunakan natrium
37 karboksimetil selulosa, polivinil alkohol dan propilen glikol sebagai basis. Sediaan masker gel
38 peel off ekstrak kayu secang yang dihasilkan selanjutnya dilakukan pengujian dengan
39 beberapa parameter untuk mengetahui karakteristik fisik dan aktivitas antioksidan. Hasil
40 menunjukkan semakin tinggi konsentrasi ekstrak kayu secang berpengaruh signifikan (p-value
41 < 0,05) pada peningkatan viskositas, daya lekat dan waktu mengering serta dapat
42 menurunkan pH, daya sebar dan nilai IC₅₀. Aktivitas antioksidan semua formula termasuk
43 dalam kategori kuat dengan nilai IC₅₀ ketiga formula berturut-turut adalah 88.71 µg/mL; 81.58
44 µg/mL dan 79.04 µg/mL.

Commented [AS1]: It has not been stated what the vulnerable value is if it is classified as a strong category.

BUKTI KORESPONDENSI CATATAN REVIEWER 1

45
46 **Kata Kunci:** Kayu secang, Formulasi, Masker gel peel off, antioksidan, karakteristik fisik

47 **1. Introduction**

48 Air pollution is currently experiencing a significant increase, reaching 20%. Low air
49 quality can have a negative impact because long-term exposure can cause health problems
50 (Wahdaningsih et al., 2015). One of the mechanisms is the occurrence of oxidative stress in
51 the body. The high level of air pollution today can cause the formation of free radicals so it
52 needs to be balanced with natural antioxidant intake to prevent oxidative damage which is a
53 trigger for various diseases, especially skin disorders (Widowati, 2011). Flavonoids are natural
54 compounds that have the ability as antioxidants by inhibiting the formation of free radicals
55 hydroxyl, peroxide, alkoxyl, superoxide anions, oxygen singkets and hydrogen peroxide (Utari,
56 2017).

57 Secang wood contains active compounds of the flavonoid group which can be used as
58 primary antioxidants or secondary antioxidants. The presence of brazilin components in
59 secang wood has the effect of protecting the body from poisoning due to free radicals (Rina
60 et al., 2012). Has reliable antioxidant power with a higher antioxidant index than commercial
61 antioxidants (BHT and BHA) so it has the potential as a free radical scavenging agent
62 (Sugiyanto et al., 2013). Secang wood extract has been proven effective as an antioxidant with
63 an IC₅₀ value of 74,44 µg/mL (Tanzaq et al., 2019).

64 Mask is one of the cosmetics for facial skin care. However, the use of masks is generally
65 less efficient. The demands of market needs with today's lifestyle are not only effective but
66 easy, comfortable and flexible in their use. Peel off gel mask is the result of the development
67 of facial skin care products that can answer these challenges (Ningsih et al., 2016). Peel off
68 gel mask is a type of facial mask that has the advantage of being easy to remove or lift like an
69 elastic membrane (Rahmawanty et al., 2015). Several studies have proven that peel off gel
70 mask preparations can increase the effectiveness of antioxidants, including Paedaria fotida
71 extract (Eka et al., 2022), areca seed extract (Dwi Mulyani et al., 2023), red spinach leaves
72 extract (Welly et al., 2022) and mangrove leaves extract (Hasibuan et al., 2024).

74 **2. Methods**

75 **2.1 Materials and Tools**

Commented [AS2]: Write down the novelty of this research that distinguishes it from previous studies that used secang wood as a peel off gel marker.

BUKTI KORESPONDENSI CATATAN REVIEWER 1

76 The materials used in this study were secang wood, ethanol 96% (Merck), Sodium
77 Carboxymethyl Cellulose (CMC Na), Polyvinil Alcohol (PVA), propilenglicol, vitamin C dan 1,1-
78 difenil-2-pikrilhidrazil (DPPH) .

79 The tools used in this study were rotary evaporator (Heidolph), alat-alat gelas (Pyrex),
80 pH meter (Hanna Instrument pH 210 Microprocessor), viskometer (Brookfield DV-I Prime),
81 and spektrofotometer UV-Vis mini 1240 (Shimadzu).

82 **2.2 Sengon Wood Extraction**

83 The extraction method used is maceration by soaking secang wood powder using 96%
84 ethanol solvent with a ratio of 1:10. Extraction is carried out for 3x24 hours. The filtrate
85 obtained is then evaporated with a rotary evaporator until a thick extract is obtained (Tanzaq
86 et al., 2019).

87 **2.3 Formulation of Peel Off Gel Masker Secang Wood Extract**

88 Peel-off gel mask of secang wood extract was made by developing PVA and CMC Na (Table
89 1) in hot distilled water until fully expanded. PVA mass plus expanded propylene glycol and
90 CMC Na was stirred until homogeneous. Ethanol extract of secang wood was added little by
91 little into the peel-off gel mask base, distilled water was added until the weight of the
92 preparation was 100% and stirred until homogeneous (Cahyani et al., 2025).

93 **2.4 Physical Characterization Evaluation of Peel Off Gel Mask Secang Wood Extract**

94 **Organoleptic**

95 Observations were made on the color, odor, and dosage form of the Peel Off Gel Mask
96 Secang Wood Extract (Syam et al., 2021).

97 **Homogeneity**

98 Observations are made by preparing a number of preparations on object glass (Cahyani
99 & Putri, 2017). All particles are evenly dispersed on the object glass indicating a homogeneous
100 preparation (Syam et al., 2021)

101 **pH**

102 The pH meter electrode is dipped into the preparation until the display on the device
103 shows a constant pH value (Andini et al., 2017). Results that match the skin pH (4.5-6.5) can
104 increase acceptability when used (Silvia et al., 2021).

105 **Viscosity**

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106 The viscosity of the preparation was measured using a Brookfield spindle 64 viscometer
107 at a speed of 1.0 rpm (Cahyani & Putri, 2017). At a viscosity of 2000-50000 cps indicates a
108 good peel-off gel mask (SNI 16-4399-1996: 1).

109 **Spreadability**

110 Observations were made on the spreading ability of 0.5 grams of the preparation placed
111 in the middle of the spreading power tester, then covered with a glass plate that had
112 previously been weighed and its weight recorded, left for one minute. The spreading ability
113 is indicated by measuring the diameter of the four sides of the spread. Do the same steps for
114 each additional 50 grams of load above it until the diameter of the spread is constant (Cahyani
115 & Putri, 2017). The ideal spread of the peel off gel mask is 5-7 cm (Silvia et al., 2021).

116 **Adhesion**

117 0.25 g preparation on a glass object is given a load pressure of 100 grams for 5 minutes
118 and then placed on the adhesive strength tester. The adhesive strength is measured by
119 recording the time when the two glass objects are released. A time of more than 1 second
120 indicates good adhesive strength of the peel off gel mask (Syam et al., 2021).

121 **Drying Time**

122 0.1 g of the preparation is applied to the arm with an area of 2.5 x 2.5 cm, then the time
123 is observed until the preparation dries (Andini et al., 2017). standard drying time for a peel-
124 off gel mask is 15-30 minutes (Silvia et al., 2021).

125 **2.5 Antioxidant Activity with DPPH (2,2-difenyl-1-picrylhydrazyl) Method**

126 The test was carried out in several stages. First, determine the maximum wavelength of
127 the DPPH 30 solution $\mu\text{g/mL}$ with a UV-Vis spectrophotometer in the 400-800 nm region.
128 Determination of operating time is done by measuring the absorption at the maximum
129 wavelength obtained using a standard solution (vitamin C) and DPPH 30 solution $\mu\text{g/mL}$ at a
130 1:1 ratio for 60 minutes.

131 An amount of 0.05 grams of the preparation was dissolved in methanol up to 50 mL and
132 diluted to obtain sample solution concentrations of 60,70,80,100 and 120 $\mu\text{g/mL}$. For each
133 concentration, DPPH 30 solution was added $\mu\text{g/mL}$ at a ratio of 1:1 and absorbance
134 measurements were carried out using a UV-Vis spectrophotometer at a maximum
135 wavelength after being incubated at room temperature for the time obtained from the results
136 of determining the operating time. The same stage was also carried out on vitamin C solutions

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137 with concentrations of 2.4,6,8,10 µg/mL as a reference standard. Determine the IC₅₀ value
138 from the results of measuring the absorbance of the sample solution and the reference
139 standard obtained (Maharani et al., 2022).

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3. Results and Discussion

3.1 Physical Characterization Evaluation of Peel Off Gel Mask Secang Wood Extract

143 Traditionally, secang wood has many health benefits, including antibacterial, anti-
144 inflammatory, anti-diabetic, tuberculosis, malaria and tetanus (Setyowati et al., 2023). In
145 addition, it is also widely used in food and cosmetics as an antioxidant (Rajput et al., 2022).
146 Secang wood contains active compounds that are included in the flavonoid group, namely
147 brazilin, brazilin, 3'-o-methylbrazilin, sappanin, chalcone, and sappan chalcone. Brazilin in
148 secang wood has an antioxidant effect (Ngamwonglumlert & Devahastin, 2023). For the
149 manufacture of secang wood extract, the maceration method using 96% ethanol (1:1) was
150 used. The peel-off gel mask has unique characteristics with the formation of a transparent,
151 elastic and easily removable film layer without rinsing which can increase the comfort of use
152 and the effectiveness of active compounds. Therefore, this study was designed to make a
153 peel-off gel mask of secang wood extract as an antioxidant F1 (2.5%) F2 (5%0 and F3 (7.5%)
154 with the results of the physical characteristics test presented in Table 2.

155 Organoleptic and homogeneity testing aims to see the physical appearance and
156 distribution of each component of a preparation. Based on table 2, the results show that the
157 three formulas give the same results. The level of comfort of using a preparation is also
158 influenced by the pH of the preparation. The higher the concentration of secang wood extract,
159 the lower the pH of the preparation as seen in Figure 1a. This occurs because the ethanol
160 extract of secang wood has a pH that tends to be acidic (2-6) (Muslimin et al., 2024), so that
161 by adding the amount of secang wood extract, the pH of the preparation will decrease. The
162 pH value of secang wood extract can affect the color of the peel-off gel mask preparation
163 produced. This effect is caused because the stability of brazilin is greatly influenced by its
164 acidity level where at pH 2-5 (yellow-orange), pH 6-7 (pink) and pH > 7 (red-violet) where the
165 degradation results of brazilin into brazilein which is red in color (Rina et al., 2017).

166 The results of the viscosity test showed an increase that was proportional to the
167 increase in the concentration of secang wood extract in the peel-off gel mask formula (Figure

Commented [AS3]: explanation for table 1 has not been included in the research results

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168 1b). The thick concentration of secang wood extract showed high resistance so that it would
169 affect the resistance of the preparation to flow. The viscosity of the preparation is closely
170 related to the spreadability, adhesion and drying time. The higher the viscosity, the lower the
171 spreadability (Figure 1c) and the higher the adhesion (Figure 1d) of the preparation because
172 high resistance indicates a stronger bond between particles which causes water to be trapped
173 and dry longer (Figure 1e) (Cahyani et al., 2025).

174 3.2 Antioxidant Activity of Peel Off Gel Mask Secang Wood Extract

175 Test results all formulas showed antioxidant activity included in the strong category
176 as indicated by the IC₅₀ value (Table 2) so it can be said that the selection of the peel off gel
177 mask preparation is right and the resulting formula can maintain the stability of the active
178 compound. The increase in antioxidant activity is indicated by a decrease in the IC₅₀ value
179 along with the increase in extract concentration (Figure 2). This is because the higher the
180 concentration of sengon wood extract, the higher the brazilin content in the peel off gel mask
181 preparation. Brazilin, in addition to playing a role in the color produced, is also a flavonoid
182 with high antioxidant activity and is widely used in natural skin care (Faizah et al., 2023).
183 Brazilin is a flavonoid with the ability to ward off free radicals and can inhibit enzymes
184 responsible for the production of free radicals (Hu et al., 2008)

Commented [AS4]: It has not been explained on what basis the antioxidants obtained are categorized as strong, medium, or weak.

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4. Conclusion

187 Increasing the concentration of secang wood extract has a significant effect (p-value
188 <0.05) on increasing the viscosity, adhesiveness and drying time and can reduce pH,
189 spreadability and IC₅₀ value. The antioxidant activity of all formulas is included in the strong
190 category with the IC₅₀ values of the three formulas respectively being 88, 71 µg/mL; 81.58
191 µg/mL and 79.04 µg/mL. Peel off gel mask preparation formula with good characteristics and
192 strong antioxidant activity at a concentration of 7.5% secang wood extract.

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5. References

- 195 Andini, T., Yusriadi, Y., & Yuliet, Y. (2017). Optimasi Pembentuk Film Polivinil Alkohol dan
196 Humektan Propilen Glikol pada Formula Masker Gel Peel Off Sari Buah Labu Kuning
197 (Cucurbita moschata Duchesne) sebagai Antioksidan. *Jurnal Farmasi Galenika (Galenika*
198 *Journal of Pharmacy)*, 3(2), 101–108.
- 199 Cahyani, I. M., Hanhadyanaputri, E. S., Wulan, A. H., & Sulistyarini, I. (2025). Optimization
200 Formula of Kolang-Kaling (Arenga Pinnata.) Peel Off Gel Mask with Combination PVA-
201 CMC Na As Gelling Agent on Simplex Lattice Design. *Media Farmasi Indonesia*, 20(1), 67–

BUKTI KORESPONDENSI CATATAN REVIEWER 1

- 202 75. <https://doi.org/10.53359/mfi.v20i1.316>
- 203 Cahyani, I. M., & Putri, I. D. C. (2017). Efektivitas Karbopol 940 Dalam Formula Masker Gel
204 Peel-Off Ekstrak Temu Giring (*Curcuma heyneana* Val & Zijp). *Journal of Pharmaceutical*
205 *and Medicinal Sciences*, 2(2), 48–51.
- 206 Dwi Mulyani, A., Rahayu, P., Aini, N., Purnamasari, D., Mulyani, A. D., Farmasi, J., & Mulyani,
207 A. D. (2023). Formulasi dan Evaluasi Mutu Fisik Sediaan Masker Gel Peel-Off Ekstrak Biji
208 Pinang (*Areca Catechu* L.) Sebagai Antioksidan. *Indonesian Journal of Pharmaceutical*
209 *Education*, 3(3), 2775–3670. <https://doi.org/10.37311/IJPE.V3I3.22033>
- 210 Eka, R., Susanti, E., & A'yun, Q. (2022). Formulation and Antioxidant Activity of Peel Off Gel
211 Mask from *Paederia Foetida* Extract. *JKPK (Jurnal Kimia Dan Pendidikan Kimia)*, 7(1), 12–
212 19. <https://doi.org/10.20961/JKPK.V7I1.45798>
- 213 Faizah, U. N., Maula, N. N., Mustika, R. A., & Wahyuni, S. (2023). Potensi Senyawa Antioksidan
214 Yang Terkandung Dalam Kayu Secang (*Caesalpinia sappan*) Untuk Perawatan Kulit Alami.
215 *Symbiotic: Journal of Biological Education and Science*, 4(1), 41–49.
216 <https://doi.org/10.32939/SYMBIOTIC.V4I1.90>
- 217 Hasibuan, N. E., Azka, A., Basri, & Mujiyanti, A. (2024). Aktivitas Antioksidam dan Karakteristik
218 Masker Gel Peel Off dari Ekstrak Daun Mangrove (*Avicennia marina*). *Jurnal Pengolahan*
219 *Hasil Perikanan Indonesia (JPHPI)*, 2(9), 42–55.
220 <https://doi.org/http://dx.doi.org/10.17844/jphpi.v27i9.52083>
- 221 Hu, J., Yan, X., Wang, W., Wu, H., Hua, L., & Du, L. (2008). Antioxidant Activity In Vitro of Three
222 Constituents from *Caesalpinia sappan* L. *Tsinghua Science & Technology*, 13(4), 474–479.
223 [https://doi.org/10.1016/S1007-0214\(08\)70076-2](https://doi.org/10.1016/S1007-0214(08)70076-2)
- 224 Maharani, N. P. D. S., Cahyani, I. M., & Hanhadyanaputri, E. S. (2022). Optimization of Polyvinyl
225 Alcohol (PVA) and Glycerin in Kolang Kaling Peel-Off Gel Mask Formula (*Arenga pinnata*).
226 *Journal of Food and Pharmaceutical Sciences*, 2022(3), 746–753.
227 <https://doi.org/10.22146/JFPS.5718>
- 228 Muslimin, M. K., Rahayuningsih, E., & Mindaryani, A. (2024). Optimasi proses metilasi
229 brazilein hasil ekstrak kayu secang (*Caesalpinia sappan* linn) sebagai bahan pewarna
230 merah alami untuk tekstil. *Jurnal Rekayasa Proses*, 18(2), 89–99.
231 <https://doi.org/10.22146/JREKPROS.82068>
- 232 Ngamwonglumlert, L., & Devahastin, S. (2023). Brazilein as an alternative pigment: Isolation,
233 characterization, stability enhancement and food applications. *Food Chemistry*, 398,
234 133898. <https://doi.org/10.1016/J.FOODCHEM.2022.133898>
- 235 Ningsih, W., Firmansyah, F., & Fitri, H. (2016). Formulasi Masker Peel Off dengan Beberapa
236 Konsentrasi Ekstrak Etanol Buah Naga Super Merah (*Hylocereus costaricensis* (F.A.C
237 Weber) Britton & Rose). *Scientia: Jurnal Farmasi Dan Kesehatan*, 6(1), 18.
238 <https://doi.org/10.36434/SCIENTIA.V6I1.37>
- 239 Rahmawanty, D., Yulianti, N., & Fitriana, M. (2015). Formulasi dan Evaluasi Masker Wajah
240 Peel-Off Mengandung Kuersetin dengan Variasi Konsentrasi Gelatin dan Gliserin. *Media*
241 *Farmasi: Jurnal Ilmu Farmasi*, 12(1), 17–32. <https://doi.org/10.12928/MF.V12I1.3019>
- 242 Rajput, M. S., Nirmal, N. P., Nirmal, S. J., & Santivarangkna, C. (2022). Bio-actives from
243 *Caesalpinia sappan* L.: Recent advancements in phytochemistry and pharmacology.
244 *South African Journal of Botany*, 151, 60–74.
245 <https://doi.org/10.1016/J.SAJB.2021.11.021>
- 246 Rina, O., Sanusi, I., Abdidharma, Afrizal, Utami, C., & Widodo, Y. (2017). Stabilities Natural
247 Colorant of Sappan Wood (*Caesalpinia sappan* L.) for Food and Beverages in Various pH,
248 Temperature and Matrices of Food. *International Journal of Chemtech Research*, 10(1),

BUKTI KORESPONDENSI CATATAN REVIEWER 1

- 249 98–103.
- 250 Rina, O., W., C. U., & Ansori, A. (2012). Efektifitas Ekstrak Kayu Secang (*Caesalpinia Sappan* L.)
251 Sebagai Bahan Pengawet Daging. *Jurnal Penelitian Pertanian Terapan*, *12*(3).
252 <https://doi.org/10.25181/JPPT.V12I3.215>
- 253 Setyowati, N., Masyhuri, Mulyo, J. H., Irham, & Yudhistira, B. (2023). The hidden treasure of
254 wedang uwuh, an ethnic traditional drink from Java, Indonesia: Its benefits and
255 innovations. *International Journal of Gastronomy and Food Science*, *31*, 100688.
256 <https://doi.org/10.1016/J.IJGFS.2023.100688>
- 257 Silvia, B. ., Dewi, M. ., & Darusman, F. (2021). Studi Literatur Pengaruh Jenis dan Konsentrasi
258 Basis terhadap Karakteristik Masker Gel Peel Off. *Prosiding Farmasi*, 148–156.
- 259 Sugiyanto, R. N., Putri, S. R., Damanik, F. S., & Sasmita, G. M. A. (2013). Aplikasi Kayu Secang
260 (*Caesalpinia Sappan* L.) dalam Upaya Prevensi Kerusakan Dna Akibat Paparan Zat
261 Potensial Karsinogenik melalui Mnpce Assay. *Pekan Ilmiah Mahasiswa Nasional Program
262 Kreativitas Mahasiswa - Penelitian 2013*.
263 <https://www.neliti.com/id/publications/171018/>
- 264 Syam, N. ., Lestari, U., & Muhaimin. (2021). Formulasi Dan Uji Sifat Masker Gel Peel-Off dari
265 Minyak Sawit Murni dengan Basis Carbomer 940. *Indonesian Journal of Pharma Science*,
266 *3*(1), 42–55.
- 267 Tanzaq, T. tanando, Agustina, R. D., Setiawati, K. E., & Cahyani, I. M. (2019). Uji Aktivitas
268 Penangkapan Radikal DPPH (1,1-Diphenyl-2-Picrylhrazyl) Ekstrak Etanol Kayu Secang
269 (*Caesalpinia sappan* L.). *Media Farmasi Indonesia*, *14*(1), 1461–1465.
270 <https://mfi.stifar.ac.id/MFI/article/view/105/86>
- 271 Utari, F. D. (2017). Produksi Antioksidan dari Ekstrak Kayu Secang (*Caesalpinia sappan* L.)
272 Menggunakan Pengereng Berkelembaban Rendah. *Jurnal Aplikasi Teknologi Pangan*,
273 *6*(3). <https://doi.org/10.17728/JATP.241>
- 274 Wahdaningsih, S., Budilaksono, W., & Fahrurroji, A. (2015). Uji aktivitas antioksidan fraksi n-
275 heksana kulit buah naga merah menggunakan metode 1,1-Difenil-2-Pikrilhidrazil. *Jurnal
276 Kesehatan Khatulistiwa*, *1*(2), 115–136.
277 <https://doi.org/10.26418/JURKESWA.V1I2.42997>
- 278 Welly, S., Supriyanto, & Saraswati, M. (2022). Antioxidant Test and Peel-Off Mask Formulation
279 Extract of Red Spinning (*Amaranthus tricolor* L.) Leaves with Variations of Gelling Agent
280 Types. *Joseph (Journal of Pharmacy)*, *2*(1), 42–55.
- 281 Widowati, W. (Wahyu). (2011). Uji Fitokimia Dan Potensi Antioksidan Ekstrak Etanol Kayu
282 Secang (*Caesalpinia Sappan* L.). *Maranatha Journal of Medicine and Health*, *11*(1),
283 151615. <https://www.neliti.com/id/publications/151615/>
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Table 1. Formulation of Peel Off Gel Masker Secang Wood Extract

Material	Formula (%)		
	I	II	III
Secang Wood Extract	2,5	5	7,5
CMC Na	1,26	1,26	1,26
PVA	6,74	6,74	6,74
Propilenglikol	4	4	4
Aqua destilata ad	100	100	100

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Table 2. Characterization and Antioxidant Activity of Peel Off Gel Mask Secang Wood Extract

Evaluation	Formula		
	I	II	III
Organoleptic	Consistency thick and soft, colour orange, odor secang smell	Consistency thick and soft, colour orange, odor secang smell	Consistency thick and soft, colour orange, odor secang smell
Homogeneity	Homogeneous	Homogeneous	Homogeneous
pH	6.4 ± 0.16	5.85 ± 0.43	5.09 ± 0.35
Viscosity (cPs)	11986.4 ± 6.02	13992.6 ± 5.13	15993.2 ± 5.36
Spreadability (cm)	5.6 ± 0.19	5.18 ± 0.33	4.52 ± 0.33
Adhesion (secon)	3.5 ± 0.13	4.2 ± 0.16	4.85 ± 0.04
Drying Time (minute)	16.06 ± 0.39	17.88 ± 0.38	19.45 ± 0.40
IC ₅₀ (µg/mL)	88.71 ± 2.06	81.58 ± 3.60	79.04 ± 1.84

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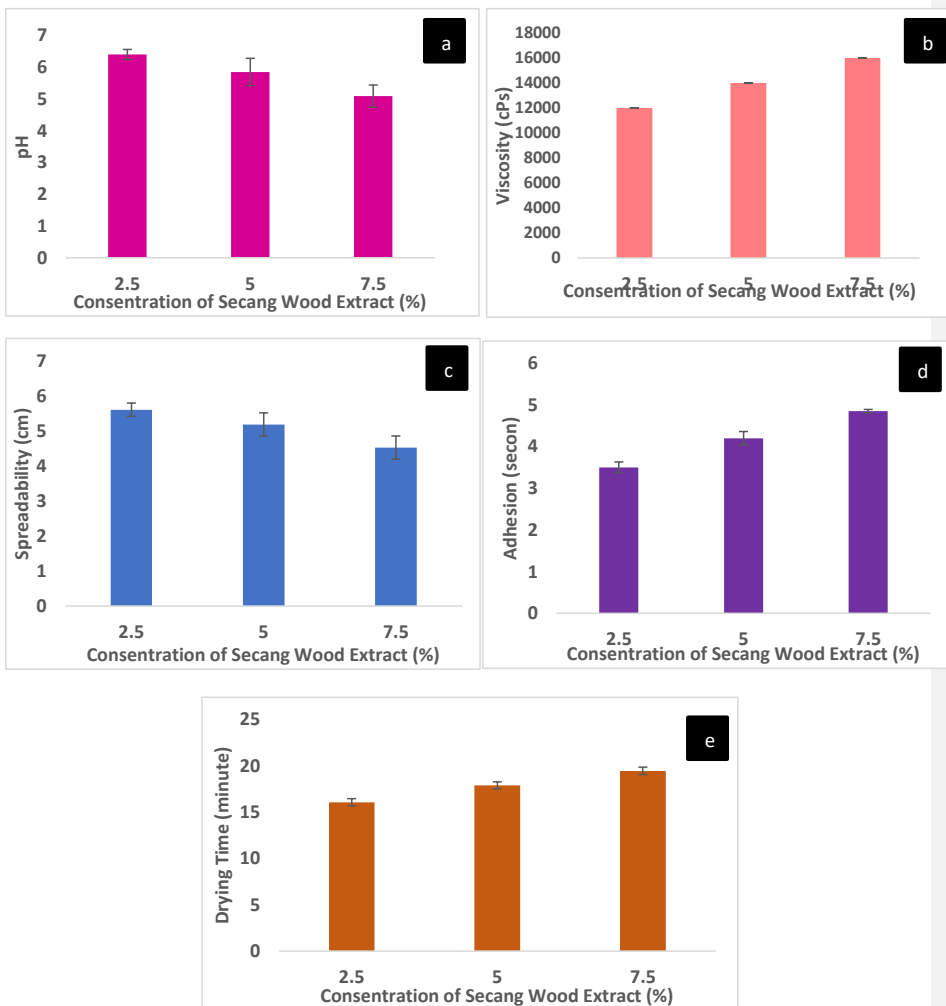
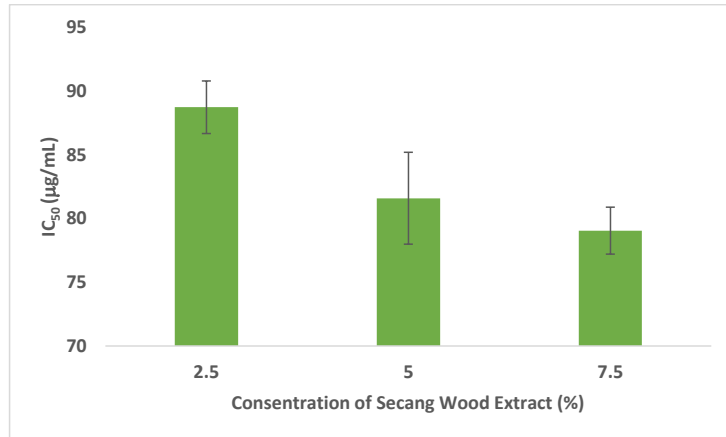


Figure 1. Characterization of Peel Off Gel Mask Secang Wood Extract: (a) pH, (b) Viscosity, (c) Spreadability, (d) Adhesion and (e) Drying Time

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Figure 2. Antioxidant activity (IC₅₀) of Peel Off Gel Mask Secang Wood Extract

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BUKTI KORESPONDENSI CATATAN REVIEWER 2

1 Peel Off Gel Mask Secang Wood Extract as an Antioxidant: Formulation and 2 Characterization

3 Masker Gel Peel Off Ekstrak Kayu Secang sebagai Antioksidan : Formulasi dan 4 Karakterisasi 5

6 Abstract

7 Secang wood contains active compounds of the flavonoid group, namely brazilin, brazilin, 3'-
8 O-methylbrazilin, sappanin chalcone, and sappan chalcone which can be used as primary
9 antioxidants or secondary antioxidants. Antioxidants are compounds that can inhibit
10 oxidation reactions by binding reactive free radicals. Increasing the value of the benefits of
11 secang wood as an antioxidant can be done by developing a topical preparation formulation.
12 Peel-off gel mask is the right topical preparation because in addition to maintaining skin
13 health, it can also increase effectiveness and comfort during use. The study aims to determine
14 the formula of a peel-off gel mask with secang wood extract as an antioxidant with good
15 characteristics. The formulation of the peel-off gel mask was made with a concentration of
16 secang wood extract of 2.5%; 5% and 7.5% using sodium carboxymethyl cellulose, polyvinyl
17 alcohol and propylene glycol as a base. The preparation of the peel-off gel mask with secang
18 wood extract produced was then tested with several parameters to determine the physical
19 characteristics and antioxidant activity. The results showed that the higher the concentration
20 of secang wood extract, the more significant the effect (p-value <0.05) on increasing viscosity,
21 adhesiveness and drying time and can reduce pH, spreadability and IC₅₀ value. The antioxidant
22 activity of all formulas is included in the strong category with the IC₅₀ value of the three
23 formulas respectively being 88, 71 µg/mL; 81.58 µg/mL and 79.04 µg/mL.
24

25 Keywords: Secang wood, Formulation, Peel off gel mask, Antioxidants, Physical characteristics

26 Abstrak

27 Kayu secang mengandung senyawa aktif golongan flavonoid yaitu brazilin, brazilin, 3'-O-
28 metilbrazilin, sappanin chalcone, dan sappan chalcone yang dapat digunakan sebagai
29 antioksidan primer maupun antioksidan sekunder. Antioksidan merupakan senyawa yang
30 dapat menghambat reaksi oksidasi dengan mengikat radikal bebas yang reaktif. Peningkatan
31 nilai manfaat kayu secang sebagai antioksidan dapat dilakukan dengan pengembangan
32 formulasi sediaan topikal. Masker gel peel-off merupakan sediaan topikal yang tepat karena
33 selain dapat menjaga kesehatan kulit juga dapat meningkatkan efektivitas dan kenyamanan
34 saat penggunaan. Penelitian bertujuan untuk mengetahui formula masker gel peel off ekstrak
35 kayu secang sebagai antioksidan dengan karakteristik yang baik. Formulasi masker gel peel
36 off dibuat dengan konsentrasi ekstrak kayu secang 2.5%; 5% dan 7.5% menggunakan natrium
37 karboksimetil selulosa, polivinil alkohol dan propilen glikol sebagai basis. Sediaan masker gel
38 peel off ekstrak kayu secang yang dihasilkan selanjutnya dilakukan pengujian dengan
39 beberapa parameter untuk mengetahui karakteristik fisik dan aktivitas antioksidan. Hasil
40 menunjukkan semakin tinggi konsentrasi ekstrak kayu secang berpengaruh signifikan (p-value
41 < 0,05) pada peningkatan viskositas, daya lekat dan waktu mengering serta dapat
42 menurunkan pH, daya sebar dan nilai IC₅₀. Aktivitas antioksidan semua formula termasuk
43 dalam kategori kuat dengan nilai IC₅₀ ketiga formula berturut-turut adalah 88.71 µg/mL; 81.58
44 µg/mL dan 79.04 µg/mL.

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45
46 **Kata Kunci:** Kayu secang, Formulasi, Masker gel peel off, antioksidan, karakteristik fisik

47 **1. Introduction**

48 Air pollution is currently experiencing a significant increase, reaching 20%. Low air
49 quality can have a negative impact because long-term exposure can cause health problems
50 (Wahdaningsih et al., 2015). One of the mechanisms is the occurrence of oxidative stress in
51 the body. The high level of air pollution today can cause the formation of free radicals so it
52 needs to be balanced with natural antioxidant intake to prevent oxidative damage which is a
53 trigger for various diseases, especially skin disorders (Widowati, 2011). Flavonoids are natural
54 compounds that have the ability as antioxidants by inhibiting the formation of free radicals
55 hydroxyl, peroxide, alkoxyl, superoxide anions, oxygen singkets and hydrogen peroxide (Utari,
56 2017).

57 Secang wood contains active compounds of the flavonoid group which can be used as
58 primary antioxidants or secondary antioxidants. The presence of brazilin components in
59 secang wood has the effect of protecting the body from poisoning due to free radicals (Rina
60 et al., 2012). Has reliable antioxidant power with a higher antioxidant index than commercial
61 antioxidants (BHT and BHA) so it has the potential as a free radical scavenging agent
62 (Sugiyanto et al., 2013). Secang wood extract has been proven effective as an antioxidant with
63 an IC₅₀ value of 74,44 µg/mL (Tanzaq et al., 2019).

64 Mask is one of the cosmetics for facial skin care. However, the use of masks is generally
65 less efficient. The demands of market needs with today's lifestyle are not only effective but
66 easy, comfortable and flexible in their use. Peel off gel mask is the result of the development
67 of facial skin care products that can answer these challenges (Ningsih et al., 2016). Peel off
68 gel mask is a type of facial mask that has the advantage of being easy to remove or lift like an
69 elastic membrane (Rahmawanty et al., 2015). Several studies have proven that peel off gel
70 mask preparations can increase the effectiveness of antioxidants, including Paedaria fotida
71 extract (Eka et al., 2022), areca seed extract (Dwi Mulyani et al., 2023), red spinach leaves
72 extract (Welly et al., 2022) and mangrove leaves extract (Hasibuan et al., 2024).

73 74 **2. Methods**

75 **2.1 Materials and Tools**

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76 The materials used in this study were secang wood, ethanol 96% (Merck), Sodium
77 Carboxymethyl Cellulose (CMC Na), Polyvinil Alcohol (PVA), propilenglicol, vitamin C dan 1,1-
78 difenil-2-pikrilhidrazil (DPPH) .

79 The tools used in this study were rotary evaporator (Heidolph), alat-alat gelas (Pyrex),
80 pH meter (Hanna Instrument pH 210 Microprocessor), viskometer (Brookfield DV-I Prime),
81 and spektrofotometer UV-Vis mini 1240 (Shimadzu).

82 **2.2 Sengon Wood Extraction**

83 The extraction method used is maceration by soaking secang wood powder using 96%
84 ethanol solvent with a ratio of 1:10. Extraction is carried out for 3x24 hours. The filtrate
85 obtained is then evaporated with a rotary evaporator until a thick extract is obtained (Tanzaq
86 et al., 2019).

87 **2.3 Formulation of Peel Off Gel Masker Secang Wood Extract**

88 Peel-off gel mask of secang wood extract was made by developing PVA and CMC Na (Table
89 1) in hot distilled water until fully expanded. PVA mass plus expanded propylene glycol and
90 CMC Na was stirred until homogeneous. Ethanol extract of secang wood was added little by
91 little into the peel-off gel mask base, distilled water was added until the weight of the
92 preparation was 100% and stirred until homogeneous (Cahyani et al., 2025).

93 **2.4 Physical Characterization Evaluation of Peel Off Gel Mask Secang Wood Extract**

94 **Organoleptic**

95 Observations were made on the color, odor, and dosage form of the Peel Off Gel Mask
96 Secang Wood Extract (Syam et al., 2021).

97 **Homogeneity**

98 Observations are made by preparing a number of preparations on object glass (Cahyani
99 & Putri, 2017). All particles are evenly dispersed on the object glass indicating a homogeneous
100 preparation (Syam et al., 2021)

101 **pH**

102 The pH meter electrode is dipped into the preparation until the display on the device
103 shows a constant pH value (Andini et al., 2017). Results that match the skin pH (4.5-6.5) can
104 increase acceptability when used (Silvia et al., 2021).

105 **Viscosity**

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106 The viscosity of the preparation was measured using a Brookfield spindle 64 viscometer
107 at a speed of 1.0 rpm (Cahyani & Putri, 2017). At a viscosity of 2000-50000 cps indicates a
108 good peel-off gel mask (SNI 16-4399-1996: 1).

109 **Spreadability**

110 Observations were made on the spreading ability of 0.5 grams of the preparation placed
111 in the middle of the spreading power tester, then covered with a glass plate that had
112 previously been weighed and its weight recorded, left for one minute. The spreading ability
113 is indicated by measuring the diameter of the four sides of the spread. Do the same steps for
114 each additional 50 grams of load above it until the diameter of the spread is constant (Cahyani
115 & Putri, 2017). The ideal spread of the peel off gel mask is 5-7 cm (Silvia et al., 2021).

116 **Adhesion**

117 0.25 g preparation on a glass object is given a load pressure of 100 grams for 5 minutes
118 and then placed on the adhesive strength tester. The adhesive strength is measured by
119 recording the time when the two glass objects are released. A time of more than 1 second
120 indicates good adhesive strength of the peel off gel mask (Syam et al., 2021).

121 **Drying Time**

122 0.1 g of the preparation is applied to the arm with an area of 2.5 x 2.5 cm, then the time
123 is observed until the preparation dries (Andini et al., 2017). standard drying time for a peel-
124 off gel mask is 15-30 minutes (Silvia et al., 2021).

125 **2.5 Antioxidant Activity with DPPH (2,2-difenyl-1-picrylhydrazyl) Method**

126 The test was carried out in several stages. First, determine the maximum wavelength of
127 the DPPH 30 solution $\mu\text{g/mL}$ with a UV-Vis spectrophotometer in the 400-800 nm region.
128 Determination of operating time is done by measuring the absorption at the maximum
129 wavelength obtained using a standard solution (vitamin C) and DPPH 30 solution $\mu\text{g/mL}$ at a
130 1:1 ratio for 60 minutes.

131 An amount of 0.05 grams of the preparation was dissolved in methanol up to 50 mL and
132 diluted to obtain sample solution concentrations of 60,70,80,100 and 120 $\mu\text{g/mL}$. For each
133 concentration, DPPH 30 solution was added $\mu\text{g/mL}$ at a ratio of 1:1 and absorbance
134 measurements were carried out using a UV-Vis spectrophotometer at a maximum
135 wavelength after being incubated at room temperature for the time obtained from the results
136 of determining the operating time. The same stage was also carried out on vitamin C solutions

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137 with concentrations of 2.4,6,8,10 µg/mL as a reference standard. Determine the IC₅₀ value
138 from the results of measuring the absorbance of the sample solution and the reference
139 standard obtained (Maharani et al., 2022).

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141

3. Results and Discussion

3.1 Physical Characterization Evaluation of Peel Off Gel Mask Secang Wood Extract

143 Traditionally, secang wood has many health benefits, including antibacterial, anti-
144 inflammatory, anti-diabetic, tuberculosis, malaria and tetanus (Setyowati et al., 2023). In
145 addition, it is also widely used in food and cosmetics as an antioxidant (Rajput et al., 2022).
146 Secang wood contains active compounds that are included in the flavonoid group, namely
147 brazilin, brazilin, 3'-o-methylbrazilin, sappanin, chalcone, and sappan chalcone. Brazilin in
148 secang wood has an antioxidant effect (Ngamwonglumlert & Devahastin, 2023). For the
149 manufacture of secang wood extract, the maceration method using 96% ethanol (1:1) was
150 used. The peel-off gel mask has unique characteristics with the formation of a transparent,
151 elastic and easily removable film layer without rinsing which can increase the comfort of use
152 and the effectiveness of active compounds. Therefore, this study was designed to make a
153 peel-off gel mask of secang wood extract as an antioxidant F1 (2.5%) F2 (5%) and F3 (7.5%)
154 with the results of the physical characteristics test presented in Table 2.

155 Organoleptic and homogeneity testing aims to see the physical appearance and
156 distribution of each component of a preparation. Based on table 2, the results show that the
157 three formulas give the same results. The level of comfort of using a preparation is also
158 influenced by the pH of the preparation. The higher the concentration of secang wood extract,
159 the lower the pH of the preparation as seen in Figure 1a. This occurs because the ethanol
160 extract of secang wood has a pH that tends to be acidic (2-6) (Muslimin et al., 2024), so that
161 by adding the amount of secang wood extract, the pH of the preparation will decrease. The
162 pH value of secang wood extract can affect the color of the peel-off gel mask preparation
163 produced. This effect is caused because the stability of brazilin is greatly influenced by its
164 acidity level where at pH 2-5 (yellow-orange), pH 6-7 (pink) and pH > 7 (red-violet) where the
165 degradation results of brazilin into brazilein which is red in color (Rina et al., 2017).

166 The results of the viscosity test showed an increase that was proportional to the
167 increase in the concentration of secang wood extract in the peel-off gel mask formula (Figure

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168 1b). The thick concentration of secang wood extract showed high resistance so that it would
169 affect the resistance of the preparation to flow. The viscosity of the preparation is closely
170 related to the spreadability, adhesion and drying time. The higher the viscosity, the lower the
171 spreadability (Figure 1c) and the higher the adhesion (Figure 1d) of the preparation because
172 high resistance indicates a stronger bond between particles which causes water to be trapped
173 and dry longer (Figure 1e) (Cahyani et al., 2025).

174 3.2 Antioxidant Activity of Peel Off Gel Mask Secang Wood Extract

175 Test results all formulas showed antioxidant activity included in the strong category
176 as indicated by the IC₅₀ value (Table 2) so it can be said that the selection of the peel off gel
177 mask preparation is right and the resulting formula can maintain the stability of the active
178 compound. The increase in antioxidant activity is indicated by a decrease in the IC₅₀ value
179 along with the increase in extract concentration (Figure 2). This is because the higher the
180 concentration of **sengon** wood extract, the higher the brazilin content in the peel off gel mask
181 preparation. Brazilin, in addition to playing a role in the color produced, is also a flavonoid
182 with high antioxidant activity and is widely used in natural skin care (Faizah et al., 2023).
183 Brazilin is a flavonoid with the ability to ward off free radicals and can inhibit enzymes
184 responsible for the production of free radicals (Hu et al., 2008)

Commented [da1]: How is the analysis of vitamin C as a standard against the three formulas?

185

186

4. Conclusion

187 Increasing the concentration of secang wood extract has a significant effect (p-value
188 <0.05) on increasing the viscosity, adhesiveness and drying time and can reduce pH,
189 spreadability and IC₅₀ value. The antioxidant activity of all formulas is included in the strong
190 category with the IC₅₀ values of the three formulas respectively being 88, 71 µg/mL; 81.58
191 µg/mL and 79.04 µg/mL. Peel off gel mask preparation formula with good characteristics and
192 strong antioxidant activity at a concentration of 7.5% secang wood extract.

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5. References

- 195 Andini, T., Yusriadi, Y., & Yuliet, Y. (2017). Optimasi Pembentuk Film Polivinil Alkohol dan
196 Humektan Propilen Glikol pada Formula Masker Gel Peel Off Sari Buah Labu Kuning
197 (Cucurbita moschata Duchesne) sebagai Antioksidan. *Jurnal Farmasi Galenika (Galenika
198 Journal of Pharmacy)*, 3(2), 101–108.
- 199 Cahyani, I. M., Hanhadyanaputri, E. S., Wulan, A. H., & Sulistyarini, I. (2025). Optimization
200 Formula of Kolang-Kaling (Arenga Pinnata.) Peel Off Gel Mask with Combination PVA-
201 CMC Na As Gelling Agent on Simplex Lattice Design. *Media Farmasi Indonesia*, 20(1), 67–

BUKTI KORESPONDENSI CATATAN REVIEWER 2

- 202 75. <https://doi.org/10.53359/mfi.v20i1.316>
- 203 Cahyani, I. M., & Putri, I. D. C. (2017). Efektivitas Karbopol 940 Dalam Formula Masker Gel
204 Peel-Off Ekstrak Temu Giring (*Curcuma heyneana* Val & Zijp). *Journal of Pharmaceutical*
205 *and Medicinal Sciences*, 2(2), 48–51.
- 206 Dwi Mulyani, A., Rahayu, P., Aini, N., Purnamasari, D., Mulyani, A. D., Farmasi, J., & Mulyani,
207 A. D. (2023). Formulasi dan Evaluasi Mutu Fisik Sediaan Masker Gel Peel-Off Ekstrak Biji
208 Pinang (*Areca Catechu* L.) Sebagai Antioksidan. *Indonesian Journal of Pharmaceutical*
209 *Education*, 3(3), 2775–3670. <https://doi.org/10.37311/IJPE.V3I3.22033>
- 210 Eka, R., Susanti, E., & A'yun, Q. (2022). Formulation and Antioxidant Activity of Peel Off Gel
211 Mask from *Paederia Foetida* Extract. *JKPK (Jurnal Kimia Dan Pendidikan Kimia)*, 7(1), 12–
212 19. <https://doi.org/10.20961/JKPK.V7I1.45798>
- 213 Faizah, U. N., Maula, N. N., Mustika, R. A., & Wahyuni, S. (2023). Potensi Senyawa Antioksidan
214 Yang Terkandung Dalam Kayu Secang (*Caesalpinia sappan*) Untuk Perawatan Kulit Alami.
215 *Symbiotic: Journal of Biological Education and Science*, 4(1), 41–49.
216 <https://doi.org/10.32939/SYMBIOTIC.V4I1.90>
- 217 Hasibuan, N. E., Azka, A., Basri, & Mujiyanti, A. (2024). Aktivitas Antioksidam dan Karakteristik
218 Masker Gel Peel Off dari Ekstrak Daun Mangrove (*Avicennia marina*). *Jurnal Pengolahan*
219 *Hasil Perikanan Indonesia (JPHPI)*, 2(9), 42–55.
220 <https://doi.org/http://dx.doi.org/10.17844/jphpi.v27i9.52083>
- 221 Hu, J., Yan, X., Wang, W., Wu, H., Hua, L., & Du, L. (2008). Antioxidant Activity In Vitro of Three
222 Constituents from *Caesalpinia sappan* L. *Tsinghua Science & Technology*, 13(4), 474–479.
223 [https://doi.org/10.1016/S1007-0214\(08\)70076-2](https://doi.org/10.1016/S1007-0214(08)70076-2)
- 224 Maharani, N. P. D. S., Cahyani, I. M., & Hanhadyanaputri, E. S. (2022). Optimization of Polyvinyl
225 Alcohol (PVA) and Glycerin in Kolang Kaling Peel-Off Gel Mask Formula (*Arenga pinnata*).
226 *Journal of Food and Pharmaceutical Sciences*, 2022(3), 746–753.
227 <https://doi.org/10.22146/JFPS.5718>
- 228 Muslimin, M. K., Rahayuningsih, E., & Mindaryani, A. (2024). Optimasi proses metilasi
229 brazilein hasil ekstrak kayu secang (*Caesalpinia sappan* linn) sebagai bahan pewarna
230 merah alami untuk tekstil. *Jurnal Rekayasa Proses*, 18(2), 89–99.
231 <https://doi.org/10.22146/JREKPROS.82068>
- 232 Ngamwonglumlert, L., & Devahastin, S. (2023). Brazilein as an alternative pigment: Isolation,
233 characterization, stability enhancement and food applications. *Food Chemistry*, 398,
234 133898. <https://doi.org/10.1016/J.FOODCHEM.2022.133898>
- 235 Ningsih, W., Firmansyah, F., & Fitri, H. (2016). Formulasi Masker Peel Off dengan Beberapa
236 Konsentrasi Ekstrak Etanol Buah Naga Super Merah (*Hylocereus costaricensis* (F.A.C
237 Weber) Britton & Rose). *Scientia: Jurnal Farmasi Dan Kesehatan*, 6(1), 18.
238 <https://doi.org/10.36434/SCIENTIA.V6I1.37>
- 239 Rahmawanty, D., Yulianti, N., & Fitriana, M. (2015). Formulasi dan Evaluasi Masker Wajah
240 Peel-Off Mengandung Kuersetin dengan Variasi Konsentrasi Gelatin dan Gliserin. *Media*
241 *Farmasi: Jurnal Ilmu Farmasi*, 12(1), 17–32. <https://doi.org/10.12928/MF.V12I1.3019>
- 242 Rajput, M. S., Nirmal, N. P., Nirmal, S. J., & Santivarangkna, C. (2022). Bio-actives from
243 *Caesalpinia sappan* L.: Recent advancements in phytochemistry and pharmacology.
244 *South African Journal of Botany*, 151, 60–74.
245 <https://doi.org/10.1016/J.SAJB.2021.11.021>
- 246 Rina, O., Sanusi, I., Abdidharma, Afrizal, Utami, C., & Widodo, Y. (2017). Stabilities Natural
247 Colorant of Sappan Wood (*Caesalpinia sappan* L.) for Food and Beverages in Various pH,
248 Temperature and Matrices of Food. *International Journal of Chemtech Research*, 10(1),

BUKTI KORESPONDENSI CATATAN REVIEWER 2

- 249 98–103.
- 250 Rina, O., W., C. U., & Ansori, A. (2012). Efektifitas Ekstrak Kayu Secang (*Caesalpinia Sappan* L.)
251 Sebagai Bahan Pengawet Daging. *Jurnal Penelitian Pertanian Terapan*, 12(3).
252 <https://doi.org/10.25181/JPPT.V12I3.215>
- 253 Setyowati, N., Masyhuri, Mulyo, J. H., Irham, & Yudhistira, B. (2023). The hidden treasure of
254 wedang uwuh, an ethnic traditional drink from Java, Indonesia: Its benefits and
255 innovations. *International Journal of Gastronomy and Food Science*, 31, 100688.
256 <https://doi.org/10.1016/J.IJGFS.2023.100688>
- 257 Silvia, B. ., Dewi, M. ., & Darusman, F. (2021). Studi Literatur Pengaruh Jenis dan Konsentrasi
258 Basis terhadap Karakteristik Masker Gel Peel Off. *Prosiding Farmasi*, 148–156.
- 259 Sugiyanto, R. N., Putri, S. R., Damanik, F. S., & Sasmita, G. M. A. (2013). Aplikasi Kayu Secang
260 (*Caesalpinia Sappan* L.) dalam Upaya Prevensi Kerusakan Dna Akibat Paparan Zat
261 Potensial Karsinogenik melalui Mnpce Assay. *Pekan Ilmiah Mahasiswa Nasional Program
262 Kreativitas Mahasiswa - Penelitian 2013*.
263 <https://www.neliti.com/id/publications/171018/>
- 264 Syam, N. ., Lestari, U., & Muhaimin. (2021). Formulasi Dan Uji Sifat Masker Gel Peel-Off dari
265 Minyak Sawit Murni dengan Basis Carbomer 940. *Indonesian Journal of Pharma Science*,
266 3(1), 42–55.
- 267 Tanzaq, T. tanando, Agustina, R. D., Setiawati, K. E., & Cahyani, I. M. (2019). Uji Aktivitas
268 Penangkapan Radikal DPPH (1,1-Diphenyl-2-Picrylhrazyl) Ekstrak Etanol Kayu Secang
269 (*Caesalpinia sappan* L.). *Media Farmasi Indonesia*, 14(1), 1461–1465.
270 <https://mfi.stifar.ac.id/MFI/article/view/105/86>
- 271 Utari, F. D. (2017). Produksi Antioksidan dari Ekstrak Kayu Secang (*Caesalpinia sappan* L.)
272 Menggunakan Pengering Berkelembaban Rendah. *Jurnal Aplikasi Teknologi Pangan*,
273 6(3). <https://doi.org/10.17728/JATP.241>
- 274 Wahdaningsih, S., Budilaksono, W., & Fahrurroji, A. (2015). Uji aktivitas antioksidan fraksi n-
275 heksana kulit buah naga merah menggunakan metode 1,1-Difenil-2-Pikrilhidrazil. *Jurnal
276 Kesehatan Khatulistiwa*, 1(2), 115–136.
277 <https://doi.org/10.26418/JURKESWA.V1I2.42997>
- 278 Welly, S., Supriyanto, & Saraswati, M. (2022). Antioxidant Test and Peel-Off Mask Formulation
279 Extract of Red Spinning (*Amaranthus tricolor* L.) Leaves with Variations of Gelling Agent
280 Types. *Joseph (Journal of Pharmacy)*, 2(1), 42–55.
- 281 Widowati, W. (Wahyu). (2011). Uji Fitokimia Dan Potensi Antioksidan Ekstrak Etanol Kayu
282 Secang (*Caesalpinia Sappan* L.). *Maranatha Journal of Medicine and Health*, 11(1),
283 151615. <https://www.neliti.com/id/publications/151615/>
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Table 1. Formulation of Peel Off Gel Masker Secang Wood Extract

Material	Formula (%)		
	I	II	III
Secang Wood Extract	2,5	5	7,5
CMC Na	1,26	1,26	1,26
PVA	6,74	6,74	6,74
Propilenglikol	4	4	4
Aqua destilata ad	100	100	100

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297 **Table 2.** Characterization and Antioxidant Activity of Peel Off Gel Mask Secang Wood Extract

Evaluation	Formula		
	I	II	III
Organoleptic	Consistency thick and soft, colour orange, odor secang smell	Consistency thick and soft, colour orange, odor secang smell	Consistency thick and soft, colour orange, odor secang smell
Homogeneity	Homogeneous	Homogeneous	Homogeneous
pH	6.4 ± 0.16	5.85 ± 0.43	5.09 ± 0.35
Viscosity (cPs)	11986.4 ± 6.02	13992.6 ± 5.13	15993.2 ± 5.36
Spreadability (cm)	5.6 ± 0.19	5.18 ± 0.33	4.52 ± 0.33
Adhesion (secon)	3.5 ± 0.13	4.2 ± 0.16	4.85 ± 0.04
Drying Time (minute)	16.06 ± 0.39	17.88 ± 0.38	19.45 ± 0.40
IC ₅₀ (µg/mL)	88.71 ± 2.06	81.58 ± 3.60	79.04 ± 1.84

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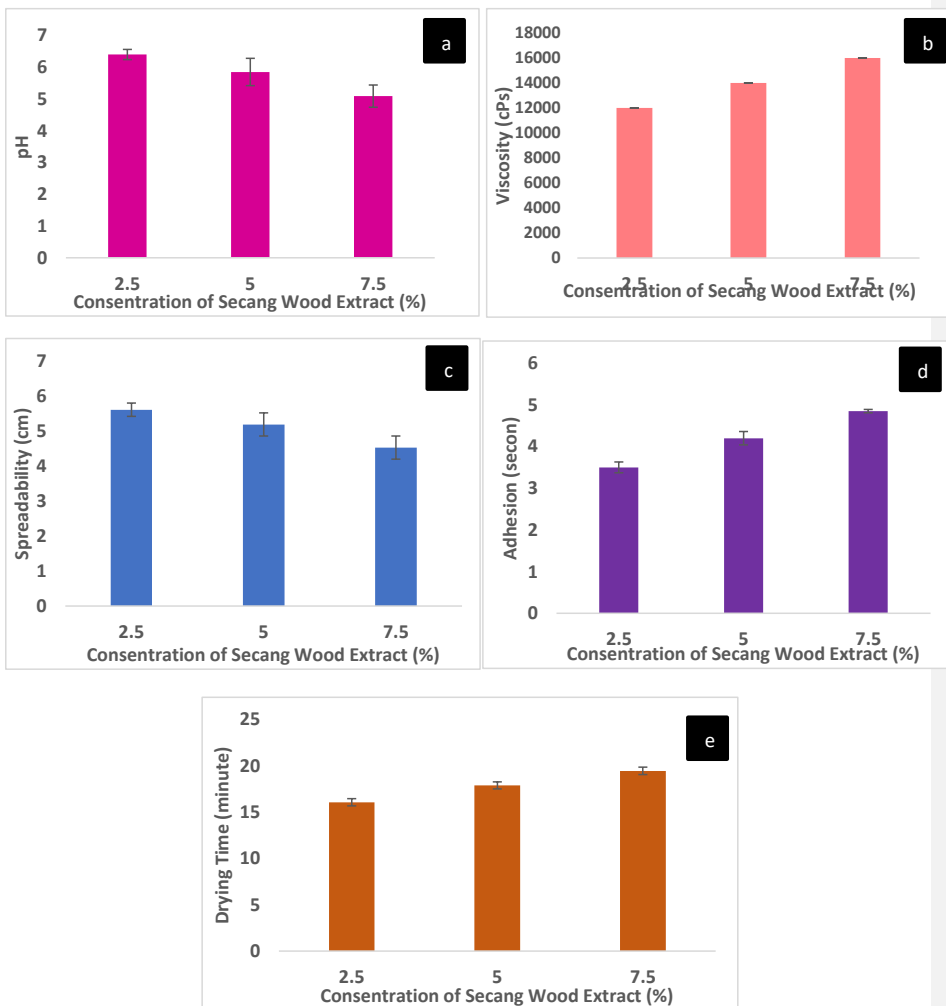
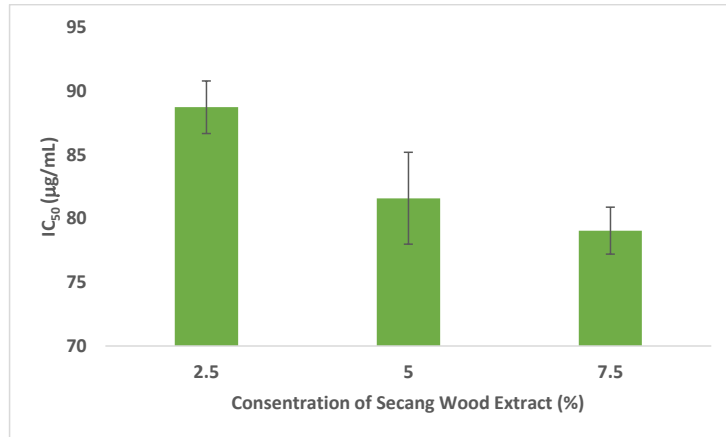


Figure 1. Characterization of Peel Off Gel Mask Secang Wood Extract: (a) pH, (b) Viscosity, (c) Spreadability, (d) Adhesion and (e) Drying Time

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Figure 2. Antioxidant activity (IC₅₀) of Peel Off Gel Mask Secang Wood Extract

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1 Peel Off Gel Mask Secang Wood Extract as an Antioxidant: Formulation and 2 Characterization

3 Masker Gel Peel Off Ekstrak Kayu Secang sebagai Antioksidan : Formulasi dan 4 Karakterisasi 5

6 Abstract

7 Secang wood contains active compounds of the flavonoid group, namely brazilin, brazilin, 3'-
8 O-methylbrazilin, sappanin chalcone, and sappan chalcone which can be used as primary
9 antioxidants or secondary antioxidants. Antioxidants are compounds that can inhibit
10 oxidation reactions by binding reactive free radicals. Increasing the value of the benefits of
11 secang wood as an antioxidant can be done by developing a topical preparation formulation.
12 Peel-off gel mask is the right topical preparation because in addition to maintaining skin
13 health, it can also increase effectiveness and comfort during use. The study aims to determine
14 the formula of a peel-off gel mask with secang wood extract as an antioxidant with good
15 characteristics. The formulation of the peel-off gel mask was made with a concentration of
16 secang wood extract of 2.5%; 5% and 7.5% using sodium carboxymethyl cellulose, polyvinyl
17 alcohol and propylene glycol as a base. The preparation of the peel-off gel mask with secang
18 wood extract produced was then tested with several parameters to determine the physical
19 characteristics and antioxidant activity. The results showed that the higher the concentration
20 of secang wood extract, the more significant the effect (p-value <0.05) on increasing viscosity,
21 adhesiveness and drying time and can reduce pH, spreadability and IC₅₀ value. The antioxidant
22 activity of all formulas is included in the strong category with the IC₅₀ value of the three
23 formulas respectively being 88, 71 µg/mL; 81.58 µg/mL and 79.04 µg/mL.

24
25 Keywords: Secang wood, Formulation, Peel off gel mask, Antioxidants, Physical characteristics

26 Abstrak

27 Kayu secang mengandung senyawa aktif golongan flavonoid yaitu brazilin, brazilin, 3'-O-
28 metilbrazilin, sappanin chalcone, dan sappan chalcone yang dapat digunakan sebagai
29 antioksidan primer maupun antioksidan sekunder. Antioksidan merupakan senyawa yang
30 dapat menghambat reaksi oksidasi dengan mengikat radikal bebas yang reaktif. Peningkatan
31 nilai manfaat kayu secang sebagai antioksidan dapat dilakukan dengan pengembangan
32 formulasi sediaan topikal. Masker gel peel-off merupakan sediaan topikal yang tepat karena
33 selain dapat menjaga kesehatan kulit juga dapat meningkatkan efektivitas dan kenyamanan
34 saat penggunaan. Penelitian bertujuan untuk mengetahui formula masker gel peel off ekstrak
35 kayu secang sebagai antioksidan dengan karakteristik yang baik. Formulasi masker gel peel
36 off dibuat dengan konsentrasi ekstrak kayu secang 2.5%; 5% dan 7.5% menggunakan natrium
37 karboksimetil selulosa, polivinil alkohol dan propilen glikol sebagai basis. Sediaan masker gel
38 peel off ekstrak kayu secang yang dihasilkan selanjutnya dilakukan pengujian dengan
39 beberapa parameter untuk mengetahui karakteristik fisik dan aktivitas antioksidan. Hasil
40 menunjukkan semakin tinggi konsentrasi ekstrak kayu secang berpengaruh signifikan (p-value
41 < 0,05) pada peningkatan viskositas, daya lekat dan waktu mengering serta dapat
42 menurunkan pH, daya sebar dan nilai IC₅₀. Aktivitas antioksidan semua formula termasuk
43 dalam kategori kuat dengan nilai IC₅₀ ketiga formula berturut-turut adalah 88.71 µg/mL; 81.58
44 µg/mL dan 79.04 µg/mL.

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45
46 **Kata Kunci:** Kayu secang, Formulasi, Masker gel peel off, antioksidan, karakteristik fisik

47 **1. Introduction**

48 Air pollution is currently experiencing a significant increase, reaching 20%. Low air
49 quality can have a negative impact because long-term exposure can cause health problems
50 (Wahdaningsih et al., 2015). One of the mechanisms is the occurrence of oxidative stress in
51 the body. The high level of air pollution today can cause the formation of free radicals so it
52 needs to be balanced with natural antioxidant intake to prevent oxidative damage which is a
53 trigger for various diseases, especially skin disorders (Widowati, 2011). Flavonoids are natural
54 compounds that have the ability as antioxidants by inhibiting the formation of free radicals
55 hydroxyl, peroxide, alkoxyl, superoxide anions, oxygen singkets and hydrogen peroxide (Utari,
56 2017).

57 Secang wood contains active compounds of the flavonoid group which can be used as
58 primary antioxidants or secondary antioxidants. The presence of brazilin components in
59 secang wood has the effect of protecting the body from poisoning due to free radicals (Rina
60 et al., 2012). Has reliable antioxidant power with a higher antioxidant index than commercial
61 antioxidants (BHT and BHA) so it has the potential as a free radical scavenging agent
62 (Sugiyanto et al., 2013). Secang wood extract has been proven effective as an antioxidant with
63 an IC₅₀ value of 74,44 µg/mL (Tanzaq et al., 2019).

64 Mask is one of the cosmetics for facial skin care. However, the use of masks is generally
65 less efficient. The demands of market needs with today's lifestyle are not only effective but
66 easy, comfortable and flexible in their use. Peel off gel mask is the result of the development
67 of facial skin care products that can answer these challenges (Ningsih et al., 2016). Peel off
68 gel mask is a type of facial mask that has the advantage of being easy to remove or lift like an
69 elastic membrane (Rahmawanty et al., 2015). Several studies have proven that peel off gel
70 mask preparations can increase the effectiveness of antioxidants, including Paedaria fotida
71 extract (Eka et al., 2022), areca seed extract (Dwi Mulyani et al., 2023), red spinach leaves
72 extract (Welly et al., 2022) and mangrove leaves extract (Hasibuan et al., 2024).

73 74 **2. Methods**

75 **2.1 Materials and Tools**

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76 The materials used in this study were secang wood, ethanol 96% (Merck), Sodium
77 Carboxymethyl Cellulose (CMC Na), Polyvinil Alcohol (PVA), propilenglicol, vitamin C dan 1,1-
78 difenil-2-pikrilhidrazil (DPPH) .

79 The tools used in this study were rotary evaporator (Heidolph), alat-alat gelas (Pyrex),
80 pH meter (Hanna Instrument pH 210 Microprocessor), viskometer (Brookfield DV-I Prime),
81 and spektrofotometer UV-Vis mini 1240 (Shimadzu).

82 2.2 Sengon Wood Extraction

83 The extraction method used is maceration by soaking secang wood powder using 96%
84 ethanol solvent with a ratio of 1:10. Extraction is carried out for 3x24 hours. The filtrate
85 obtained is then evaporated with a rotary evaporator until a thick extract is obtained (Tanzaq
86 et al., 2019).

87 2.3 Formulation of Peel Off Gel Masker Secang Wood Extract

88 Peel-off gel mask of secang wood extract was made by developing PVA and CMC Na (Table
89 1) in hot distilled water until fully expanded. PVA mass plus expanded propylene glycol and
90 CMC Na was stirred until homogeneous. Ethanol extract of secang wood was added little by
91 little into the peel-off gel mask base, distilled water was added until the weight of the
92 preparation was 100% and stirred until homogeneous (Cahyani et al., 2025).

93 2.4 Physical Characterization Evaluation of Peel Off Gel Mask Secang Wood Extract

94 Organoleptic

95 Observations were made on the color, odor, and dosage form of the Peel Off Gel Mask
96 Secang Wood Extract (Syam et al., 2021).

97 Homogeneity

98 Observations are made by preparing a number of preparations on object glass (Cahyani
99 & Putri, 2017). All particles are evenly dispersed on the object glass indicating a homogeneous
100 preparation (Syam et al., 2021)

101 pH

102 The pH meter electrode is dipped into the preparation until the display on the device
103 shows a constant pH value (Andini et al., 2017). Results that match the skin pH (4.5-6.5) can
104 increase acceptability when used (Silvia et al., 2021).

105 Viscosity

Commented [L1]: Sengon wood or secang wood?

Commented [L2]: What about the comparative formula? both negative and positive. Should be included in table 1 and discussion

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106 The viscosity of the preparation was measured using a Brookfield spindle 64 viscometer
107 at a speed of 1.0 rpm (Cahyani & Putri, 2017). At a viscosity of 2000-50000 cps indicates a
108 good peel-off gel mask (SNI 16-4399-1996: 1).

109 **Spreadability**

110 Observations were made on the spreading ability of 0.5 grams of the preparation placed
111 in the middle of the spreading power tester, then covered with a glass plate that had
112 previously been weighed and its weight recorded, left for one minute. The spreading ability
113 is indicated by measuring the diameter of the four sides of the spread. Do the same steps for
114 each additional 50 grams of load above it until the diameter of the spread is constant (Cahyani
115 & Putri, 2017). The ideal spread of the peel off gel mask is 5-7 cm (Silvia et al., 2021).

116 **Adhesion**

117 0.25 g preparation on a glass object is given a load pressure of 100 grams for 5 minutes
118 and then placed on the adhesive strength tester. The adhesive strength is measured by
119 recording the time when the two glass objects are released. A time of more than 1 second
120 indicates good adhesive strength of the peel off gel mask (Syam et al., 2021).

121 **Drying Time**

122 0.1 g of the preparation is applied to the arm with an area of 2.5 x 2.5 cm, then the time
123 is observed until the preparation dries (Andini et al., 2017). standard drying time for a peel-
124 off gel mask is 15-30 minutes (Silvia et al., 2021).

125 **2.5 Antioxidant Activity with DPPH (2,2-difenyl-1-picrylhydrazyl) Method**

126 The test was carried out in several stages. First, determine the maximum wavelength of
127 the DPPH 30 solution $\mu\text{g/mL}$ with a UV-Vis spectrophotometer in the 400-800 nm region.
128 Determination of operating time is done by measuring the absorption at the maximum
129 wavelength obtained using a standard solution (vitamin C) and DPPH 30 solution $\mu\text{g/mL}$ at a
130 1:1 ratio for 60 minutes.

131 An amount of 0.05 grams of the preparation was dissolved in methanol up to 50 mL and
132 diluted to obtain sample solution concentrations of 60,70,80,100 and 120 $\mu\text{g/mL}$. For each
133 concentration, DPPH 30 solution was added $\mu\text{g/mL}$ at a ratio of 1:1 and absorbance
134 measurements were carried out using a UV-Vis spectrophotometer at a maximum
135 wavelength after being incubated at room temperature for the time obtained from the results
136 of determining the operating time. The same stage was also carried out on vitamin C solutions

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137 with concentrations of 2.4,6,8,10 µg/mL as a reference standard. Determine the IC₅₀ value
138 from the results of measuring the absorbance of the sample solution and the reference
139 standard obtained (Maharani et al., 2022).

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3. Results and Discussion

3.1 Physical Characterization Evaluation of Peel Off Gel Mask Secang Wood Extract

143 Traditionally, secang wood has many health benefits, including antibacterial, anti-
144 inflammatory, anti-diabetic, tuberculosis, malaria and tetanus (Setyowati et al., 2023). In
145 addition, it is also widely used in food and cosmetics as an antioxidant (Rajput et al., 2022).
146 Secang wood contains active compounds that are included in the flavonoid group, namely
147 brazilin, brazilin, 3'-o-methylbrazilin, sappanin, chalcone, and sappan chalcone. Brazilin in
148 secang wood has an antioxidant effect (Ngamwonglumlert & Devahastin, 2023). For the
149 manufacture of secang wood extract, the maceration method using 96% ethanol (1:1) was
150 used. The peel-off gel mask has unique characteristics with the formation of a transparent,
151 elastic and easily removable film layer without rinsing which can increase the comfort of use
152 and the effectiveness of active compounds. Therefore, this study was designed to make a
153 peel-off gel mask of secang wood extract as an antioxidant F1 (2.5%) F2 (5%0 and F3 (7.5%)
154 with the results of the physical characteristics test presented in Table 2.

155 Organoleptic and homogeneity testing aims to see the physical appearance and
156 distribution of each component of a preparation. Based on table 2, the results show that the
157 three formulas give the same results. The level of comfort of using a preparation is also
158 influenced by the pH of the preparation. The higher the concentration of secang wood extract,
159 the lower the pH of the preparation as seen in Figure 1a. This occurs because the ethanol
160 extract of secang wood has a pH that tends to be acidic (2-6) (Muslimin et al., 2024), so that
161 by adding the amount of secang wood extract, the pH of the preparation will decrease. The
162 pH value of secang wood extract can affect the color of the peel-off gel mask preparation
163 produced. This effect is caused because the stability of brazilin is greatly influenced by its
164 acidity level where at pH 2-5 (yellow-orange), pH 6-7 (pink) and pH> 7 (red-violet) where the
165 degradation results of brazilin into brazilein which is red in color (Rina et al., 2017).

166 The results of the viscosity test showed an increase that was proportional to the
167 increase in the concentration of secang wood extract in the peel-off gel mask formula (Figure

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168 1b). The thick concentration of secang wood extract showed high resistance so that it would
169 affect the resistance of the preparation to flow. The viscosity of the preparation is closely
170 related to the spreadability, adhesion and drying time. The higher the viscosity, the lower the
171 spreadability (Figure 1c) and the higher the adhesion (Figure 1d) of the preparation because
172 high resistance indicates a stronger bond between particles which causes water to be trapped
173 and dry longer (Figure 1e) (Cahyani et al., 2025).

174 3.2 Antioxidant Activity of Peel Off Gel Mask Secang Wood Extract

175 Test results all formulas showed antioxidant activity included in the strong category
176 as indicated by the IC₅₀ value (Table 2) so it can be said that the selection of the peel off gel
177 mask preparation is right and the resulting formula can maintain the stability of the active
178 compound. The increase in antioxidant activity is indicated by a decrease in the IC₅₀ value
179 along with the increase in extract concentration (Figure 2). This is because the higher the
180 concentration of sengon wood extract, the higher the brazilin content in the peel off gel mask
181 preparation. Brazilin, in addition to playing a role in the color produced, is also a flavonoid
182 with high antioxidant activity and is widely used in natural skin care (Faizah et al., 2023).
183 Brazilin is a flavonoid with the ability to ward off free radicals and can inhibit enzymes
184 responsible for the production of free radicals (Hu et al., 2008)

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4. Conclusion

187 Increasing the concentration of secang wood extract has a significant effect (p-value
188 <0.05) on increasing the viscosity, adhesiveness and drying time and can reduce pH,
189 spreadability and IC₅₀ value. The antioxidant activity of all formulas is included in the strong
190 category with the IC₅₀ values of the three formulas respectively being 88, 71 µg/mL; 81.58
191 µg/mL and 79.04 µg/mL. Peel off gel mask preparation formula with good characteristics and
192 strong antioxidant activity at a concentration of 7.5% secang wood extract.

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5. References

- 195 Andini, T., Yusriadi, Y., & Yuliet, Y. (2017). Optimasi Pembentuk Film Polivinil Alkohol dan
196 Humektan Propilen Glikol pada Formula Masker Gel Peel Off Sari Buah Labu Kuning
197 (Cucurbita moschata Duchesne) sebagai Antioksidan. *Jurnal Farmasi Galenika (Galenika*
198 *Journal of Pharmacy)*, 3(2), 101–108.
- 199 Cahyani, I. M., Hanhadyanaputri, E. S., Wulan, A. H., & Sulistyarini, I. (2025). Optimization
200 Formula of Kolang-Kaling (Arenga Pinnata.) Peel Off Gel Mask with Combination PVA-
201 CMC Na As Gelling Agent on Simplex Lattice Design. *Media Farmasi Indonesia*, 20(1), 67–

BUKTI KORESPONDENSI CATATAN REVIEWER 3

- 202 75. <https://doi.org/10.53359/mfi.v20i1.316>
- 203 Cahyani, I. M., & Putri, I. D. C. (2017). Efektivitas Karbopol 940 Dalam Formula Masker Gel
204 Peel-Off Ekstrak Temu Giring (*Curcuma heyneana* Val & Zijp). *Journal of Pharmaceutical*
205 *and Medicinal Sciences*, 2(2), 48–51.
- 206 Dwi Mulyani, A., Rahayu, P., Aini, N., Purnamasari, D., Mulyani, A. D., Farmasi, J., & Mulyani,
207 A. D. (2023). Formulasi dan Evaluasi Mutu Fisik Sediaan Masker Gel Peel-Off Ekstrak Biji
208 Pinang (*Areca Catechu* L.) Sebagai Antioksidan. *Indonesian Journal of Pharmaceutical*
209 *Education*, 3(3), 2775–3670. <https://doi.org/10.37311/IJPE.V3I3.22033>
- 210 Eka, R., Susanti, E., & A'yun, Q. (2022). Formulation and Antioxidant Activity of Peel Off Gel
211 Mask from *Paederia Foetida* Extract. *JKPK (Jurnal Kimia Dan Pendidikan Kimia)*, 7(1), 12–
212 19. <https://doi.org/10.20961/JKPK.V7I1.45798>
- 213 Faizah, U. N., Maula, N. N., Mustika, R. A., & Wahyuni, S. (2023). Potensi Senyawa Antioksidan
214 Yang Terkandung Dalam Kayu Secang (*Caesalpinia sappan*) Untuk Perawatan Kulit Alami.
215 *Symbiotic: Journal of Biological Education and Science*, 4(1), 41–49.
216 <https://doi.org/10.32939/SYMBIOTIC.V4I1.90>
- 217 Hasibuan, N. E., Azka, A., Basri, & Mujiyanti, A. (2024). Aktivitas Antioksidam dan Karakteristik
218 Masker Gel Peel Off dari Ekstrak Daun Mangrove (*Avicennia marina*). *Jurnal Pengolahan*
219 *Hasil Perikanan Indonesia (JPHPI)*, 2(9), 42–55.
220 <https://doi.org/http://dx.doi.org/10.17844/jphpi.v27i9.52083>
- 221 Hu, J., Yan, X., Wang, W., Wu, H., Hua, L., & Du, L. (2008). Antioxidant Activity In Vitro of Three
222 Constituents from *Caesalpinia sappan* L. *Tsinghua Science & Technology*, 13(4), 474–479.
223 [https://doi.org/10.1016/S1007-0214\(08\)70076-2](https://doi.org/10.1016/S1007-0214(08)70076-2)
- 224 Maharani, N. P. D. S., Cahyani, I. M., & Hanhadyanaputri, E. S. (2022). Optimization of Polyvinyl
225 Alcohol (PVA) and Glycerin in Kolang Kaling Peel-Off Gel Mask Formula (*Arenga pinnata*).
226 *Journal of Food and Pharmaceutical Sciences*, 2022(3), 746–753.
227 <https://doi.org/10.22146/JFPS.5718>
- 228 Muslimin, M. K., Rahayuningsih, E., & Mindaryani, A. (2024). Optimasi proses metilasi
229 brazilein hasil ekstrak kayu secang (*Caesalpinia sappan* linn) sebagai bahan pewarna
230 merah alami untuk tekstil. *Jurnal Rekayasa Proses*, 18(2), 89–99.
231 <https://doi.org/10.22146/JREKPROS.82068>
- 232 Ngamwonglumlert, L., & Devahastin, S. (2023). Brazilein as an alternative pigment: Isolation,
233 characterization, stability enhancement and food applications. *Food Chemistry*, 398,
234 133898. <https://doi.org/10.1016/J.FOODCHEM.2022.133898>
- 235 Ningsih, W., Firmansyah, F., & Fitri, H. (2016). Formulasi Masker Peel Off dengan Beberapa
236 Konsentrasi Ekstrak Etanol Buah Naga Super Merah (*Hylocereus costaricensis* (F.A.C
237 Weber) Britton & Rose). *Scientia: Jurnal Farmasi Dan Kesehatan*, 6(1), 18.
238 <https://doi.org/10.36434/SCIENTIA.V6I1.37>
- 239 Rahmawanty, D., Yulianti, N., & Fitriana, M. (2015). Formulasi dan Evaluasi Masker Wajah
240 Peel-Off Mengandung Kuersetin dengan Variasi Konsentrasi Gelatin dan Gliserin. *Media*
241 *Farmasi: Jurnal Ilmu Farmasi*, 12(1), 17–32. <https://doi.org/10.12928/MF.V12I1.3019>
- 242 Rajput, M. S., Nirmal, N. P., Nirmal, S. J., & Santivarangkna, C. (2022). Bio-actives from
243 *Caesalpinia sappan* L.: Recent advancements in phytochemistry and pharmacology.
244 *South African Journal of Botany*, 151, 60–74.
245 <https://doi.org/10.1016/J.SAJB.2021.11.021>
- 246 Rina, O., Sanusi, I., Abdidharma, Afrizal, Utami, C., & Widodo, Y. (2017). Stabilities Natural
247 Colorant of Sappan Wood (*Caesalpinia sappan* L.) for Food and Beverages in Various pH,
248 Temperature and Matrices of Food. *International Journal of Chemtech Research*, 10(1),

BUKTI KORESPONDENSI CATATAN REVIEWER 3

- 249 98–103.
- 250 Rina, O., W., C. U., & Ansori, A. (2012). Efektifitas Ekstrak Kayu Secang (*Caesalpinia Sappan* L.)
251 Sebagai Bahan Pengawet Daging. *Jurnal Penelitian Pertanian Terapan*, 12(3).
252 <https://doi.org/10.25181/JPPT.V12I3.215>
- 253 Setyowati, N., Masyhuri, Mulyo, J. H., Irham, & Yudhistira, B. (2023). The hidden treasure of
254 wedang uwuh, an ethnic traditional drink from Java, Indonesia: Its benefits and
255 innovations. *International Journal of Gastronomy and Food Science*, 31, 100688.
256 <https://doi.org/10.1016/J.IJGFS.2023.100688>
- 257 Silvia, B. ., Dewi, M. ., & Darusman, F. (2021). Studi Literatur Pengaruh Jenis dan Konsentrasi
258 Basis terhadap Karakteristik Masker Gel Peel Off. *Prosiding Farmasi*, 148–156.
- 259 Sugiyanto, R. N., Putri, S. R., Damanik, F. S., & Sasmita, G. M. A. (2013). Aplikasi Kayu Secang
260 (*Caesalpinia Sappan* L.) dalam Upaya Prevensi Kerusakan Dna Akibat Paparan Zat
261 Potensial Karsinogenik melalui Mnpce Assay. *Pekan Ilmiah Mahasiswa Nasional Program
262 Kreativitas Mahasiswa - Penelitian 2013*.
263 <https://www.neliti.com/id/publications/171018/>
- 264 Syam, N. ., Lestari, U., & Muhaimin. (2021). Formulasi Dan Uji Sifat Masker Gel Peel-Off dari
265 Minyak Sawit Murni dengan Basis Carbomer 940. *Indonesian Journal of Pharma Science*,
266 3(1), 42–55.
- 267 Tanzaq, T. tanando, Agustina, R. D., Setiawati, K. E., & Cahyani, I. M. (2019). Uji Aktivitas
268 Penangkapan Radikal DPPH (1,1-Diphenyl-2-Picrylhrazyl) Ekstrak Etanol Kayu Secang
269 (*Caesalpinia sappan* L.). *Media Farmasi Indonesia*, 14(1), 1461–1465.
270 <https://mfi.stifar.ac.id/MFI/article/view/105/86>
- 271 Utari, F. D. (2017). Produksi Antioksidan dari Ekstrak Kayu Secang (*Caesalpinia sappan* L.)
272 Menggunakan Pengereng Berkelembaban Rendah. *Jurnal Aplikasi Teknologi Pangan*,
273 6(3). <https://doi.org/10.17728/JATP.241>
- 274 Wahdaningsih, S., Budilaksono, W., & Fahrurroji, A. (2015). Uji aktivitas antioksidan fraksi n-
275 heksana kulit buah naga merah menggunakan metode 1,1-Difenil-2-Pikrilhidrazil. *Jurnal
276 Kesehatan Khatulistiwa*, 1(2), 115–136.
277 <https://doi.org/10.26418/JURKESWA.V1I2.42997>
- 278 Welly, S., Supriyanto, & Saraswati, M. (2022). Antioxidant Test and Peel-Off Mask Formulation
279 Extract of Red Spinning (*Amaranthus tricolor* L.) Leaves with Variations of Gelling Agent
280 Types. *Joseph (Journal of Pharmacy)*, 2(1), 42–55.
- 281 Widowati, W. (Wahyu). (2011). Uji Fitokimia Dan Potensi Antioksidan Ekstrak Etanol Kayu
282 Secang (*Caesalpinia Sappan* L.). *Maranatha Journal of Medicine and Health*, 11(1),
283 151615. <https://www.neliti.com/id/publications/151615/>
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Table 1. Formulation of Peel Off Gel Masker Secang Wood Extract

Material	Formula (%)		
	I	II	III
Secang Wood Extract	2,5	5	7,5
CMC Na	1,26	1,26	1,26
PVA	6,74	6,74	6,74
Propilenglikol	4	4	4
Aqua destilata ad	100	100	100

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Table 2. Characterization and Antioxidant Activity of Peel Off Gel Mask Secang Wood Extract

Evaluation	Formula		
	I	II	III
Organoleptic	Consistency thick and soft, colour orange, odor secang smell	Consistency thick and soft, colour orange, odor secang smell	Consistency thick and soft, colour orange, odor secang smell
Homogeneity	Homogeneous	Homogeneous	Homogeneous
pH	6.4 ± 0.16	5.85 ± 0.43	5.09 ± 0.35
Viscosity (cPs)	11986.4 ± 6.02	13992.6 ± 5.13	15993.2 ± 5.36
Spreadability (cm)	5.6 ± 0.19	5.18 ± 0.33	4.52 ± 0.33
Adhesion (secon)	3.5 ± 0.13	4.2 ± 0.16	4.85 ± 0.04
Drying Time (minute)	16.06 ± 0.39	17.88 ± 0.38	19.45 ± 0.40
IC ₅₀ (µg/mL)	88.71 ± 2.06	81.58 ± 3.60	79.04 ± 1.84

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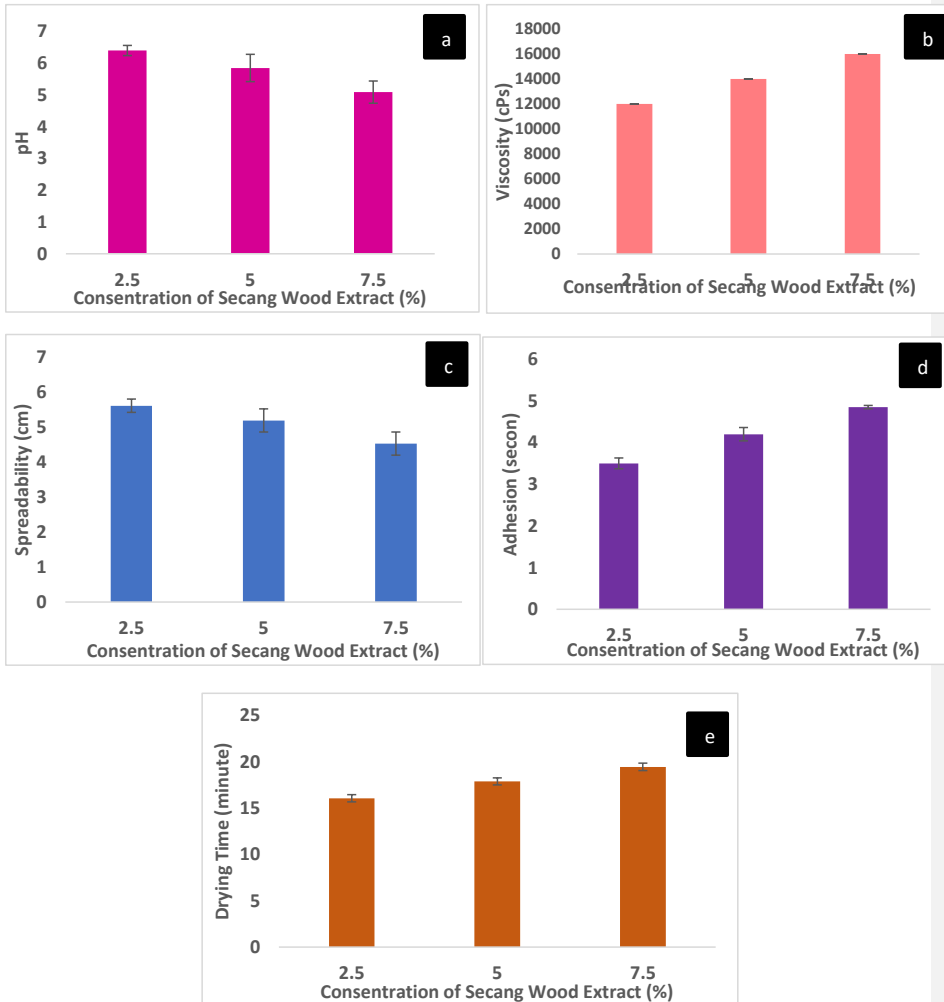
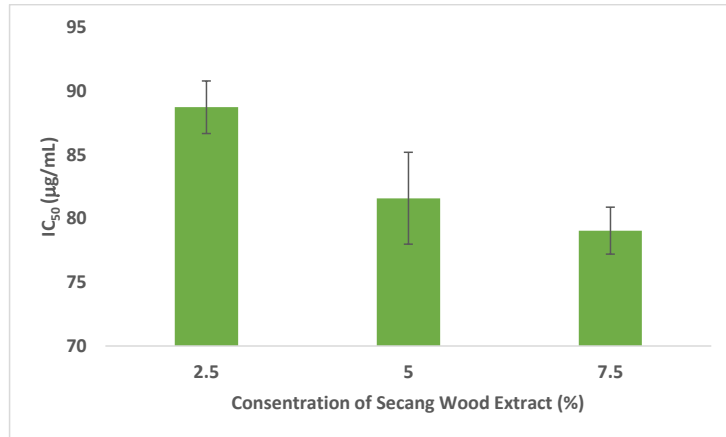


Figure 1. Characterization of Peel Off Gel Mask Secang Wood Extract: (a) pH, (b) Viscosity, (c) Spreadability, (d) Adhesion and (e) Drying Time

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Figure 2. Antioxidant activity (IC₅₀) of Peel Off Gel Mask Secang Wood Extract

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Peel Off Gel Mask Secang Wood Extract as an Antioxidant: Formulation and Characterization

Masker Gel Peel Off Ekstrak Kayu Secang sebagai Antioksidan : Formulasi dan Karakterisasi

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Abstract

Secang wood contains active compounds of the flavonoid group, namely brazilin, brazilin, 3'-O-methylbrazilin, sappanin chalcone, and sappan calchone which can be used as primary antioxidants or secondary antioxidants. Antioxidants are compounds that can inhibit oxidation reactions by binding reactive free radicals. Increasing the value of the benefits of secang wood as an antioxidant can be done by developing a topical preparation formulation. Peel-off gel mask is the right topical preparation because in addition to maintaining skin health, it can also increase effectiveness and comfort during use. The study aims to determine the formula of a peel-off gel mask with secang wood extract as an antioxidant with good characteristics. The formulation of the peel-off gel mask was made with a concentration of secang wood extract of 2.5%; 5% and 7.5% using sodium carboxymethyl cellulose, polyvinyl alcohol and propylene glycol as a base. The preparation of the peel-off gel mask with secang wood extract produced was then tested with several parameters to determine the physical characteristics and antioxidant activity. The results showed that the higher the concentration of secang wood extract, the more significant the effect (p -value < 0.05) on increasing viscosity, adhesiveness and drying time and can reduce pH, spreadability and IC_{50} value. The antioxidant activity of all formulas is included in the strong category were the IC_{50} value (50-100 $\mu\text{g/mL}$) and the third formula respectively are 88, 71 $\mu\text{g/mL}$; 81.58 $\mu\text{g/mL}$ and 79.04 $\mu\text{g/mL}$.

Keywords: Secang wood, Formulation, Peel off gel mask, Antioxidants, Physical characteristics

Abstrak

Kayu secang mengandung senyawa aktif golongan flavonoid yaitu brazilin, brazilin, 3'-O-metilbrazilin, sappanin chalcone, dan sappan calchone yang dapat digunakan sebagai antioksidan primer maupun antioksidan sekunder. Antioksidan merupakan senyawa yang dapat menghambat reaksi oksidasi dengan mengikat radikal bebas yang reaktif. Peningkatan nilai manfaat kayu secang sebagai antioksidan dapat dilakukan dengan pengembangan formulasi sediaan topikal. Masker gel peel-off merupakan sediaan topikal yang tepat karena selain dapat menjaga kesehatan kulit juga dapat meningkatkan efektivitas dan kenyamanan saat penggunaan. Penelitian bertujuan untuk mengetahui formula masker gel peel off ekstrak kayu secang sebagai antioksidan dengan karakteristik yang baik. Formulasi masker gel peel off dibuat dengan konsentrasi ekstrak kayu secang 2.5%; 5% dan 7.5% menggunakan natrium karboksimetil selulosa, polivinil alkohol dan propilen glikol sebagai basis. Sediaan masker gel peel off ekstrak kayu secang yang dihasilkan selanjutnya dilakukan pengujian dengan beberapa parameter untuk mengetahui karakteristik fisik dan aktivitas antioksidan. Hasil menunjukkan semakin tinggi konsentrasi ekstrak kayu secang berpengaruh signifikan (p -value $< 0,05$) pada peningkatan viskositas, daya lekat dan waktu mengering serta dapat

45 menurunkan pH, daya sebar dan nilai IC₅₀. Aktivitas antioksidan semua formula termasuk
46 dalam kategori kuat dimana nilai IC₅₀ (50-100 µg/mL) dan pada ketiga formula berturut-turut
47 adalah 88.71 µg/mL; 81.58 µg/mL dan 79.04 µg/mL.

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49 **Kata Kunci:** Kayu secang, Formulasi, Masker gel peel off, antioksidan, karakteristik fisik

50

1. Introduction

51 Air pollution is currently experiencing a significant increase, reaching 20%. Low air
52 quality can have a negative impact because long-term exposure can cause health problems
53 (Wahdaningsih et al., 2015). One of the mechanisms is the occurrence of oxidative stress in
54 the body. The high level of air pollution today can cause the formation of free radicals so it
55 needs to be balanced with natural antioxidant intake to prevent oxidative damage which is a
56 trigger for various diseases, especially skin disorders (Widowati, 2011). Flavonoids are natural
57 compounds that have the ability as antioxidants by inhibiting the formation of free radicals
58 hydroxyl, peroxide, alkoxyl, superoxide anions, oxygen singkets and hydrogen peroxide (Utari,
59 2017).

60 Secang wood contains active compounds of the flavonoid group which can be used as
61 primary antioxidants or secondary antioxidants. The presence of brazilin components in
62 secang wood has the effect of protecting the body from poisoning due to free radicals (Rina
63 et al., 2012). Has reliable antioxidant power with a higher antioxidant index than commercial
64 antioxidants (BHT and BHA) so it has the potential as a free radical scavenging agent
65 (Sugiyanto et al., 2013). Secang wood extract has been proven effective as an antioxidant with
66 an IC₅₀ value of 74,44 µg/mL (Tanzaq et al., 2019).

67 Mask is one of the cosmetics for facial skin care. However, the use of masks is generally
68 less efficient. The demands of market needs with today's lifestyle are not only effective but
69 easy, comfortable and flexible in their use. Peel off gel mask is the result of the development
70 of facial skin care products that can answer these challenges (Ningsih et al., 2016). Peel off
71 gel mask is a type of facial mask that has the advantage of being easy to remove or lift like an
72 elastic membrane (Rahmawanty et al., 2015). Several studies have proven that peel off gel
73 mask preparations can increase the effectiveness of antioxidants, including Paedaria fotida
74 extract (Eka et al., 2022), areca seed extract (Dwi Mulyani et al., 2023), red spinach leaves
75 extract (Welly et al., 2022) and mangrove leaves extract (Hasibuan et al., 2024).

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2. Methods

2.1 Materials and Tools

The materials used in this study were secang wood, ethanol 96% (Merck), Sodium Carboxymethyl Cellulose (CMC Na), Polyvinil Alcohol (PVA), propilenglicol, vitamin C dan 1,1-difenil-2-pikrilhidrazil (DPPH) .

The tools used in this study were rotary evaporator (Heidolph), alat-alat gelas (Pyrex), pH meter (Hanna Instrument pH 210 Microprocessor), viskometer (Brookfield DV-I Prime), and spektrofotometer UV-Vis mini 1240 (Shimadzu).

2.2 Secang Wood Extraction

The extraction method used is maceration by soaking secang wood powder using 96% ethanol solvent with a ratio of 1:10. Extraction is carried out for 3x24 hours. The filtrate obtained is then evaporated with a rotary evaporator until a thick extract is obtained (Tanzaq et al., 2019).

2.3 Formulation of Peel Off Gel Masker Secang Wood Extract

Peel-off gel mask of secang wood extract was made by developing PVA and CMC Na (Table 1) in distilled water (80°C) until fully expanded. PVA mass plus expanded propylene glycol and CMC Na was stirred until homogeneous. Ethanol extract of secang wood was added little by little into the peel-off gel mask base, distilled water was added until the weight of the preparation was 100% and stirred until homogeneous (Cahyani et al., 2025).

2.4 Physical Characterization Evaluation of Peel Off Gel Mask Secang Wood Extract

Organoleptic

Observations were made on the color, odor, and dosage form of the Peel Off Gel Mask Secang Wood Extract (Syam et al., 2021).

Homogeneity

Observations are made by preparing a number of preparations on object glass (Cahyani & Putri, 2017). All particles are evenly dispersed on the object glass indicating a homogeneous preparation (Syam et al., 2021)

pH

106 The pH meter electrode is dipped into the preparation until the display on the device
107 shows a constant pH value (Andini et al., 2017). Results that match the skin pH (4.5-6.5) can
108 increase acceptability when used (Silvia et al., 2021).

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110 **Viscosity**

111 The viscosity of the preparation was measured using a Brookfield spindle 64 viscometer
112 at a speed of 1.0 rpm (Cahyani & Putri, 2017). At a viscosity of 2000-50000 cps indicates a
113 good peel-off gel mask (SNI 16-4399-1996: 1).

114 **Spreadability**

115 Observations were made on the spreading ability of 0.5 grams of the preparation placed
116 in the middle of the spreading power tester, then covered with a glass plate that had
117 previously been weighed and its weight recorded, left for one minute. The spreading ability
118 is indicated by measuring the diameter of the four sides of the spread. Do the same steps for
119 each additional 50 grams of load above it until the diameter of the spread is constant (Cahyani
120 & Putri, 2017). The ideal spread of the peel off gel mask is 5-7 cm (Silvia et al., 2021).

121 **Adhesion**

122 0.25 g preparation on a glass object is given a load pressure of 100 grams for 5 minutes
123 and then placed on the adhesive strength tester. The adhesive strength is measured by
124 recording the time when the two glass objects are released. A time of more than 1 second
125 indicates good adhesive strength of the peel off gel mask (Syam et al., 2021).

126 **Drying Time**

127 0.1 g of the preparation is applied to the arm with an area of 2.5 x 2.5 cm, then the time
128 is observed until the preparation dries (Andini et al., 2017). standard drying time for a peel-
129 off gel mask is 15-30 minutes (Silvia et al., 2021).

130 **2.5 Antioxidant Activity with DPPH (2,2-difenyl-1-picrylhydrazyl) Method**

131 The test was carried out in several stages. First, determine the maximum wavelength of
132 the DPPH 30 solution $\mu\text{g/mL}$ with a UV-Vis spectrophotometer in the 400-800 nm region.
133 Determination of operating time is done by measuring the absorption at the maximum
134 wavelength obtained using a standard solution (vitamin C) and DPPH 30 solution $\mu\text{g/mL}$ at a
135 1:1 ratio for 60 minutes.

136 An amount of 0.05 grams of the preparation was dissolved in methanol up to 50 mL and
137 diluted to obtain sample solution concentrations of 60,70,80,100 and 120 $\mu\text{g}/\text{mL}$. For each
138 concentration, DPPH 30 solution was added $\mu\text{g}/\text{mL}$ at a ratio of 1:1 and absorbance
139 measurements were carried out using a UV-Vis spectrophotometer at a maximum
140 wavelength after being incubated at room temperature for the time obtained from the results
141 of determining the operating time. The same stage was also carried out on vitamin C solutions
142 with concentrations of 2.4,6,8,10 $\mu\text{g}/\text{mL}$ as a reference standard. Determine the IC_{50} value
143 from the results of measuring the absorbance of the sample solution and the reference
144 standard obtained (Maharani et al., 2022).

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3. Results and Discussion

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3.1 Physical Characterization Evaluation of Peel Off Gel Mask Secang Wood Extract

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Traditionally, secang wood has many health benefits, including antibacterial, anti-inflammatory, anti-diabetic, tuberculosis, malaria and tetanus (Setyowati et al., 2023). In addition, it is also widely used in food and cosmetics as an antioxidant (Rajput et al., 2022). Secang wood contains active compounds that are included in the flavonoid group, namely brazilin, brazilin, 3'-o-methylbrazilin, sappanin, chalcone, and sappan chalcone. Brazilin in secang wood has an antioxidant effect (Ngamwonglumlert & Devahastin, 2023). For the manufacture of secang wood extract, the maceration method using 96% ethanol (1:1) was used. The peel-off gel mask has unique characteristics with the formation of a transparent, elastic and easily removable film layer without rinsing which can increase the comfort of use and the effectiveness of active compounds. Therefore, this study was designed to make a peel-off gel mask of secang wood extract as an antioxidant F1 (2.5%) F2 (5%) and F3 (7.5%) with the results of the physical characteristics test presented in Table 2.

160

Gelling agents used in the peel-off gel mask formulation are PVA and CMC Na (Table 1).

161

PVA is a hydrophilic polymer with adhesive properties that are easy to peel off when dry and

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provide a film layer effect called the peel-off effect (Anindhita et al., 2023). However, the film

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layer formed tends to be stiff and easily broken (Sinambela & Telaumbanua, 2022).

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Carboxymethyl Cellulose Sodium (CMC Na) is a hydrophilic polymer with a more stable

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viscosity in the long term (Eryani et al., 2023) so that it can increase the elasticity of the PVA

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layer formed as reported in previous studies (Cahyani et al., 2025).

167 Organoleptic and homogeneity testing aims to see the physical appearance and
168 distribution of each component of a preparation. Based on table 2, the results show that the
169 three formulas give the same results. The level of comfort of using a preparation is also
170 influenced by the pH of the preparation. The higher the concentration of secang wood extract,
171 the lower the pH of the preparation as seen in Figure 1a. This occurs because the ethanol
172 extract of secang wood has a pH that tends to be acidic (2-6) (Muslimin et al., 2024), so that
173 by adding the amount of secang wood extract, the pH of the preparation will decrease. The
174 pH value of secang wood extract can affect the color of the peel-off gel mask preparation
175 produced. This effect is caused because the stability of brazilin is greatly influenced by its
176 acidity level where at pH 2-5 (yellow-orange), pH 6-7 (pink) and pH > 7 (red-violet) where the
177 degradation results of brazilin into brazilein which is red in color (Rina et al., 2017).

178 The results of the viscosity test showed an increase that was proportional to the
179 increase in the concentration of secang wood extract in the peel-off gel mask formula (Figure
180 1b). The thick concentration of secang wood extract showed high resistance so that it would
181 affect the resistance of the preparation to flow. The viscosity of the preparation is closely
182 related to the spreadability, adhesion and drying time. The higher the viscosity, the lower the
183 spreadability (Figure 1c) and the higher the adhesion (Figure 1d) of the preparation because
184 high resistance indicates a stronger bond between particles which causes water to be trapped
185 and dry longer (Figure 1e) (Cahyani et al., 2025).

186 **3.2 Antioxidant Activity of Peel Off Gel Mask Secang Wood Extract**

187 Test results all formulas showed antioxidant activity included in the strong category
188 as indicated by the IC₅₀ value. The determination of the antioxidant activity category is based
189 on IC₅₀ where it is very strong (<50 µg/mL), strong (50-100 µg/mL), moderate (100-150 µg/mL)
190 and weak (151-200 µg/mL) (Puspitasari & Wulandari, 2017). IC₅₀ value of the three formulas
191 in Table 2. indicated that the selection of the peel off gel mask preparation is right and the
192 resulting formula can maintain the stability of the active compound. The increase in
193 antioxidant activity is indicated by a decrease in the IC₅₀ value along with the increase in
194 extract concentration (Figure 2). This is because the higher the concentration of secang wood
195 extract, the higher the brazilin content in the peel off gel mask preparation. Brazilin, in
196 addition to playing a role in the color produced, is also a flavonoid with high antioxidant
197 activity and is widely used in natural skin care (Faizah et al., 2023). Brazilin is a flavonoid with

198 the ability to ward off free radicals and can inhibit enzymes responsible for the production of
 199 free radicals (Hu et al., 2008). Several previous studies were limited to characterization of the
 200 preparation and did not determine the antioxidant activity in the formulation peel off gel
 201 mask (Ermawati & Adi, 2023). The formulation of sappanwood extract in the peel-off gel mask
 202 preparation was considered appropriate because the IC₅₀ value of the preparation was close
 203 to the IC₅₀ of the extract (74.44 µg/mL). However, when compared, vitamin C is still stronger
 204 as a comparative standard in the very strong category 3.04 µg/mL (Tanzaq et al., 2019).

205 4. Conclusion

206 Increasing the concentration of secang wood extract has a significant effect (p-value
 207 <0.05) on increasing the viscosity, adhesiveness and drying time and can reduce pH,
 208 spreadability and IC₅₀ value. The antioxidant activity of all formulas is included in the strong
 209 category with the IC₅₀ values of the three formulas respectively being 88, 71 µg/mL; 81.58
 210 µg/mL and 79.04 µg/mL. Peel off gel mask preparation formula with good characteristics and
 211 strong antioxidant activity at a concentration of 7.5% secang wood extract.

212 5. References

- 214 Andini, T., Yusriadi, Y., & Yuliet, Y. (2017). Optimasi Pembentuk Film Polivinil Alkohol dan
 215 Humektan Propilen Glikol pada Formula Masker Gel Peel Off Sari Buah Labu Kuning
 216 (Cucurbita moschata Duchesne) sebagai Antioksidan. *Jurnal Farmasi Galenika (Galenika
 217 Journal of Pharmacy)*, 3(2), 101–108.
- 218 Anindhita, M. A., Prastiwi, D., Lu, N., Fitriyani, L., Nanda Rini, S., & Farmasi Universitas
 219 Pekalongan, F. (2023). Pengaruh Penggunaan Polivinil Alkohol sebagai Gelling Agent
 220 terhadap Sifat Fisikokimia sediaan Gel Peel-off Ekstrak Etanol Buah Pedada.
 221 *Parapemikir : Jurnal Ilmiah Farmasi*, 12(1), 18–29.
 222 <https://doi.org/10.30591/PJIF.V12I1.3990>
- 223 Cahyani, I. M., Hanhadyanaputri, E. S., Wulan, A. H., & Sulistyarini, I. (2025). Optimization
 224 Formula of Kolang-Kaling (Arenga Pinnata.) Peel Off Gel Mask with Combination PVA-
 225 CMC Na As Gelling Agent on Simplex Lattice Design. *Media Farmasi Indonesia*, 20(1), 67–
 226 75. <https://doi.org/10.53359/mfi.v20i1.316>
- 227 Cahyani, I. M., & Putri, I. D. C. (2017). Efektivitas Karbopol 940 Dalam Formula Masker Gel
 228 Peel-Off Ekstrak Temu Giring (Curcuma heyneana Val & Zijp). *Journal of Pharmaceutical
 229 and Medicinal Sciences*, 2(2), 48–51.
- 230 Dwi Mulyani, A., Rahayu, P., Aini, N., Purnamasari, D., Mulyani, A. D., Farmasi, J., & Mulyani,
 231 A. D. (2023). Formulasi dan Evaluasi Mutu Fisik Sediaan Masker Gel Peel-Off Ekstrak Biji
 232 Pinang (Areca Catechu L.) Sebagai Antioksidan. *Indonesian Journal of Pharmaceutical
 233 Education*, 3(3), 2775–3670. <https://doi.org/10.37311/IJPE.V3I3.22033>
- 234 Eka, R., Susanti, E., & A'yun, Q. (2022). Formulation and Antioxidant Activity of Peel Off Gel
 235 Mask from Paederia Foetida Extract. *JKPK (Jurnal Kimia Dan Pendidikan Kimia)*, 7(1), 12–
 236 19. <https://doi.org/10.20961/JKPK.V7I1.45798>

- 237 Ermawati, D. E., & Adi, L. P. (2023). Pengaruh Konsentrasi Polivinil Alkohol terhadap Sifat Fisik
238 dan Kimia Sediaan Peel-off Mask Ekstrak Etanol Kayu Secang (*Caesalpinia sappan* L.).
239 *Journal of Applied Agriculture, Health, and Technology*, 2(1), 43–53.
- 240 Eryani, M. C., Maulani, D., & Ningsih, A. D. R. (2023). Pengaruh Variasi Konsentrasi CMC Na
241 Terhadap Sifat Fisik Masker Gel Peel Off Vitamin C. *MEDFARM: Jurnal Farmasi Dan*
242 *Kesehatan*, 12(2), 172–180.
- 243 Faizah, U. N., Maula, N. N., Mustika, R. A., & Wahyuni, S. (2023). Potensi Senyawa Antioksidan
244 Yang Terkandung Dalam Kayu Secang (*Caesalpinia sappan*) Untuk Perawatan Kulit Alami.
245 *Symbiotic: Journal of Biological Education and Science*, 4(1), 41–49.
246 <https://doi.org/10.32939/SYMBIOTIC.V4I1.90>
- 247 Hasibuan, N. E., Azka, A., Basri, & Mujiyanti, A. (2024). Aktivitas Antioksidan dan Karakteristik
248 Masker Gel Peel Off dari Ekstrak Daun Mangrove (*Avicennia marina*). *Jurnal Pengolahan*
249 *Hasil Perikanan Indonesia (JPHPI)*, 2(9), 42–55.
250 <https://doi.org/http://dx.doi.org/10.17844/jphpi.v27i9.52083>
- 251 Hu, J., Yan, X., Wang, W., Wu, H., Hua, L., & Du, L. (2008). Antioxidant Activity In Vitro of Three
252 Constituents from *Caesalpinia sappan* L. *Tsinghua Science & Technology*, 13(4), 474–479.
253 [https://doi.org/10.1016/S1007-0214\(08\)70076-2](https://doi.org/10.1016/S1007-0214(08)70076-2)
- 254 Maharani, N. P. D. S., Cahyani, I. M., & Hanhadyanaputri, E. S. (2022). Optimization of Polyvinyl
255 Alcohol (PVA) and Glycerin in Kolang Kaling Peel-Off Gel Mask Formula (*Arenga pinnata*).
256 *Journal of Food and Pharmaceutical Sciences*, 2022(3), 746–753.
257 <https://doi.org/10.22146/JFPS.5718>
- 258 Muslimin, M. K., Rahayuningsih, E., & Mindaryani, A. (2024). Optimasi proses metilasi
259 brazilein hasil ekstrak kayu secang (*Caesalpinia sappan* linn) sebagai bahan pewarna
260 merah alami untuk tekstil. *Jurnal Rekayasa Proses*, 18(2), 89–99.
261 <https://doi.org/10.22146/JREKPROS.82068>
- 262 Ngamwonglumlert, L., & Devahastin, S. (2023). Brazilein as an alternative pigment: Isolation,
263 characterization, stability enhancement and food applications. *Food Chemistry*, 398,
264 133898. <https://doi.org/10.1016/J.FOODCHEM.2022.133898>
- 265 Ningsih, W., Firmansyah, F., & Fitri, H. (2016). Formulasi Masker Peel Off dengan Beberapa
266 Konsentrasi Ekstrak Etanol Buah Naga Super Merah (*Hylocereus costaricensis* (F.A.C
267 Weber) Britton & Rose). *Scientia: Jurnal Farmasi Dan Kesehatan*, 6(1), 18.
268 <https://doi.org/10.36434/SCIENTIA.V6I1.37>
- 269 Puspitasari, A. D., & Wulandari, R. L. (2017). Aktivitas Antioksidan dan Penetapan Kadar
270 Flavonoid Total Ekstrak Etil Asetat Daun Kersen (*Muntingia calabura*). *Jurnal*
271 *Pharmascience*, 4(2). <https://doi.org/10.20527/JPS.V4I2.5770>
- 272 Rahmawanty, D., Yulianti, N., & Fitriana, M. (2015). Formulasi dan Evaluasi Masker Wajah
273 Peel-Off Mengandung Kuersetin dengan Variasi Konsentrasi Gelatin dan Gliserin. *Media*
274 *Farmasi: Jurnal Ilmu Farmasi*, 12(1), 17–32. <https://doi.org/10.12928/MF.V12I1.3019>
- 275 Rajput, M. S., Nirmal, N. P., Nirmal, S. J., & Santivarangkna, C. (2022). Bio-actives from
276 *Caesalpinia sappan* L.: Recent advancements in phytochemistry and pharmacology.
277 *South African Journal of Botany*, 151, 60–74.
278 <https://doi.org/10.1016/J.SAJB.2021.11.021>
- 279 Rina, O., Sanusi, I., Abdidharma, Afrizal, Utami, C., & Widodo, Y. (2017). Stabilities Natural
280 Colorant of Sappan Wood (*Caesalpinia sappan* L.) for Food and Beverages in Various pH,
281 Temperature and Matrices of Food. *International Journal of Chemtech Research*, 10(1),
282 98–103.
- 283 Rina, O., W., C. U., & Ansori, A. (2012). Efektifitas Ekstrak Kayu Secang (*Caesalpinia Sappan* L.)

- 284 Sebagai Bahan Pengawet Daging. *Jurnal Penelitian Pertanian Terapan*, 12(3).
285 <https://doi.org/10.25181/JPPT.V12I3.215>
- 286 Setyowati, N., Masyhuri, Mulyo, J. H., Irham, & Yudhistira, B. (2023). The hidden treasure of
287 wedang uwuh, an ethnic traditional drink from Java, Indonesia: Its benefits and
288 innovations. *International Journal of Gastronomy and Food Science*, 31, 100688.
289 <https://doi.org/10.1016/J.IJGFS.2023.100688>
- 290 Silvia, B. ., Dewi, M. ., & Darusman, F. (2021). Studi Literatur Pengaruh Jenis dan Konsentrasi
291 Basis terhadap Karakteristik Masker Gel Peel Off. *Prosiding Farmasi*, 148–156.
- 292 Sinambela, E. S., & Telaumbanua, D. (2022). Pengaruh Variasi Konsentrasi PVA dan HPMC
293 Terhadap Stabilitas Fisik Masker Gel Peel-Off Ekstrak Metanol Biji Pepaya (Carica papaya
294 L.). *Journal Health Of Education*, 3(2), 1–4.
- 295 Sugiyanto, R. N., Putri, S. R., Damanik, F. S., & Sasmita, G. M. A. (2013). Aplikasi Kayu Secang
296 (Caesalpinia Sappan L.) dalam Upaya Prevensi Kerusakan Dna Akibat Paparan Zat
297 Potensial Karsinogenik melalui Mnpce Assay. *Pekan Ilmiah Mahasiswa Nasional Program
298 Kreativitas Mahasiswa - Penelitian 2013*.
299 <https://www.neliti.com/id/publications/171018/>
- 300 Syam, N. ., Lestari, U., & Muhaimin. (2021). Formulasi Dan Uji Sifat Masker Gel Peel-Off dari
301 Minyak Sawit Murni dengan Basis Carbomer 940. *Indonesian Journal of Pharma Science*,
302 3(1), 42–55.
- 303 Tanzaq, T. tanando, Agustina, R. D., Setiawati, K. E., & Cahyani, I. M. (2019). Uji Aktivitas
304 Penangkapan Radikal DPPH (1,1-Diphenyl-2-Picrylhdrazyl) Ekstrak Etanol Kayu Secang
305 (Caesalpinia sappan L.). *Media Farmasi Indonesia*, 14(1), 1461–1465.
306 <https://mfi.stifar.ac.id/MFI/article/view/105/86>
- 307 Utari, F. D. (2017). Produksi Antioksidan dari Ekstrak Kayu Secang (Caesalpinia sappan L.)
308 Menggunakan Pengereng Berkelembaban Rendah. *Jurnal Aplikasi Teknologi Pangan*,
309 6(3). <https://doi.org/10.17728/JATP.241>
- 310 Wahdaningsih, S., Budilaksono, W., & Fahrurroji, A. (2015). Uji aktivitas antioksidan fraksi n-
311 heksana kulit buah naga merah menggunakan metode 1,1-Difenil-2-Pikrilhidrazil. *Jurnal
312 Kesehatan Khatulistiwa*, 1(2), 115–136.
313 <https://doi.org/10.26418/JURKESWA.V1I2.42997>
- 314 Welly, S., Supriyanto, & Saraswati, M. (2022). Antioxidant Test and Peel-Off Mask Formulation
315 Extract of Red Spinning (Amaranthus tricolor L.) Leaves with Variations of Gelling Agent
316 Types. *Joseph (Journal of Pharmacy)*, 2(1), 42–55.
- 317 Widowati, W. (Wahyu). (2011). Uji Fitokimia Dan Potensi Antioksidan Ekstrak Etanol Kayu
318 Secang (Caesalpinia Sappan L.). *Maranatha Journal of Medicine and Health*, 11(1),
319 151615. <https://www.neliti.com/id/publications/151615/>

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Table 1. Formulation of Peel Off Gel Masker Secang Wood Extract

Material	Formula (%)		
	I	II	III
Secang Wood Extract	2,5	5	7,5
CMC Na	1,26	1,26	1,26
PVA	6,74	6,74	6,74
Propilenglikol	4	4	4
Aqua destilata ad	100	100	100

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Table 2. Characterization and Antioxidant Activity of Peel Off Gel Mask Secang Wood Extract

Evaluation	Formula		
	I	II	III
Organoleptic	Consistency thick and soft, colour orange, odor secang smell	Consistency thick and soft, colour orange, odor secang smell	Consistency thick and soft, colour orange, odor secang smell
Homogeneity	Homogeneous	Homogeneous	Homogeneous
pH	6.4 ± 0.16	5.85 ± 0.43	5.09 ± 0.35
Viscosity (cPs)	11986.4 ± 6.02	13992.6 ± 5.13	15993.2 ± 5.36
Spreadability (cm)	5.6 ± 0.19	5.18 ± 0.33	4.52 ± 0.33
Adhesion (secon)	3.5 ± 0.13	4.2 ± 0.16	4.85 ± 0.04
Drying Time (minute)	16.06 ± 0.39	17.88 ± 0.38	19.45 ± 0.40
IC ₅₀ (µg/mL)	88.71 ± 2.06	81.58 ± 3.60	79.04 ± 1.84

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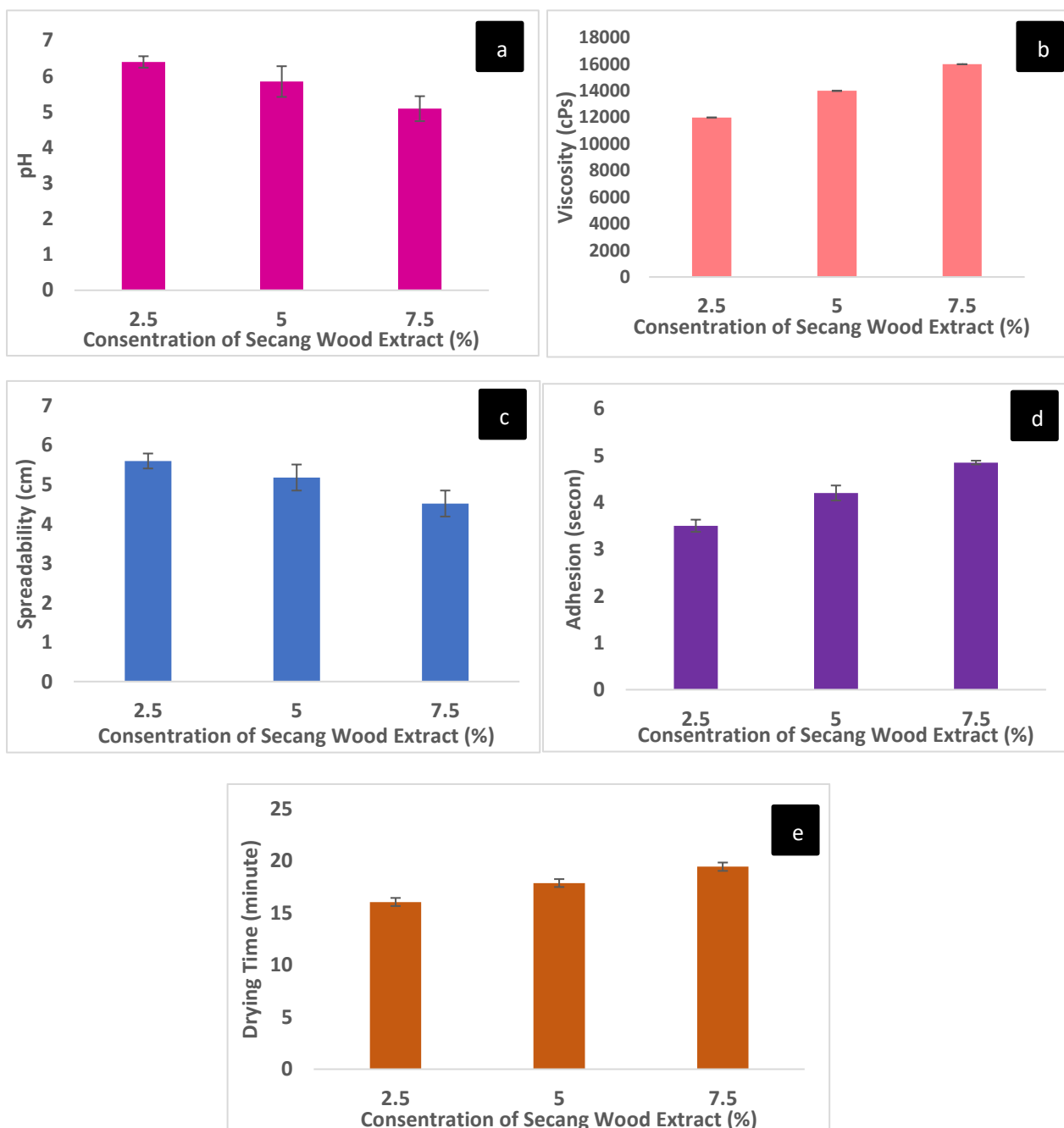
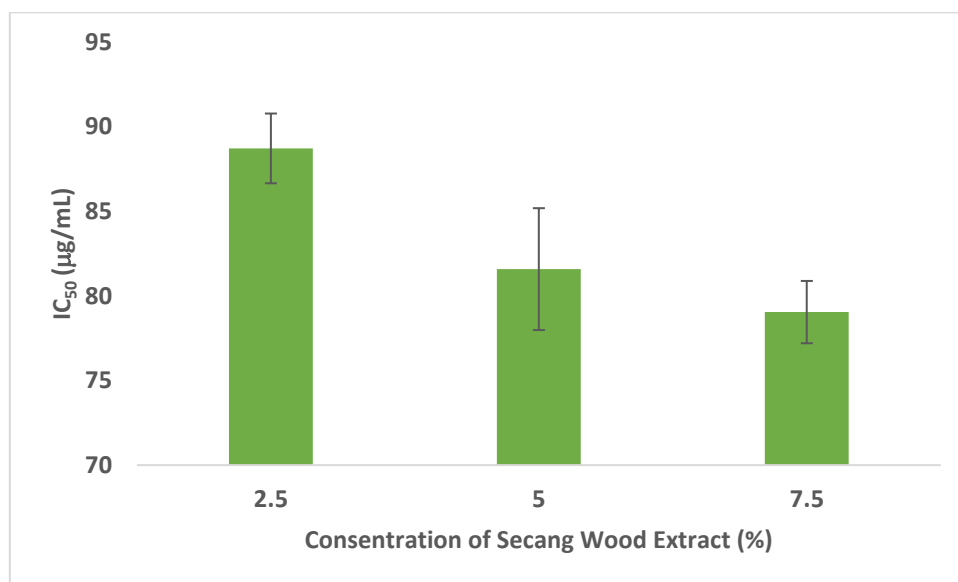


Figure 1. Characterization of Peel Off Gel Mask Secang Wood Extract: (a) pH, (b) Viscosity, (c) Spreadability, (d) Adhesion and (e) Drying Time

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Figure 2. Antioxidant activity (IC₅₀) of Peel Off Gel Mask Secang Wood Extract

Responses to Reviewers' and Editorial Comments

Journal name : Journal Jamu Indonesia
 Manuscript Title : Peel Off Gel Mask Secang Wood Extract as an Antioxidant: Formulation and Characterization
 Manuscript No : 403
 Type of paper : Original Article
 Authors Name : Intan Martha Cahyani, Tan Tanando Tanzaq, Ruth Ditya Agustina, Kemala Endar Setiawati

Reviewer Code	Original comments of the reviewer	Reply by the author(s)	Changes done on page number and line number
3437	Remove "Sengon" and change with "Secang"	we rewrite as suggested	Line 86
3437	What about the comparative formula?both negative and positive. Should be included in table 1 and discussion	we added to the result and discussion as suggested	Line 160-166
3437	Need to be compared with previous research in the section discussion ” Physical Characterization Evaluation of Peel Off Gel Mask Secang Wood Extract”	we added to the result and discussion as suggested	Line 165-166
3437	Need to be compared with previous research in the section discussion ” Antioxidant Activity of Peel Off Gel Mask Secang Wood Extract”	we added to the result and discussion as suggested	Line 199-204
3438	Remove "Sengon" and change with "Secang"	we rewrite as suggested	Line 86
3438	How is the analysis of vitamin C as a standard against the three formulas?	we added to the result and discussion as suggested	Line 203-204
3438	Remove "Sengon" and change with "Secang"	we rewrite as suggested	Line 194

BUKTI KORESPONDENSI RESPONSES TO REVIEWERS' AND EDITORIAL COMMENTS

3440	It has not been stated what the vulnerable value is if it is classified as a strong category in the abstract	we added to the abstract as suggested	Line 25 dan 46
3440	Write down the novelty of this research that distinguishes it from previous studies that used secang wood as a peel off gel mask	we added to the result and discussion as suggested	Line 199-204
3440	explanation for table 1 has not been included in the research results	we added to the result and discussion as suggested	Line 160-166
3440	It has not been explained on what basis the antioxidants obtained are categorized as strong, medium, or weak.	we added to the result and discussion as suggested	Line 188-190

Note : Highlighted yellow for changes to response reviewer.

EDITOR'S COMMENTS ON FIRST REVISED MANUSCRIPT

1 Peel Off Gel Mask Secang Wood Extract as an Antioxidant: Formulation and 2 Characterization

3 Masker Gel Peel Off Ekstrak Kayu Secang sebagai Antioksidan : Formulasi dan 4 Karakterisasi

5 Intan Martha Cahyani^{1*}, Tan Tanando Tanzaq¹, Ruth Ditya Agustina¹, Kemala Endar Setiawati¹

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8 Abstract

9
10 Secang wood contains active compounds of the flavonoid group, namely brazilin, brazilin, 3'-
11 O-methylbrazilin, sappanin chalcone, and sappan calchone which can be used as primary
12 antioxidants or secondary antioxidants. Antioxidants are compounds that can inhibit
13 oxidation reactions by binding reactive free radicals. Increasing the value of the benefits of
14 secang wood as an antioxidant can be done by developing a topical preparation formulation.
15 Peel-off gel mask is the right topical preparation because in addition to maintaining skin
16 health, it can also increase effectiveness and comfort during use. The study aims to determine
17 the formula of a peel-off gel mask with secang wood extract as an antioxidant with good
18 characteristics. The formulation of the peel-off gel mask was made with a concentration of
19 secang wood extract of 2.5%; 5% and 7.5% using sodium carboxymethyl cellulose, polyvinyl
20 alcohol and propylene glycol as a base. The preparation of the peel-off gel mask with secang
21 wood extract produced was then tested with several parameters to determine the physical
22 characteristics and antioxidant activity. The results showed that the higher the concentration
23 of secang wood extract, the more significant the effect (p-value <0.05) on increasing viscosity,
24 adhesiveness and drying time and can reduce pH, spreadability and IC₅₀ value. The antioxidant
25 activity of all formulas is included in **the strong category were the IC₅₀ value (50-100 µg/mL)**
26 and the third formula respectively are 88, 71 µg/mL; 81.58 µg/mL and 79.04 µg/mL.

27
28 Keywords: Secang wood, Formulation, Peel off gel mask, Antioxidants, Physical characteristics

29 Abstrak

30 Kayu secang mengandung senyawa aktif golongan flavonoid yaitu brazilin, brazilin, 3'-O-
31 metilbrazilin, sappanin chalcone, dan sappan calchone yang dapat digunakan sebagai
32 antioksidan primer maupun antioksidan sekunder. Antioksidan merupakan senyawa yang
33 dapat menghambat reaksi oksidasi dengan mengikat radikal bebas yang reaktif. Peningkatan
34 nilai manfaat kayu secang sebagai antioksidan dapat dilakukan dengan pengembangan
35 formulasi sediaan topikal. Masker gel peel-off merupakan sediaan topikal yang tepat karena
36 selain dapat menjaga kesehatan kulit juga dapat meningkatkan efektivitas dan kenyamanan
37 saat penggunaan. Penelitian bertujuan untuk mengetahui formula masker gel peel off ekstrak
38 kayu secang sebagai antioksidan dengan karakteristik yang baik. Formulasi masker gel peel
39 off dibuat dengan konsentrasi ekstrak kayu secang 2.5%; 5% dan 7.5% menggunakan natrium
40 karboksimetil selulosa, polivinil alkohol dan propilen glikol sebagai basis. Sediaan masker gel
41 peel off ekstrak kayu secang yang dihasilkan selanjutnya dilakukan pengujian dengan
42 beberapa parameter untuk mengetahui karakteristik fisik dan aktivitas antioksidan. Hasil
43 menunjukkan semakin tinggi konsentrasi ekstrak kayu secang berpengaruh signifikan (p-value
44 < 0,05) pada peningkatan viskositas, daya lekat dan waktu mengering serta dapat

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45 menurunkan pH, daya sebar dan nilai IC₅₀. Aktivitas antioksidan semua formula termasuk
46 dalam kategori kuat dimana nilai IC₅₀ (50-100 µg/mL) dan pada ketiga formula berturut-turut
47 adalah 88.71 µg/mL; 81.58 µg/mL dan 79.04 µg/mL.

48
49 **Kata Kunci:** Kayu secang, Formulasi, Masker gel peel off, antioksidan, karakteristik fisik

1. Introduction

50
51 Air pollution is currently experiencing a significant increase, reaching 20%. Low air
52 quality can have a negative impact because long-term exposure can cause health problems
53 (Wahdaningsih et al., 2015). One of the mechanisms is the occurrence of oxidative stress in
54 the body. The high level of air pollution today can cause the formation of free radicals so it
55 needs to be balanced with natural antioxidant intake to prevent oxidative damage which is a
56 trigger for various diseases, especially skin disorders (Widowati, 2011). Flavonoids are natural
57 compounds that have the ability as antioxidants by inhibiting the formation of free radicals
58 hydroxyl, peroxide, alkoxy, superoxide anions, oxygen singkets and hydrogen peroxide (Utari,
59 2017).

60 Secang wood contains active compounds of the flavonoid group which can be used as
61 primary antioxidants or secondary antioxidants. The presence of brazilin components in
62 secang wood has the effect of protecting the body from poisoning due to free radicals (Rina
63 et al., 2012). Has reliable antioxidant power with a higher antioxidant index than commercial
64 antioxidants (BHT and BHA) so it has the potential as a free radical scavenging agent
65 (Sugiyanto et al., 2013). Secang wood extract has been proven effective as an antioxidant with
66 an IC₅₀ value of 74,44 µg/mL (Tanzaq et al., 2019).

67 Mask is one of the cosmetics for facial skin care. However, the use of masks is generally
68 less efficient. The demands of market needs with today's lifestyle are not only effective but
69 easy, comfortable and flexible in their use. Peel off gel mask is the result of the development
70 of facial skin care products that can answer these challenges (Ningsih et al., 2016). Peel off
71 gel mask is a type of facial mask that has the advantage of being easy to remove or lift like an
72 elastic membrane (Rahmawanty et al., 2015). Several studies have proven that peel off gel
73 mask preparations can increase the effectiveness of antioxidants, including *Paedaria fotida*
74 extract (Eka et al., 2022), areca seed extract (Dwi Mulyani et al., 2023), red spinach leaves
75 extract (Welly et al., 2022) and mangrove leaves extract (Hasibuan et al., 2024).

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2. Methods

2.1 Materials and Tools

80 The materials used in this study were secang wood, ethanol 96% (Merck), Sodium
81 Carboxymethyl Cellulose (CMC Na), Polyvinil Alcohol (PVA), propilenglicol, vitamin C dan 1,1-
82 difenil-2-pikrilhidrazil (DPPH).

83 The tools used in this study were rotary evaporator (Heidolph), alat-alat gelas (Pyrex),
84 pH meter (Hanna Instrument pH 210 Microprocessor), viskometer (Brookfield DV-I Prime),
85 and spektrofotometer UV-Vis mini 1240 (Shimadzu).

2.2 Secang Wood Extraction

87 The extraction method used is maceration by soaking secang wood powder using 96%
88 ethanol solvent with a ratio of 1:10. Extraction is carried out for 3x24 hours. The filtrate
89 obtained is then evaporated with a rotary evaporator until a thick extract is obtained (Tanzaq
90 et al., 2019).

2.3 Formulation of Peel Off Gel Masker Secang Wood Extract

92 Peel-off gel mask of secang wood extract was made by developing PVA and CMC Na (Table
93 1) in distilled water (80°C) until fully expanded. PVA mass plus expanded propylene glycol and
94 CMC Na was stirred until homogeneous. Ethanol extract of secang wood was added little by
95 little into the peel-off gel mask base, distilled water was added until the weight of the
96 preparation was 100% and stirred until homogeneous (Cahyani et al., 2025).

2.4 Physical Characterization Evaluation of Peel Off Gel Mask Secang Wood Extract

Organoleptic

99 Observations were made on the color, odor, and dosage form of the Peel Off Gel Mask
100 Secang Wood Extract (Syam et al., 2021).

Homogeneity

102 Observations are made by preparing a number of preparations on object glass (Cahyani
103 & Putri, 2017). All particles are evenly dispersed on the object glass indicating a homogeneous
104 preparation (Syam et al., 2021)

pH

Commented [WN1]: Tambahkan analisis data bu, misal uji Tukey untuk data-data kuantitatif?

EDITOR'S COMMENTS ON FIRST REVISED MANUSCRIPT

106 The pH meter electrode is dipped into the preparation until the display on the device
107 shows a constant pH value (Andini et al., 2017). Results that match the skin pH (4.5-6.5) can
108 increase acceptability when used (Silvia et al., 2021).

109

110 **Viscosity**

111 The viscosity of the preparation was measured using a Brookfield spindle 64 viscometer
112 at a speed of 1.0 rpm (Cahyani & Putri, 2017). At a viscosity of 2000-50000 cps indicates a
113 good peel-off gel mask (SNI 16-4399-1996: 1).

114 **Spreadability**

115 Observations were made on the spreading ability of 0.5 grams of the preparation placed
116 in the middle of the spreading power tester, then covered with a glass plate that had
117 previously been weighed and its weight recorded, left for one minute. The spreading ability
118 is indicated by measuring the diameter of the four sides of the spread. Do the same steps for
119 each additional 50 grams of load above it until the diameter of the spread is constant (Cahyani
120 & Putri, 2017). The ideal spread of the peel off gel mask is 5-7 cm (Silvia et al., 2021).

121 **Adhesion**

122 0.25 g preparation on a glass object is given a load pressure of 100 grams for 5 minutes
123 and then placed on the adhesive strength tester. The adhesive strength is measured by
124 recording the time when the two glass objects are released. A time of more than 1 second
125 indicates good adhesive strength of the peel off gel mask (Syam et al., 2021).

126 **Drying Time**

127 0.1 g of the preparation is applied to the arm with an area of 2.5 x 2.5 cm, then the time
128 is observed until the preparation dries (Andini et al., 2017). standard drying time for a peel-
129 off gel mask is 15-30 minutes (Silvia et al., 2021).

130 **2.5 Antioxidant Activity with DPPH (2,2-difeny-1-picrylhydrazyl) Method**

131 The test was carried out in several stages. First, determine the maximum wavelength of
132 the DPPH 30 solution $\mu\text{g/mL}$ with a UV-Vis spectrophotometer in the 400-800 nm region.
133 Determination of operating time is done by measuring the absorption at the maximum
134 wavelength obtained using a standard solution (vitamin C) and DPPH 30 solution $\mu\text{g/mL}$ at a
135 1:1 ratio for 60 minutes.

EDITOR'S COMMENTS ON FIRST REVISED MANUSCRIPT

136 An amount of 0.05 grams of the preparation was dissolved in methanol up to 50 mL and
137 diluted to obtain sample solution concentrations of 60,70,80,100 and 120 µg/mL. For each
138 concentration, DPPH 30 solution was added µg/mL at a ratio of 1:1 and absorbance
139 measurements were carried out using a UV-Vis spectrophotometer at a maximum
140 wavelength after being incubated at room temperature for the time obtained from the results
141 of determining the operating time. The same stage was also carried out on vitamin C solutions
142 with concentrations of 2.4,6,8,10 µg/mL as a reference standard. Determine the IC₅₀ value
143 from the results of measuring the absorbance of the sample solution and the reference
144 standard obtained (Maharani et al., 2022).

145

146

3. Results and Discussion

3.1 Physical Characterization Evaluation of Peel Off Gel Mask Secang Wood Extract

147 Traditionally, secang wood has many health benefits, including antibacterial, anti-
148 inflammatory, anti-diabetic, tuberculosis, malaria and tetanus (Setyowati et al., 2023). In
149 addition, it is also widely used in food and cosmetics as an antioxidant (Rajput et al., 2022).
150 Secang wood contains active compounds that are included in the flavonoid group, namely
151 brazilin, brazilin, 3'-o-methylbrazilin, sappanin, chalcone, and sappan chalcone. Brazilin in
152 secang wood has an antioxidant effect (Ngamwonglumlert & Devahastin, 2023). For the
153 manufacture of secang wood extract, the maceration method using 96% ethanol (1:1) was
154 used. The peel-off gel mask has unique characteristics with the formation of a transparent,
155 elastic and easily removable film layer without rinsing which can increase the comfort of use
156 and the effectiveness of active compounds. Therefore, this study was designed to make a
157 peel-off gel mask of secang wood extract as an antioxidant F1 (2.5%) F2 (5%) and F3 (7.5%)
158 with the results of the physical characteristics test presented in Table 2.

159 Gelling agents used in the peel-off gel mask formulation are PVA and CMC Na (Table 1).
160 PVA is a hydrophilic polymer with adhesive properties that are easy to peel off when dry and
161 provide a film layer effect called the peel-off effect (Anindhita et al., 2023). However, the film
162 layer formed tends to be stiff and easily broken (Sinambela & Telaumbanua, 2022).
163 Carboxymethyl Cellulose Sodium (CMC Na) is a hydrophilic polymer with a more stable
164 viscosity in the long term (Eryani et al., 2023) so that it can increase the elasticity of the PVA
165 layer formed as reported in previous studies (Cahyani et al., 2025).

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167 Organoleptic and homogeneity testing aims to see the physical appearance and
168 distribution of each component of a preparation. Based on table 2, the results show that the
169 three formulas give the same results. The level of comfort of using a preparation is also
170 influenced by the pH of the preparation. The higher the concentration of secang wood extract,
171 the lower the pH of the preparation as seen in Figure 1a. This occurs because the ethanol
172 extract of secang wood has a pH that tends to be acidic (2-6) (Muslimin et al., 2024), so that
173 by adding the amount of secang wood extract, the pH of the preparation will decrease. The
174 pH value of secang wood extract can affect the color of the peel-off gel mask preparation
175 produced. This effect is caused because the stability of brazilin is greatly influenced by its
176 acidity level where at pH 2-5 (yellow-orange), pH 6-7 (pink) and pH > 7 (red-violet) where the
177 degradation results of brazilin into brazilein which is red in color (Rina et al., 2017).

178 The results of the viscosity test showed an increase that was proportional to the
179 increase in the concentration of secang wood extract in the peel-off gel mask formula (Figure
180 1b). The thick concentration of secang wood extract showed high resistance so that it would
181 affect the resistance of the preparation to flow. The viscosity of the preparation is closely
182 related to the spreadability, adhesion and drying time. The higher the viscosity, the lower the
183 spreadability (Figure 1c) and the higher the adhesion (Figure 1d) of the preparation because
184 high resistance indicates a stronger bond between particles which causes water to be trapped
185 and dry longer (Figure 1e) (Cahyani et al., 2025).

186 3.2 Antioxidant Activity of Peel Off Gel Mask Secang Wood Extract

187 Test results all formulas showed antioxidant activity included in the strong category
188 as indicated by the IC₅₀ value. The determination of the antioxidant activity category is based
189 on IC₅₀ where it is very strong (<50 µg/mL), strong (50-100 µg/mL), moderate (100-150 µg/mL)
190 and weak (151-200 µg/mL) (Puspitasari & Wulandari, 2017). IC₅₀ value of the three formulas
191 in Table 2. indicated that the selection of the peel off gel mask preparation is right and the
192 resulting formula can maintain the stability of the active compound. The increase in
193 antioxidant activity is indicated by a decrease in the IC₅₀ value along with the increase in
194 extract concentration (Figure 2). This is because the higher the concentration of secang wood
195 extract, the higher the brazilin content in the peel off gel mask preparation. Brazilin, in
196 addition to playing a role in the color produced, is also a flavonoid with high antioxidant
197 activity and is widely used in natural skin care (Faizah et al., 2023). Brazilin is a flavonoid with

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198 the ability to ward off free radicals and can inhibit enzymes responsible for the production of
199 free radicals (Hu et al., 2008). Several previous studies were limited to characterization of the
200 preparation and did not determine the antioxidant activity in the formulation peel off gel
201 mask (Ermawati & Adi, 2023). The formulation of sappanwood extract in the peel-off gel mask
202 preparation was considered appropriate because the IC₅₀ value of the preparation was close
203 to the IC₅₀ of the extract (74.44 µg/mL). However, when compared, vitamin C is still stronger
204 as a comparative standard in the very strong category 3.04 µg/mL (Tanzaq et al., 2019).

4. Conclusion

206 Increasing the concentration of secang wood extract has a significant effect (p-value
207 <0.05) on increasing the viscosity, adhesiveness and drying time and can reduce pH,
208 spreadability and IC₅₀ value. The antioxidant activity of all formulas is included in the strong
209 category with the IC₅₀ values of the three formulas respectively being 88, 71 µg/mL; 81.58
210 µg/mL and 79.04 µg/mL. Peel off gel mask preparation formula with good characteristics and
211 strong antioxidant activity at a concentration of 7.5% secang wood extract.

5. References

- 212
213
214 Andini, T., Yusriadi, Y., & Yuliet, Y. (2017). Optimasi Pembentuk Film Polivinil Alkohol dan
215 Humektan Propilen Glikol pada Formula Masker Gel Peel Off Sari Buah Labu Kuning
216 (Cucurbita moschata Duchesne) sebagai Antioksidan. *Jurnal Farmasi Galenika (Galenika
217 Journal of Pharmacy)*, 3(2), 101–108.
- 218 Anindhita, M. A., Prastiwi, D., Lu, N., Fitriyani, L., Nanda Rini, S., & Farmasi Universitas
219 Pekalongan, F. (2023). Pengaruh Penggunaan Polivinil Alkohol sebagai Gelling Agent
220 terhadap Sifat Fisikokimia sediaan Gel Peel-off Ekstrak Etanol Buah Pedada.
221 *Parapemikir : Jurnal Ilmiah Farmasi*, 12(1), 18–29.
222 <https://doi.org/10.30591/PJIF.V12I1.3990>
- 223 Cahyani, I. M., Hanhadyanaputri, E. S., Wulan, A. H., & Sulistyarini, I. (2025). Optimization
224 Formula of Kolang-Kaling (Arenga Pinnata.) Peel Off Gel Mask with Combination PVA-
225 CMC Na As Gelling Agent on Simplex Lattice Design. *Media Farmasi Indonesia*, 20(1), 67–
226 75. <https://doi.org/10.53359/mfi.v20i1.316>
- 227 Cahyani, I. M., & Putri, I. D. C. (2017). Efektivitas Karbopol 940 Dalam Formula Masker Gel
228 Peel-Off Ekstrak Temu Giring (Curcuma heyneana Val & Zijp). *Journal of Pharmaceutical
229 and Medicinal Sciences*, 2(2), 48–51.
- 230 Dwi Mulyani, A., Rahayu, P., Aini, N., Purnamasari, D., Mulyani, A. D., Farmasi, J., & Mulyani,
231 A. D. (2023). Formulasi dan Evaluasi Mutu Fisik Sediaan Masker Gel Peel-Off Ekstrak Biji
232 Pinang (Areca Catechu L.) Sebagai Antioksidan. *Indonesian Journal of Pharmaceutical
233 Education*, 3(3), 2775–3670. <https://doi.org/10.37311/IJPE.V3I3.22033>
- 234 Eka, R., Susanti, E., & A'yun, Q. (2022). Formulation and Antioxidant Activity of Peel Off Gel
235 Mask from Paederia Foetida Extract. *JKPK (Jurnal Kimia Dan Pendidikan Kimia)*, 7(1), 12–
236 19. <https://doi.org/10.20961/JKPK.V7I1.45798>

EDITOR'S COMMENTS ON FIRST REVISED MANUSCRIPT

- 237 Ermawati, D. E., & Adi, L. P. (2023). Pengaruh Konsentrasi Polivinil Alkohol terhadap Sifat Fisik
238 dan Kimia Sediaan Peel-off Mask Ekstrak Etanol Kayu Secang (*Caesalpinia sappan* L.).
239 *Journal of Applied Agriculture, Health, and Technology*, 2(1), 43–53.
- 240 Eryani, M. C., Maulani, D., & Ningsih, A. D. R. (2023). Pengaruh Variasi Konsentrasi CMC Na
241 Terhadap Sifat Fisik Masker Gel Peel Off Vitamin C. *MEDFARM: Jurnal Farmasi Dan*
242 *Kesehatan*, 12(2), 172–180.
- 243 Faizah, U. N., Maula, N. N., Mustika, R. A., & Wahyuni, S. (2023). Potensi Senyawa Antioksidan
244 Yang Terkandung Dalam Kayu Secang (*Caesalpinia sappan*) Untuk Perawatan Kulit Alami.
245 *Symbiotic: Journal of Biological Education and Science*, 4(1), 41–49.
246 <https://doi.org/10.32939/SYMBIOTIC.V4I1.90>
- 247 Hasibuan, N. E., Azka, A., Basri, & Mujiyanti, A. (2024). Aktivitas Antioksidan dan Karakteristik
248 Masker Gel Peel Off dari Ekstrak Daun Mangrove (*Avicennia marina*). *Jurnal Pengolahan*
249 *Hasil Perikanan Indonesia (JPHPI)*, 2(9), 42–55.
250 <https://doi.org/http://dx.doi.org/10.17844/jphpi.v27i9.52083>
- 251 Hu, J., Yan, X., Wang, W., Wu, H., Hua, L., & Du, L. (2008). Antioxidant Activity In Vitro of Three
252 Constituents from *Caesalpinia sappan* L. *Tsinghua Science & Technology*, 13(4), 474–479.
253 [https://doi.org/10.1016/S1007-0214\(08\)70076-2](https://doi.org/10.1016/S1007-0214(08)70076-2)
- 254 Maharani, N. P. D. S., Cahyani, I. M., & Hanhadyanaputri, E. S. (2022). Optimization of Polyvinyl
255 Alcohol (PVA) and Glycerin in Kolang Kaling Peel-Off Gel Mask Formula (*Arenga pinnata*).
256 *Journal of Food and Pharmaceutical Sciences*, 2022(3), 746–753.
257 <https://doi.org/10.22146/JFPS.5718>
- 258 Muslimin, M. K., Rahayuningsih, E., & Mindaryani, A. (2024). Optimasi proses metilasi
259 brazilin hasil ekstrak kayu secang (*Caesalpinia sappan* Linn) sebagai bahan pewarna
260 merah alami untuk tekstil. *Jurnal Rekayasa Proses*, 18(2), 89–99.
261 <https://doi.org/10.22146/JREKPROS.82068>
- 262 Ngamwonglumlert, L., & Devahastin, S. (2023). Brazilin as an alternative pigment: Isolation,
263 characterization, stability enhancement and food applications. *Food Chemistry*, 398,
264 133898. <https://doi.org/10.1016/J.FOODCHEM.2022.133898>
- 265 Ningsih, W., Firmansyah, F., & Fitri, H. (2016). Formulasi Masker Peel Off dengan Beberapa
266 Konsentrasi Ekstrak Etanol Buah Naga Super Merah (*Hylocereus costaricensis* (F.A.C
267 Weber) Britton & Rose). *Scientia: Jurnal Farmasi Dan Kesehatan*, 6(1), 18.
268 <https://doi.org/10.36434/SCIENTIA.V6I1.37>
- 269 Puspitasari, A. D., & Wulandari, R. L. (2017). Aktivitas Antioksidan dan Penetapan Kadar
270 Flavonoid Total Ekstrak Etil Asetat Daun Kersen (*Muntingia calabura*). *Jurnal*
271 *Pharmascience*, 4(2). <https://doi.org/10.20527/JPS.V4I2.5770>
- 272 Rahmawanty, D., Yulianti, N., & Fitriana, M. (2015). Formulasi dan Evaluasi Masker Wajah
273 Peel-Off Mengandung Kuersetin dengan Variasi Konsentrasi Gelatin dan Gliserin. *Media*
274 *Farmasi: Jurnal Ilmu Farmasi*, 12(1), 17–32. <https://doi.org/10.12928/MF.V12I1.3019>
- 275 Rajput, M. S., Nirmal, N. P., Nirmal, S. J., & Santivarangkna, C. (2022). Bio-actives from
276 *Caesalpinia sappan* L.: Recent advancements in phytochemistry and pharmacology.
277 *South African Journal of Botany*, 151, 60–74.
278 <https://doi.org/10.1016/J.SAJB.2021.11.021>
- 279 Rina, O., Sanusi, I., Abdidharma, Afrizal, Utami, C., & Widodo, Y. (2017). Stabilities Natural
280 Colorant of Sappan Wood (*Caesalpinia sappan* L.) for Food and Beverages in Various pH,
281 Temperature and Matrices of Food. *International Journal of Chemtech Research*, 10(1),
282 98–103.
- 283 Rina, O., W., C. U., & Ansori, A. (2012). Efektifitas Ekstrak Kayu Secang (*Caesalpinia Sappan* L.)

EDITOR'S COMMENTS ON FIRST REVISED MANUSCRIPT

- 284 Sebagai Bahan Pengawet Daging. *Jurnal Penelitian Pertanian Terapan*, 12(3).
285 <https://doi.org/10.25181/JPPT.V12I3.215>
- 286 Setyowati, N., Masyhuri, Mulyo, J. H., Irham, & Yudhistira, B. (2023). The hidden treasure of
287 wedang uwuh, an ethnic traditional drink from Java, Indonesia: Its benefits and
288 innovations. *International Journal of Gastronomy and Food Science*, 31, 100688.
289 <https://doi.org/10.1016/J.IJGFS.2023.100688>
- 290 Silvia, B. ., Dewi, M. ., & Darusman, F. (2021). Studi Literatur Pengaruh Jenis dan Konsentrasi
291 Basis terhadap Karakteristik Masker Gel Peel Off. *Prosiding Farmasi*, 148–156.
- 292 Sinambela, E. S., & Telaumbanua, D. (2022). Pengaruh Variasi Konsentrasi PVA dan HPMC
293 Terhadap Stabilitas Fisik Masker Gel Peel-Off Ekstrak Metanol Biji Pepaya (Carica pepaya
294 L.). *Journal Health Of Education*, 3(2), 1–4.
- 295 Sugiyanto, R. N., Putri, S. R., Damanik, F. S., & Sasmita, G. M. A. (2013). Aplikasi Kayu Secang
296 (Caesalpinia Sappan L.) dalam Upaya Prevensi Kerusakan Dna Akibat Paparan Zat
297 Potensial Karsinogenik melalui Mnpce Assay. *Pekan Ilmiah Mahasiswa Nasional Program
298 Kreativitas Mahasiswa - Penelitian 2013*.
299 <https://www.neliti.com/id/publications/171018/>
- 300 Syam, N. ., Lestari, U., & Muhaimin. (2021). Formulasi Dan Uji Sifat Masker Gel Peel-Off dari
301 Minyak Sawit Murni dengan Basis Carbomer 940. *Indonesian Journal of Pharma Science*,
302 3(1), 42–55.
- 303 Tanzaq, T. tanando, Agustina, R. D., Setiawati, K. E., & Cahyani, I. M. (2019). Uji Aktivitas
304 Penangkapan Radikal DPPH (1,1-Diphenyl-2-Picrylhrazyl) Ekstrak Etanol Kayu Secang
305 (Caesalpinia sappan L.). *Media Farmasi Indonesia*, 14(1), 1461–1465.
306 <https://mfi.stifar.ac.id/MFI/article/view/105/86>
- 307 Utari, F. D. (2017). Produksi Antioksidan dari Ekstrak Kayu Secang (Caesalpinia sappan L.)
308 Menggunakan Pengereng Berkelembaban Rendah. *Jurnal Aplikasi Teknologi Pangan*,
309 6(3). <https://doi.org/10.17728/JATP.241>
- 310 Wahdaningsih, S., Budilaksono, W., & Fahrurroji, A. (2015). Uji aktivitas antioksidan fraksi n-
311 heksana kulit buah naga merah menggunakan metode 1,1-Difenil-2-Pikrilhidrazil. *Jurnal
312 Kesehatan Khatulistiwa*, 1(2), 115–136.
313 <https://doi.org/10.26418/JURKESWA.V1I2.42997>
- 314 Welly, S., Supriyanto, & Saraswati, M. (2022). Antioxidant Test and Peel-Off Mask Formulation
315 Extract of Red Spinning (Amaranthus tricolor L.) Leaves with Variations of Gelling Agent
316 Types. *Joseph (Journal of Pharmacy)*, 2(1), 42–55.
- 317 Widowati, W. (Wahyu). (2011). Uji Fitokimia Dan Potensi Antioksidan Ekstrak Etanol Kayu
318 Secang (Caesalpinia Sappan L.). *Maranatha Journal of Medicine and Health*, 11(1),
319 151615. <https://www.neliti.com/id/publications/151615/>
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Table 1. Formulation of Peel Off Gel Masker Secang Wood Extract

Material	Formula (%)		
	I	II	III
Secang Wood Extract	2,5	5	7,5
CMC Na	1,26	1,26	1,26
PVA	6,74	6,74	6,74
Propilenglikol	4	4	4
Aqua destilata ad	100	100	100

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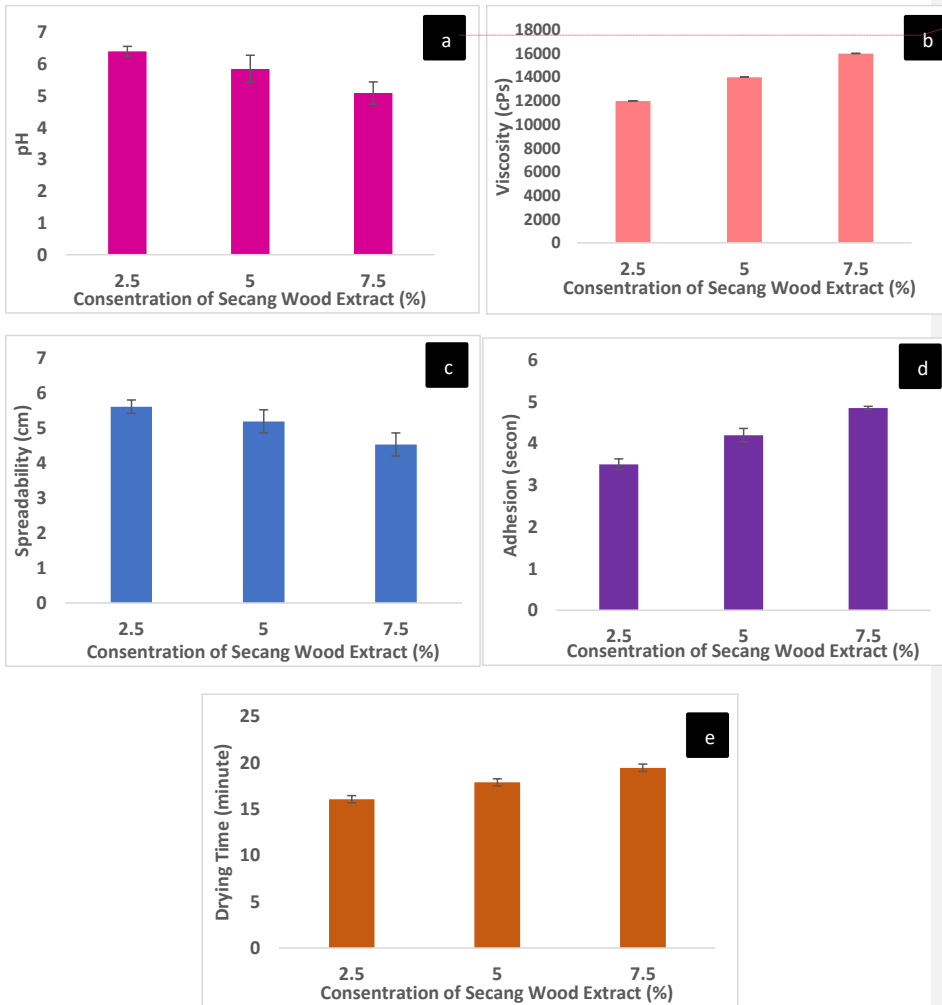
Table 2. Characterization and Antioxidant Activity of Peel Off Gel Mask Secang Wood Extract

Evaluation	Formula		
	I	II	III
Organoleptic	Consistency thick and soft, colour orange, odor secang smell	Consistency thick and soft, colour orange, odor secang smell	Consistency thick and soft, colour orange, odor secang smell
Homogeneity	Homogeneous	Homogeneous	Homogeneous
pH	6.4 ± 0.16	5.85 ± 0.43	5.09 ± 0.35
Viscosity (cPs)	11986.4 ± 6.02	13992.6 ± 5.13	15993.2 ± 5.36
Spreadability (cm)	5.6 ± 0.19	5.18 ± 0.33	4.52 ± 0.33
Adhesion (secon)	3.5 ± 0.13	4.2 ± 0.16	4.85 ± 0.04
Drying Time (minute)	16.06 ± 0.39	17.88 ± 0.38	19.45 ± 0.40
IC ₅₀ (µg/mL)	88.71 ± 2.06	81.58 ± 3.60	79.04 ± 1.84

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Figure 1. Characterization of Peel Off Gel Mask Secang Wood Extract: (a) pH, (b) Viscosity, (c) Spreadability, (d) Adhesion and (e) Drying Time

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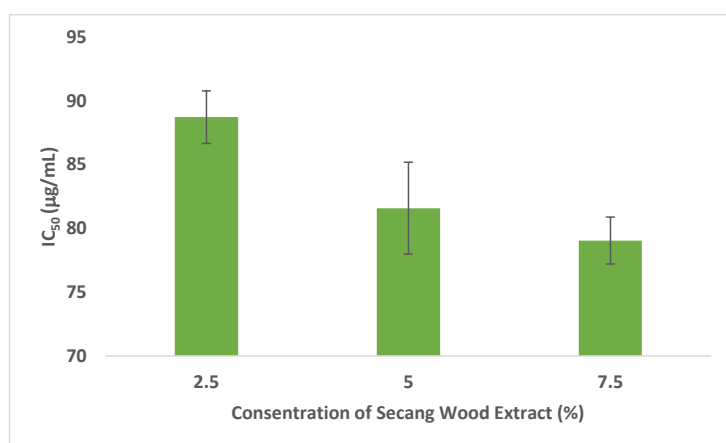


Figure 2. Antioxidant activity (IC₅₀) of Peel Off Gel Mask Secang Wood Extract

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Peel Off Gel Mask Secang Wood Extract as an Antioxidant: Formulation and Characterization

Masker Gel Peel Off Ekstrak Kayu Secang sebagai Antioksidan : Formulasi dan Karakterisasi

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Abstract

Secang wood contains active compounds of the flavonoid group, namely brazilin, brazilin, 3'-O-methylbrazilin, sappanin chalcone, and sappan calchone which can be used as primary antioxidants or secondary antioxidants. Antioxidants are compounds that can inhibit oxidation reactions by binding reactive free radicals. Increasing the value of the benefits of secang wood as an antioxidant can be done by developing a topical preparation formulation. Peel-off gel mask is the right topical preparation because in addition to maintaining skin health, it can also increase effectiveness and comfort during use. The study aims to determine the formula of a peel-off gel mask with secang wood extract as an antioxidant with good characteristics. The formulation of the peel-off gel mask was made with a concentration of secang wood extract of 2.5%; 5% and 7.5% using sodium carboxymethyl cellulose, polyvinyl alcohol and propylene glycol as a base. The preparation of the peel-off gel mask with secang wood extract produced was then tested with several parameters to determine the physical characteristics and antioxidant activity. The results showed that the higher the concentration of secang wood extract, the more significant the effect (p -value < 0.05) on increasing viscosity, adhesiveness and drying time and can reduce pH, spreadability and IC_{50} value. The antioxidant activity of all formulas is included in the strong category were the IC_{50} value (50-100 $\mu\text{g/mL}$) and the third formula respectively are 88, 71 $\mu\text{g/mL}$; 81.58 $\mu\text{g/mL}$ and 79.04 $\mu\text{g/mL}$.

Keywords: Secang wood, Formulation, Peel off gel mask, Antioxidants, Physical characteristics

Abstrak

Kayu secang mengandung senyawa aktif golongan flavonoid yaitu brazilin, brazilin, 3'-O-metilbrazilin, sappanin chalcone, dan sappan calchone yang dapat digunakan sebagai antioksidan primer maupun antioksidan sekunder. Antioksidan merupakan senyawa yang dapat menghambat reaksi oksidasi dengan mengikat radikal bebas yang reaktif. Peningkatan nilai manfaat kayu secang sebagai antioksidan dapat dilakukan dengan pengembangan formulasi sediaan topikal. Masker gel peel-off merupakan sediaan topikal yang tepat karena selain dapat menjaga kesehatan kulit juga dapat meningkatkan efektivitas dan kenyamanan saat penggunaan. Penelitian bertujuan untuk mengetahui formula masker gel peel off ekstrak kayu secang sebagai antioksidan dengan karakteristik yang baik. Formulasi masker gel peel off dibuat dengan konsentrasi ekstrak kayu secang 2.5%; 5% dan 7.5% menggunakan natrium karboksimetil selulosa, polivinil alkohol dan propilen glikol sebagai basis. Sediaan masker gel peel off ekstrak kayu secang yang dihasilkan selanjutnya dilakukan pengujian dengan beberapa parameter untuk mengetahui karakteristik fisik dan aktivitas antioksidan. Hasil menunjukkan semakin tinggi konsentrasi ekstrak kayu secang berpengaruh signifikan (p -value $< 0,05$) pada peningkatan viskositas, daya lekat dan waktu mengering serta dapat

45 menurunkan pH, daya sebar dan nilai IC₅₀. Aktivitas antioksidan semua formula termasuk
46 dalam kategori kuat dimana nilai IC₅₀ (50-100 µg/mL) dan pada ketiga formula berturut-turut
47 adalah 88.71 µg/mL; 81.58 µg/mL dan 79.04 µg/mL.

48

49 **Kata Kunci:** Kayu secang, Formulasi, Masker gel peel off, antioksidan, karakteristik fisik

50

1. Introduction

51 Air pollution is currently experiencing a significant increase, reaching 20%. Low air
52 quality can have a negative impact because long-term exposure can cause health problems
53 (Wahdaningsih et al., 2015). One of the mechanisms is the occurrence of oxidative stress in
54 the body. The high level of air pollution today can cause the formation of free radicals so it
55 needs to be balanced with natural antioxidant intake to prevent oxidative damage which is a
56 trigger for various diseases, especially skin disorders (Widowati, 2011). Flavonoids are natural
57 compounds that have the ability as antioxidants by inhibiting the formation of free radicals
58 hydroxyl, peroxide, alkoxyl, superoxide anions, oxygen singkets and hydrogen peroxide (Utari,
59 2017).

60 Secang wood contains active compounds of the flavonoid group which can be used as
61 primary antioxidants or secondary antioxidants. The presence of brazilin components in
62 secang wood has the effect of protecting the body from poisoning due to free radicals (Rina
63 et al., 2012). Has reliable antioxidant power with a higher antioxidant index than commercial
64 antioxidants (BHT and BHA) so it has the potential as a free radical scavenging agent
65 (Sugiyanto et al., 2013). Secang wood extract has been proven effective as an antioxidant with
66 an IC₅₀ value of 74,44 µg/mL (Tanzaq et al., 2019).

67 Mask is one of the cosmetics for facial skin care. However, the use of masks is generally
68 less efficient. The demands of market needs with today's lifestyle are not only effective but
69 easy, comfortable and flexible in their use. Peel off gel mask is the result of the development
70 of facial skin care products that can answer these challenges (Ningsih et al., 2016). Peel off
71 gel mask is a type of facial mask that has the advantage of being easy to remove or lift like an
72 elastic membrane (Rahmawanty et al., 2015). Several studies have proven that peel off gel
73 mask preparations can increase the effectiveness of antioxidants, including Paedaria fotida
74 extract (Eka et al., 2022), areca seed extract (Dwi Mulyani et al., 2023), red spinach leaves
75 extract (Welly et al., 2022) and mangrove leaves extract (Hasibuan et al., 2024).

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2. Methods

2.1 Materials and Tools

The materials used in this study were secang wood, ethanol 96% (Merck), Sodium Carboxymethyl Cellulose (CMC Na), Polyvinil Alcohol (PVA), propilenglicol, vitamin C dan 1,1-difenil-2-pikrilhidrazil (DPPH) .

The tools used in this study were rotary evaporator (Heidolph), alat-alat gelas (Pyrex), pH meter (Hanna Instrument pH 210 Microprocessor), viskometer (Brookfield DV-I Prime), and spektrofotometer UV-Vis mini 1240 (Shimadzu).

2.2 Secang Wood Extraction

The extraction method used is maceration by soaking secang wood powder using 96% ethanol solvent with a ratio of 1:10. Extraction is carried out for 3x24 hours. The filtrate obtained is then evaporated with a rotary evaporator until a thick extract is obtained (Tanzaq et al., 2019).

2.3 Formulation of Peel Off Gel Masker Secang Wood Extract

Peel-off gel mask of secang wood extract was made by developing PVA and CMC Na (Table 1) in distilled water (80°C) until fully expanded. PVA mass plus expanded propylene glycol and CMC Na was stirred until homogeneous. Ethanol extract of secang wood was added little by little into the peel-off gel mask base, distilled water was added until the weight of the preparation was 100% and stirred until homogeneous (Cahyani et al., 2025).

2.4 Physical Characterization Evaluation of Peel Off Gel Mask Secang Wood Extract

Organoleptic

Observations were made on the color, odor, and dosage form of the Peel Off Gel Mask Secang Wood Extract (Syam et al., 2021).

Homogeneity

Observations are made by preparing a number of preparations on object glass (Cahyani & Putri, 2017). All particles are evenly dispersed on the object glass indicating a homogeneous preparation (Syam et al., 2021)

pH

106 The pH meter electrode is dipped into the preparation until the display on the device
107 shows a constant pH value (Andini et al., 2017). Results that match the skin pH (4.5-6.5) can
108 increase acceptability when used (Silvia et al., 2021).

109

110 **Viscosity**

111 The viscosity of the preparation was measured using a Brookfield spindle 64 viscometer
112 at a speed of 1.0 rpm (Cahyani & Putri, 2017). At a viscosity of 2000-50000 cps indicates a
113 good peel-off gel mask (SNI 16-4399-1996: 1).

114 **Spreadability**

115 Observations were made on the spreading ability of 0.5 grams of the preparation placed
116 in the middle of the spreading power tester, then covered with a glass plate that had
117 previously been weighed and its weight recorded, left for one minute. The spreading ability
118 is indicated by measuring the diameter of the four sides of the spread. Do the same steps for
119 each additional 50 grams of load above it until the diameter of the spread is constant (Cahyani
120 & Putri, 2017). The ideal spread of the peel off gel mask is 5-7 cm (Silvia et al., 2021).

121 **Adhesion**

122 0.25 g preparation on a glass object is given a load pressure of 100 grams for 5 minutes
123 and then placed on the adhesive strength tester. The adhesive strength is measured by
124 recording the time when the two glass objects are released. A time of more than 1 second
125 indicates good adhesive strength of the peel off gel mask (Syam et al., 2021).

126 **Drying Time**

127 0.1 g of the preparation is applied to the arm with an area of 2.5 x 2.5 cm, then the time
128 is observed until the preparation dries (Andini et al., 2017). standard drying time for a peel-
129 off gel mask is 15-30 minutes (Silvia et al., 2021).

130 **2.5 Antioxidant Activity with DPPH (2,2-difenyl-1-picrylhydrazyl) Method**

131 The test was carried out in several stages. First, determine the maximum wavelength of
132 the DPPH 30 solution $\mu\text{g/mL}$ with a UV-Vis spectrophotometer in the 400-800 nm region.
133 Determination of operating time is done by measuring the absorption at the maximum
134 wavelength obtained using a standard solution (vitamin C) and DPPH 30 solution $\mu\text{g/mL}$ at a
135 1:1 ratio for 60 minutes.

136 An amount of 0.05 grams of the preparation was dissolved in methanol up to 50 mL and
137 diluted to obtain sample solution concentrations of 60,70,80,100 and 120 µg/mL. For each
138 concentration, DPPH 30 solution was added µg/mL at a ratio of 1:1 and absorbance
139 measurements were carried out using a UV-Vis spectrophotometer at a maximum
140 wavelength after being incubated at room temperature for the time obtained from the results
141 of determining the operating time. The same stage was also carried out on vitamin C solutions
142 with concentrations of 2.4,6,8,10 µg/mL as a reference standard. Determine the IC₅₀ value
143 from the results of measuring the absorbance of the sample solution and the reference
144 standard obtained (Maharani et al., 2022).

145 **2.3 Data Analysis**

146 The results of the physical characteristics of the secang extract peel-off gel mask (pH,
147 viscosity, spreadability, adhesiveness, drying time) and IC₅₀ were analyzed quantitatively
148 using SPSS 23.0 with the one-way ANOVA method and the Kruskal Wallis test at a significance
149 level of 95%. Descriptive analysis was carried out on the results of organoleptic and
150 homogeneity tests.

151

152

3. Results and Discussion

153 **3.1 Physical Characterization Evaluation of Peel Off Gel Mask Secang Wood Extract**

154 Traditionally, secang wood has many health benefits, including antibacterial, anti-
155 inflammatory, anti-diabetic, tuberculosis, malaria and tetanus (Setyowati et al., 2023). In
156 addition, it is also widely used in food and cosmetics as an antioxidant (Rajput et al., 2022).
157 Secang wood contains active compounds that are included in the flavonoid group, namely
158 brazilin, brazilin, 3^l-o-methylbrazilin, sappanin, chalcone, and sappan chalcone. Brazilin in
159 secang wood has an antioxidant effect (Ngamwonglumlert & Devahastin, 2023). For the
160 manufacture of secang wood extract, the maceration method using 96% ethanol (1:1) was
161 used. The peel-off gel mask has unique characteristics with the formation of a transparent,
162 elastic and easily removable film layer without rinsing which can increase the comfort of use
163 and the effectiveness of active compounds. Therefore, this study was designed to make a
164 peel-off gel mask of secang wood extract as an antioxidant F1 (2.5%) F2 (5%0 and F3 (7.5%)
165 with the results of the physical characteristics test presented in Table 2.

166 Gelling agents used in the peel-off gel mask formulation are PVA and CMC Na (Table 1).
 167 PVA is a hydrophilic polymer with adhesive properties that are easy to peel off when dry and
 168 provide a film layer effect called the peel-off effect (Anindhita et al., 2023). However, the film
 169 layer formed tends to be stiff and easily broken (Sinambela & Telaumbanua, 2022).
 170 Carboxymethyl Cellulose Sodium (CMC Na) is a hydrophilic polymer with a more stable
 171 viscosity in the long term (Eryani et al., 2023) so that it can increase the elasticity of the PVA
 172 layer formed as reported in previous studies (Cahyani et al., 2025) .

173 Organoleptic and homogeneity testing aims to see the physical appearance and
 174 distribution of each component of a preparation. Based on table 2, the results show that the
 175 three formulas give the same results. The level of comfort of using a preparation is also
 176 influenced by the pH of the preparation. The higher the concentration of secang wood extract,
 177 the lower the pH of the preparation as seen in Figure 1a. This occurs because the ethanol
 178 extract of secang wood has a pH that tends to be acidic (2-6) (Muslimin et al., 2024), so that
 179 by adding the amount of secang wood extract, the pH of the preparation will decrease. The
 180 pH value of secang wood extract can affect the color of the peel-off gel mask preparation
 181 produced. This effect is caused because the stability of brazilin is greatly influenced by its
 182 acidity level where at pH 2-5 (yellow-orange), pH 6-7 (pink) and pH> 7 (red-violet) where the
 183 degradation results of brazilin into brazilein which is red in color (Rina et al., 2017).

184 The results of the viscosity test showed an increase that was proportional to the
 185 increase in the concentration of secang wood extract in the peel-off gel mask formula (Figure
 186 1b). The thick concentration of secang wood extract showed high resistance so that it would
 187 affect the resistance of the preparation to flow. The viscosity of the preparation is closely
 188 related to the spreadability, adhesion and drying time. The higher the viscosity, the lower the
 189 spreadability (Figure 1c) and the higher the adhesion (Figure 1d) of the preparation because
 190 high resistance indicates a stronger bond between particles which causes water to be trapped
 191 and dry longer (Figure 1e). The same results were also obtained with the kolang kaling peel
 192 off gel mask (Cahyani et al., 2025). Increasing the concentration of sapanwood extract has a
 193 significant effect (p-value <0.05) on the physical characteristics including pH, viscosity,
 194 spreadability, adhesion and drying time of the secang extract peel-off gel mask.

195 3.2 Antioxidant Activity of Peel Off Gel Mask Secang Wood Extract

196 Test results all formulas showed antioxidant activity included in the strong category
 197 as indicated by the IC₅₀ value. The determination of the antioxidant activity category is based

198 on IC₅₀ where it is very strong (<50 µg/mL), strong (50-100 µg/mL), moderate (100-150 µg/mL)
 199 and weak (151-200µg/mL) (Puspitasari & Wulandari, 2017). IC₅₀ value of the three formulas
 200 in Table 2. indicated that the selection of the peel off gel mask preparation is right and the
 201 resulting formula can maintain the stability of the active compound. The increase in
 202 antioxidant activity is indicated by a decrease in the IC₅₀ value along with the increase in
 203 extract concentration (Figure 2). This is because the higher the concentration of **secang** wood
 204 extract, the higher the brazilin content in the peel off gel mask preparation. Brazilin, in
 205 addition to playing a role in the color produced, is also a flavonoid with high antioxidant
 206 activity and is widely used in natural skin care (Faizah et al., 2023). Brazilin is a flavonoid with
 207 the ability to ward off free radicals and can inhibit enzymes responsible for the production of
 208 free radicals (Hu et al., 2008). Several previous studies were limited to characterization of the
 209 preparation and did not determine the antioxidant activity in the formulation peel off gel
 210 mask (Ermawati & Adi, 2023). The formulation of secang wood extract in the peel-off gel mask
 211 preparation was considered appropriate because the IC₅₀ value of the preparation was close
 212 to the IC₅₀ of the extract (74.44µg/mL) with significant (p-value <0.05) results between
 213 formulas. However, when compared, vitamin C is still stronger as a comparative standard in
 214 the very strong category 3.04 µg/mL (Tanzaq et al., 2019).

215 4. Conclusion

216 Increasing the concentration of secang wood extract has a significant effect (p-value
 217 <0.05) on increasing the viscosity, adhesiveness and drying time and can reduce pH,
 218 spreadability and IC₅₀ value. The antioxidant activity of all formulas is included in the strong
 219 category with the IC₅₀ values of the three formulas respectively being 88, 71 µg/mL; 81.58
 220 µg/mL and 79.04 µg/mL. Peel off gel mask preparation formula with good characteristics and
 221 strong antioxidant activity at a concentration of 7.5% secang wood extract.

222 5. References

- 224 Andini, T., Yusriadi, Y., & Yuliet, Y. (2017). Optimasi Pembentuk Film Polivinil Alkohol dan
 225 Humektan Propilen Glikol pada Formula Masker Gel Peel Off Sari Buah Labu Kuning
 226 (Cucurbita moschata Duchesne) sebagai Antioksidan. *Jurnal Farmasi Galenika (Galenika*
 227 *Journal of Pharmacy)*, 3(2), 101–108.
 228 Anindhita, M. A., Prastiwi, D., Lu, N., Fitriyani, L., Nanda Rini, S., & Farmasi Universitas
 229 Pekalongan, F. (2023). Pengaruh Penggunaan Polivinil Alkohol sebagai Gelling Agent
 230 terhadap Sifat Fisikokimia sediaan Gel Peel-off Ekstrak Etanol Buah Pedada.
 231 *Parapemikir : Jurnal Ilmiah Farmasi*, 12(1), 18–29.

- 232 <https://doi.org/10.30591/PJIF.V12I1.3990>
- 233 Cahyani, I. M., Hanhadyanaputri, E. S., Wulan, A. H., & Sulistyarini, I. (2025). Optimization
234 Formula of Kolang-Kaling (Arenga Pinnata.) Peel Off Gel Mask with Combination PVA-
235 CMC Na As Gelling Agent on Simplex Lattice Design. *Media Farmasi Indonesia*, 20(1), 67–
236 75. <https://doi.org/10.53359/mfi.v20i1.316>
- 237 Cahyani, I. M., & Putri, I. D. C. (2017). Efektivitas Karbopol 940 Dalam Formula Masker Gel
238 Peel-Off Ekstrak Temu Giring (Curcuma heyneana Val & Zipp). *Journal of Pharmaceutical
239 and Medicinal Sciences*, 2(2), 48–51.
- 240 Dwi Mulyani, A., Rahayu, P., Aini, N., Purnamasari, D., Mulyani, A. D., Farmasi, J., & Mulyani,
241 A. D. (2023). Formulasi dan Evaluasi Mutu Fisik Sediaan Masker Gel Peel-Off Ekstrak Biji
242 Pinang (Areca Catechu L.) Sebagai Antioksidan. *Indonesian Journal of Pharmaceutical
243 Education*, 3(3), 2775–3670. <https://doi.org/10.37311/IJPE.V3I3.22033>
- 244 Eka, R., Susanti, E., & A'yun, Q. (2022). Formulation and Antioxidant Activity of Peel Off Gel
245 Mask from Paederia Foetida Extract. *JKPK (Jurnal Kimia Dan Pendidikan Kimia)*, 7(1), 12–
246 19. <https://doi.org/10.20961/JKPK.V7I1.45798>
- 247 Ermawati, D. E., & Adi, L. P. (2023). Pengaruh Konsentrasi Polivinil Alkohol terhadap Sifat Fisik
248 dan Kimia Sediaan Peel-off Mask Ekstrak Etanol Kayu Secang (Caesalpinia sappan L.).
249 *Journal of Applied Agriculture, Health, and Technology*, 2(1), 43–53.
- 250 Eryani, M. C., Maulani, D., & Ningsih, A. D. R. (2023). Pengaruh Variasi Konsentrasi CMC Na
251 Terhadap Sifat Fisik Masker Gel Peel Off Vitamin C. *MEDFARM: Jurnal Farmasi Dan
252 Kesehatan*, 12(2), 172–180.
- 253 Faizah, U. N., Maula, N. N., Mustika, R. A., & Wahyuni, S. (2023). Potensi Senyawa Antioksidan
254 Yang Terkandung Dalam Kayu Secang (Caesalpinia sappan) Untuk Perawatan Kulit Alami.
255 *Symbiotic: Journal of Biological Education and Science*, 4(1), 41–49.
256 <https://doi.org/10.32939/SYMBIOTIC.V4I1.90>
- 257 Hasibuan, N. E., Azka, A., Basri, & Mujiyanti, A. (2024). Aktivitas Antioksidan dan Karakteristik
258 Masker Gel Peel Off dari Ekstrak Daun Mangrove (Avicennia marina). *Jurnal Pengolahan
259 Hasil Perikanan Indonesia (JPHPI)*, 2(9), 42–55.
260 <https://doi.org/http://dx.doi.org/10.17844/jphpi.v27i9.52083>
- 261 Hu, J., Yan, X., Wang, W., Wu, H., Hua, L., & Du, L. (2008). Antioxidant Activity In Vitro of Three
262 Constituents from Caesalpinia sappan L. *Tsinghua Science & Technology*, 13(4), 474–479.
263 [https://doi.org/10.1016/S1007-0214\(08\)70076-2](https://doi.org/10.1016/S1007-0214(08)70076-2)
- 264 Maharani, N. P. D. S., Cahyani, I. M., & Hanhadyanaputri, E. S. (2022). Optimization of Polyvinyl
265 Alcohol (PVA) and Glycerin in Kolang Kaling Peel-Off Gel Mask Formula (Arenga pinnata.).
266 *Journal of Food and Pharmaceutical Sciences*, 2022(3), 746–753.
267 <https://doi.org/10.22146/JFPS.5718>
- 268 Muslimin, M. K., Rahayuningsih, E., & Mindaryani, A. (2024). Optimasi proses metilasi
269 brazilein hasil ekstrak kayu secang (Caesalpinia sappan linn) sebagai bahan pewarna
270 merah alami untuk tekstil. *Jurnal Rekayasa Proses*, 18(2), 89–99.
271 <https://doi.org/10.22146/JREKPROS.82068>
- 272 Ngamwonglumlert, L., & Devahastin, S. (2023). Brazilein as an alternative pigment: Isolation,
273 characterization, stability enhancement and food applications. *Food Chemistry*, 398,
274 133898. <https://doi.org/10.1016/J.FOODCHEM.2022.133898>
- 275 Ningsih, W., Firmansyah, F., & Fitri, H. (2016). Formulasi Masker Peel Off dengan Beberapa
276 Konsentrasi Ekstrak Etanol Buah Naga Super Merah (Hylocereus costaricensis (F.A.C
277 Weber) Britton & Rose). *Scientia: Jurnal Farmasi Dan Kesehatan*, 6(1), 18.
278 <https://doi.org/10.36434/SCIENTIA.V6I1.37>

- 279 Puspitasari, A. D., & Wulandari, R. L. (2017). Aktivitas Antioksidan dan Penetapan Kadar
280 Flavonoid Total Ekstrak Etil Asetat Daun Kersen (*Muntingia calabura*). *Jurnal*
281 *Pharmascience*, 4(2). <https://doi.org/10.20527/JPS.V4I2.5770>
- 282 Rahmawanty, D., Yulianti, N., & Fitriana, M. (2015). Formulasi dan Evaluasi Masker Wajah
283 Peel-Off Mengandung Kuersetin dengan Variasi Konsentrasi Gelatin dan Gliserin. *Media*
284 *Farmasi: Jurnal Ilmu Farmasi*, 12(1), 17–32. <https://doi.org/10.12928/MF.V12I1.3019>
- 285 Rajput, M. S., Nirmal, N. P., Nirmal, S. J., & Santivarangkna, C. (2022). Bio-actives from
286 *Caesalpinia sappan* L.: Recent advancements in phytochemistry and pharmacology.
287 *South African Journal of Botany*, 151, 60–74.
288 <https://doi.org/10.1016/J.SAJB.2021.11.021>
- 289 Rina, O., Sanusi, I., Abdidharma, Afrizal, Utami, C., & Widodo, Y. (2017). Stabilities Natural
290 Colorant of Sappan Wood (*Caesalpinia sappan* L.) for Food and Beverages in Various pH,
291 Temperature and Matrices of Food. *International Journal of Chemtech Research*, 10(1),
292 98–103.
- 293 Rina, O., W., C. U., & Ansori, A. (2012). Efektifitas Ekstrak Kayu Secang (*Caesalpinia Sappan* L.)
294 Sebagai Bahan Pengawet Daging. *Jurnal Penelitian Pertanian Terapan*, 12(3).
295 <https://doi.org/10.25181/JPPT.V12I3.215>
- 296 Setyowati, N., Masyhuri, Mulyo, J. H., Irham, & Yudhistira, B. (2023). The hidden treasure of
297 wedang uwuh, an ethnic traditional drink from Java, Indonesia: Its benefits and
298 innovations. *International Journal of Gastronomy and Food Science*, 31, 100688.
299 <https://doi.org/10.1016/J.IJGFS.2023.100688>
- 300 Silvia, B. ., Dewi, M. ., & Darusman, F. (2021). Studi Literatur Pengaruh Jenis dan Konsentrasi
301 Basis terhadap Karakteristik Masker Gel Peel Off. *Prosiding Farmasi*, 148–156.
- 302 Sinambela, E. S., & Telaumbanua, D. (2022). Pengaruh Variasi Konsentrasi PVA dan HPMC
303 Terhadap Stabilitas Fisik Masker Gel Peel-Off Ekstrak Metanol Biji Pepaya (*Carica papaya*
304 L.). *Journal Health Of Education*, 3(2), 1–4.
- 305 Sugiyanto, R. N., Putri, S. R., Damanik, F. S., & Sasmita, G. M. A. (2013). Aplikasi Kayu Secang
306 (*Caesalpinia Sappan* L.) dalam Upaya Prevensi Kerusakan Dna Akibat Paparan Zat
307 Potensial Karsinogenik melalui Mnpce Assay. *Pekan Ilmiah Mahasiswa Nasional Program*
308 *Kreativitas Mahasiswa - Penelitian 2013*.
309 <https://www.neliti.com/id/publications/171018/>
- 310 Syam, N. ., Lestari, U., & Muhaimin. (2021). Formulasi Dan Uji Sifat Masker Gel Peel-Off dari
311 Minyak Sawit Murni dengan Basis Carbomer 940. *Indonesian Journal of Pharma Science*,
312 3(1), 42–55.
- 313 Tanzaq, T. tanando, Agustina, R. D., Setiawati, K. E., & Cahyani, I. M. (2019). Uji Aktivitas
314 Penangkapan Radikal DPPH (1,1-Diphenyl-2-Picrylhdrazyl) Ekstrak Etanol Kayu Secang
315 (*Caesalpinia sappan* L.). *Media Farmasi Indonesia*, 14(1), 1461–1465.
316 <https://mfi.stifar.ac.id/MFI/article/view/105/86>
- 317 Utari, F. D. (2017). Produksi Antioksidan dari Ekstrak Kayu Secang (*Caesalpinia sappan* L.)
318 Menggunakan Pengereng Berkelembaban Rendah. *Jurnal Aplikasi Teknologi Pangan*,
319 6(3). <https://doi.org/10.17728/JATP.241>
- 320 Wahdaningsih, S., Budilaksono, W., & Fahrurroji, A. (2015). Uji aktivitas antioksidan fraksi n-
321 heksana kulit buah naga merah menggunakan metode 1,1-Difenil-2-Pikrilhidrazil. *Jurnal*
322 *Kesehatan Khatulistiwa*, 1(2), 115–136.
323 <https://doi.org/10.26418/JURKESWA.V1I2.42997>
- 324 Welly, S., Supriyanto, & Saraswati, M. (2022). Antioxidant Test and Peel-Off Mask Formulation
325 Extract of Red Spinning (*Amaranthus tricolor* L.) Leaves with Variations of Gelling Agent

326 Types. *Joseph (Journal of Pharmacy)*, 2(1), 42–55.
 327 Widowati, W. (Wahyu). (2011). Uji Fitokimia Dan Potensi Antioksidan Ekstrak Etanol Kayu
 328 Secang (*Caesalpinia Sappan L.*). *Maranatha Journal of Medicine and Health*, 11(1),
 329 151615. <https://www.neliti.com/id/publications/151615/>

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Table 1. Formulation of Peel Off Gel Masker Secang Wood Extract

Material	Formula (%)		
	I	II	III
Secang Wood Extract	2,5	5	7,5
CMC Na	1,26	1,26	1,26
PVA	6,74	6,74	6,74
Propilenglikol	4	4	4
Aqua destilata ad	100	100	100

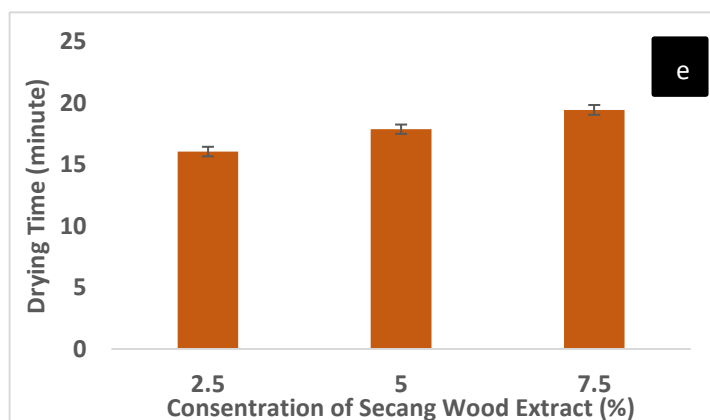
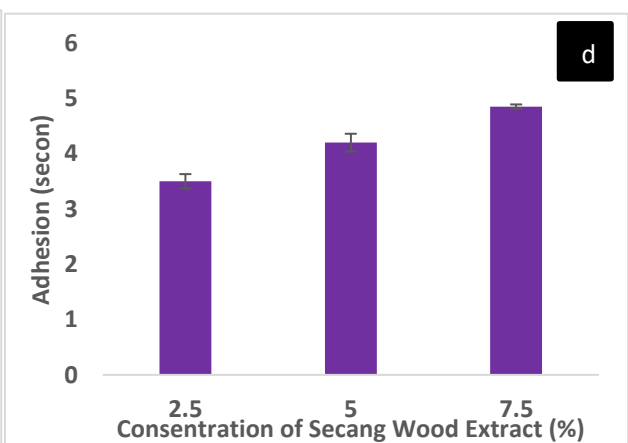
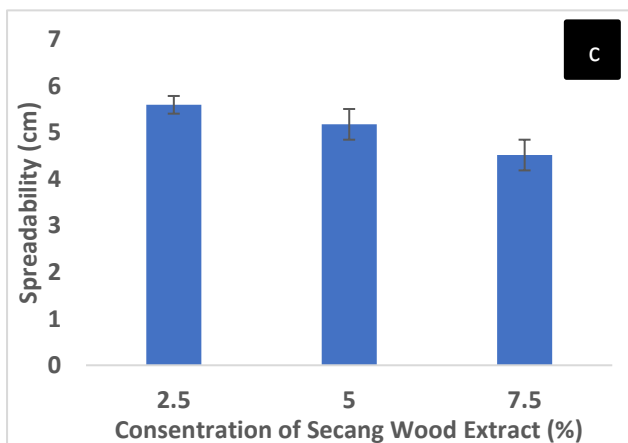
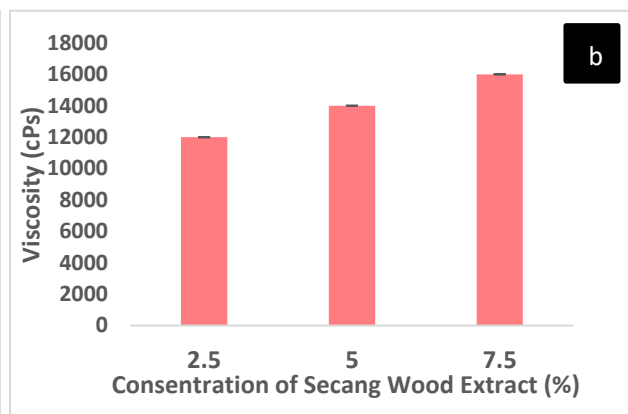
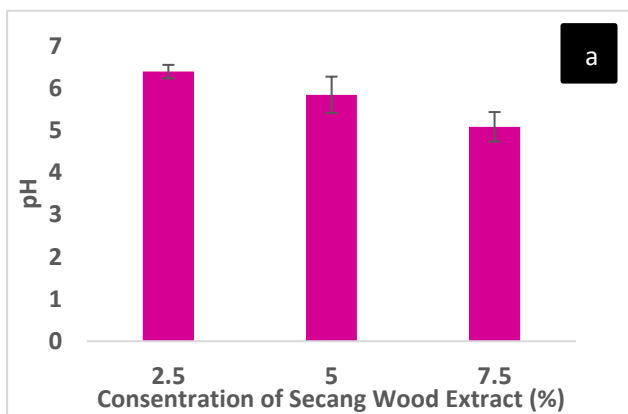
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Table 2. Characterization and Antioxidant Activity of Peel Off Gel Mask Secang Wood Extract

Evaluation	Formula		
	I	II	III
Organoleptic	Consistency thick and soft, colour orange, odor secang smell	Consistency thick and soft, colour orange, odor secang smell	Consistency thick and soft, colour orange, odor secang smell
Homogeneity	Homogeneous	Homogeneous	Homogeneous

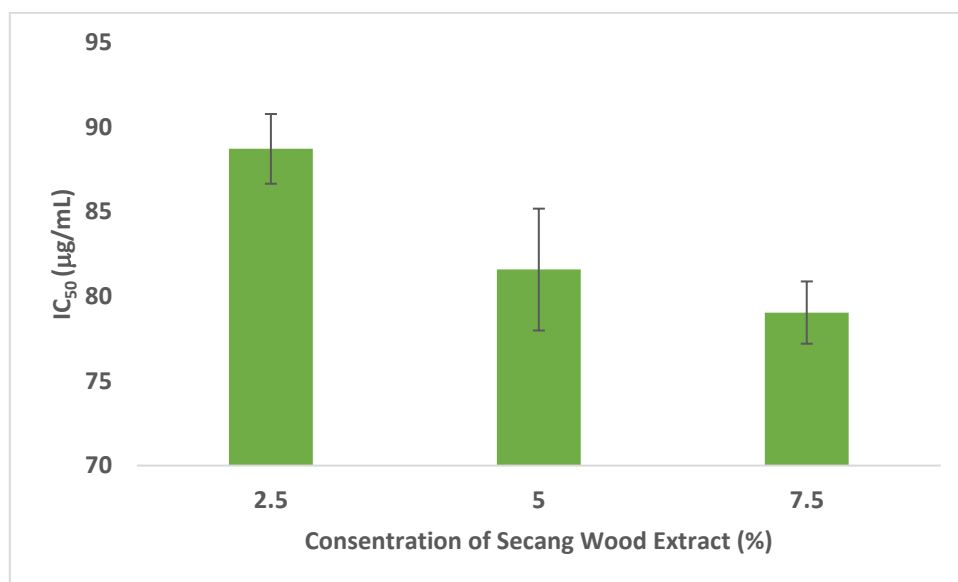
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Figure 1. Characterization of Peel Off Gel Mask Secang Wood Extract: (a) pH, (b) Viscosity, (c) Spreadability, (d) Adhesion and (e) Drying Time



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Figure 2. Antioxidant activity (IC₅₀) of Peel Off Gel Mask Secang Wood Extract

BUKTI KORESPONDENSI DATA HASIL

Evaluation	Consentration of Secang Wood Extract (%)					
	Formula I		Formula II		Formula III	
	average	SD	average	SD	average	SD
pH	6.4	0.16	5.85	0.48	5.09	0.35
Viscosity (cPs)	11986.4	6.02	13992.6	5.13	15993.2	5.36
Spreadability (cm)	5.6	0.19	5.18	0.33	4.52	0.33
Adhesion (secon)	3.5	0.13	4.2	0.16	4.85	0.04
Drying Time (minute)	16.06	0.39	17.88	0.38	19.45	0.4
IC50 (mg/mL)	88.71	2.06	81.58	3.6	79.04	1.84

**BUKTI KORESPONDENSI MINOR REVISION REQUEST FROM THE
AUTHOR ON COPYEDITING RESULTS**

**1 Formulation and Characterization of Peel-Off Gel Mask Containing Secang
2 (Caesalpinia sappan L.) Wood Extract with Strong Antioxidant Activity
3 Formulasi dan Karakterisasi Masker Gel Peel-Off Mengandung Ekstrak Kayu
4 Secang (Caesalpinia sappan L.) dengan Aktivitas Antioksidan yang Kuat**

5
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9 **Abstract**

10 Secang (*Caesalpinia sappan* L.) wood contains flavonoid compounds such as brazilin, 3'-O-
11 methylbrazilin, sappanin chalcone, and sappan chalcone, which act as primary and secondary
12 antioxidants. Antioxidants are substances that can inhibit oxidation reactions by neutralizing
13 free radicals. Enhancing the antioxidant potential of *C. sappan* wood can be achieved by
14 developing a topical dosage form. Peel-off gel masks are an ideal form due to their ability to
15 improve skin health and provide ease and comfort in application. This study aimed to
16 formulate a peel-off gel mask containing *C. sappan* extract and evaluate its physical
17 properties and antioxidant activity. The formulations were prepared using 2.5%, 5%, and 7.5%
18 extract with sodium carboxymethyl cellulose, polyvinyl alcohol, and propylene glycol as the
19 base. The resulting masks were assessed for physical characteristics (pH, viscosity,
20 spreadability, adhesiveness, and drying time) and antioxidant activity using the DPPH method.
21 The results indicated that increasing the extract concentration significantly ($p < 0.05$)
22 increased viscosity, adhesiveness, and drying time, while decreasing pH, spreadability,
23 and IC₅₀ value. All formulations demonstrated strong antioxidant activity (IC₅₀ between 50–
24 100 µg/mL), with IC₅₀ values of 88.71 µg/mL, 81.58 µg/mL, and 79.04 µg/mL, respectively.

25
26 **Keywords:** *Caesalpinia sappan*, peel-off gel mask, formulation, antioxidant, physical
27 characterization

28 **Abstrak**

29 Kayu secang (*Caesalpinia sappan* L.) mengandung senyawa flavonoid seperti brazilin, 3'-O-
30 metilbrazilin, sappanin chalcone, dan sappan chalcone yang berfungsi sebagai antioksidan
31 primer maupun sekunder. Antioksidan merupakan senyawa yang mampu menghambat reaksi
32 oksidasi dengan menetralkan radikal bebas. Upaya peningkatan potensi antioksidan kayu *C.*
33 *sappan* dapat dilakukan melalui pengembangan sediaan topikal. Masker gel peel-off
34 merupakan bentuk sediaan yang sesuai karena dapat menjaga kesehatan kulit sekaligus
35 memberikan kenyamanan dan kemudahan saat pemakaian. Penelitian ini bertujuan untuk
36 merumuskan dan mengevaluasi masker gel peel-off yang mengandung ekstrak kayu *C.*
37 *sappan* berdasarkan karakteristik fisik dan aktivitas antioksidannya. Formulasi dibuat dengan
38 konsentrasi ekstrak 2,5%, 5%, dan 7,5% menggunakan natrium karboksimetil selulosa,
39 polivinil alkohol, dan propilen glikol sebagai basis gel. Evaluasi dilakukan terhadap parameter
40 fisik (pH, viskositas, daya sebar, daya lekat, dan waktu kering) serta aktivitas antioksidan
41 menggunakan metode DPPH. Hasil menunjukkan bahwa peningkatan konsentrasi ekstrak
42 secara signifikan ($p < 0,05$) meningkatkan viskositas, daya lekat, dan waktu kering serta
43 menurunkan pH, daya sebar, dan nilai IC₅₀. Seluruh formula menunjukkan aktivitas

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44 antioksidan yang kuat (IC_{50} antara 50–100 $\mu\text{g}/\text{mL}$), dengan nilai IC_{50} berturut-turut
45 sebesar 88,71 $\mu\text{g}/\text{mL}$, 81,58 $\mu\text{g}/\text{mL}$, dan 79,04 $\mu\text{g}/\text{mL}$.

46
47 **Kata Kunci:** *Caesalpinia sappan*, masker gel peel-off, formulasi, antioksidan, karakteristik fisik

48 1. Introduction

49 Air pollution has increased significantly in recent years, with levels rising by up to 20%,
50 and has been identified as a major contributor to various health problems due to prolonged
51 exposure (Wahdaningsih et al., 2015). One of the primary mechanisms through which
52 pollution causes harm is oxidative stress, a condition arising from an overproduction of free
53 radicals in the body. These reactive species can damage biological molecules, highlighting the
54 importance of antioxidants in neutralizing free radicals and preventing oxidative damage,
55 particularly in the skin (Widowati, 2011).

56 Flavonoids are natural compounds widely recognized for their antioxidant properties.
57 They are capable of scavenging a variety of free radicals, including hydroxyl, peroxy, alkoxy,
58 superoxide anions, singlet oxygen, and hydrogen peroxide (Utari, 2017). One promising
59 source of flavonoids is the wood of secang (*Caesalpinia sappan* L.), which contains active
60 constituents such as brazilin, 3'-O-methylbrazilin, sappanin, and chalcone. These compounds
61 act as both primary and secondary antioxidants. Among them, brazilin has shown particularly
62 strong antioxidant activity, reportedly exceeding that of synthetic antioxidants such as
63 butylated hydroxytoluene (BHT) and butylated hydroxyanisole (BHA) (Sugiyanto et al., 2013).
64 In previous studies, the extract of *C. sappan* demonstrated strong antioxidant potential with
65 an IC_{50} value of 74.44 $\mu\text{g}/\text{mL}$ (Tanzaq et al., 2019).

66 Facial masks are among the most popular cosmetic products for skin care. However,
67 traditional mask types are often considered less practical due to lengthy application and
68 removal processes. Peel-off gel masks have emerged as a more efficient alternative, offering
69 ease of use, user comfort, and the ability to deliver active ingredients effectively without
70 requiring rinsing (Rahmawanty et al., 2015). Furthermore, peel-off gel formulations have
71 been shown to enhance antioxidant efficacy when natural extracts are incorporated.
72 Successful applications have been reported using extracts such as *Paederia foetida* (Eka et al.,
73 2022), areca seed (*Areca catechu*) (Dwi Mulyani et al., 2023), red spinach (*Amaranthus*

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74 *tricolor*) leaves (Welly et al., 2022), and mangrove (*Avicennia marina*) leaves (Hasibuan et al.,
75 2024).

76 Despite its promising properties, the application of *C. sappan* extract in peel-off gel
77 mask formulations remains underexplored. Therefore, the aim of this study was to formulate
78 and evaluate a peel-off gel mask containing *C. sappan* extract, with a focus on its physical
79 characteristics and antioxidant activity. This formulation is expected to serve as a natural,
80 effective skincare solution by maximizing the antioxidant potential of *C. sappan* in a user-
81 friendly topical preparation.

82 2. Methods

83 2.1 Materials and Equipment

84 The materials used in this study included *C. sappan* (secang) wood, 96% ethanol
85 (Merck), sodium carboxymethyl cellulose (CMC-Na), polyvinyl alcohol (PVA), propylene glycol,
86 vitamin C, and 1,1-diphenyl-2-picrylhydrazyl (DPPH).

87 The instruments employed were a rotary evaporator (Heidolph), standard laboratory
88 glassware (Pyrex), pH meter (Hanna Instruments pH 210 Microprocessor), viscometer
89 (Brookfield DV-I Prime), and UV-Vis spectrophotometer (Shimadzu UV-1240 Mini).

90 2.2 Extraction of *C. sappan* Wood

91 Secang wood was extracted by maceration. The wood powder was soaked in 96%
92 ethanol at a ratio of 1:10 (w/v) for 72 hours. The extract was filtered and concentrated using
93 a rotary evaporator until a thick extract was obtained (Tanzaq et al., 2019).

94 2.3 Formulation of Peel-Off Gel Mask

95 The peel-off gel mask was formulated using *C. sappan* extract at concentrations of 2.5%,
96 5%, and 7.5%, as shown in **Table 1**. The gel base consisted of polyvinyl alcohol (PVA), sodium
97 carboxymethyl cellulose (CMC-Na), and propylene glycol. PVA and CMC-Na were dispersed in
98 distilled water heated to 80°C until fully swollen. Afterward, propylene glycol was added and
99 the mixture was stirred until homogeneous. The ethanol extract of *C. sappan* was then
100 incorporated gradually into the base while stirring, and distilled water was added to reach
101 100% total weight. The final mixture was stirred continuously to ensure uniformity (Cahyani
102 et al., 2025).

103 **Table 1.** Composition of Peel-Off Gel Mask Formulations Containing *C. sappan* Extract

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Ingredient	Formula I (%)	Formula II (%)	Formula III (%)
<i>C. sappan</i> extract	2.5	5.0	7.5
Sodium CMC (CMC-Na)	1.26	1.26	1.26
Polyvinyl alcohol (PVA)	6.74	6.74	6.74
Propylene glycol	4.0	4.0	4.0
Distilled water (ad)	100	100	100

104

105 **2.4 Evaluation of Physical Characteristics**

106 The physical characteristics of the peel-off gel masks were evaluated to assess their
107 suitability as topical cosmetic formulations. Organoleptic properties including color, odor, and
108 consistency were observed visually, while homogeneity was examined by spreading a small
109 sample of the gel on a glass slide to check for uniform dispersion of components (Syam et al.,
110 2021).

111 The pH of each formulation was measured by immersing the electrode of a calibrated
112 digital pH meter into the gel and recording the stabilized value (Andini et al., 2017). Viscosity
113 was determined using a Brookfield viscometer equipped with spindle number 64, operated
114 at a speed of 1 rpm. A viscosity range of 2000–50000 cps is considered acceptable for peel-
115 off gel masks (SNI 16-4399-1996).

116 To evaluate spreadability, 0.5 g of the formulation were placed at the center of a glass
117 plate, then covered with another glass plate of known weight. The diameter of the spread
118 was measured, and additional weight was added incrementally until the diameter stabilized.
119 Adhesiveness was assessed by placing a 0.25 g sample between two glass slides, applying a
120 100 g load for five minutes, and measuring the time it took for the plates to separate after
121 load removal (Syam et al., 2021).

122 The drying time was tested by applying 0.1 gram of gel to a 2.5 × 2.5 cm area on the
123 inner forearm. The time required for the film to dry completely at room temperature was
124 recorded. An ideal drying time for peel-off gel masks ranges from 15 to 30 minutes (Silvia et
125 al., 2021).

126 **2.5 Antioxidant Activity Test Using DPPH Method**

127 The antioxidant activity of the peel-off gel mask formulations was evaluated using the
128 DPPH (2,2-diphenyl-1-picrylhydrazyl) free radical scavenging method. Initially, the maximum

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129 absorbance wavelength (λ_{max}) of the DPPH solution (30 $\mu\text{g}/\text{mL}$) was determined using a UV-
130 Vis spectrophotometer within the 400–800 nm range. The optimal reaction time was also
131 established by reacting a 1:1 volume ratio of vitamin C (as the standard antioxidant) with the
132 DPPH solution and measuring the absorbance over a 60-minute period.

133 Each sample (0.05 g) was dissolved in methanol and diluted to 50 mL. From this stock
134 solution, working concentrations of 60, 70, 80, 100, and 120 $\mu\text{g}/\text{mL}$ were prepared. Equal
135 volumes of the sample solution and DPPH solution (30 $\mu\text{g}/\text{mL}$) were mixed, incubated at room
136 temperature for the predetermined optimal time, and their absorbance measured at the
137 previously identified λ_{max} . The same procedure was applied to vitamin C standard solutions
138 at concentrations of 2, 4, 6, 8, and 10 $\mu\text{g}/\text{mL}$.

139 The percentage inhibition of DPPH radicals was calculated for each concentration, and
140 the IC_{50} value—the concentration required to inhibit 50% of the DPPH radicals—was
141 determined by linear regression analysis of the inhibition percentage versus sample
142 concentration (Maharani et al., 2022).

143 2.6 Data Analysis

144 The evaluation of the peel-off gel mask formulations was conducted using descriptive
145 analysis. Observational data such as organoleptic characteristics and homogeneity were
146 assessed qualitatively. Physical parameters including pH, viscosity, spreadability,
147 adhesiveness, and drying time were compared across formulations to identify trends related
148 to increasing concentrations of *C. sappan* extract. Similarly, antioxidant activity data were
149 interpreted by comparing the IC_{50} values of each formulation. The significance of observed
150 changes was discussed in terms of their relative magnitude and consistency rather than based
151 on formal statistical tests.

152

153 3. Results and Discussion

154 3.1 Physical Characteristics of Peel Off Gel Mask Containing *C. sappan* Extract

155 *Caesalpinia sappan* has traditionally been recognized for its therapeutic properties,
156 including antibacterial, anti-inflammatory, antidiabetic, and antioxidant effects. The ethanol
157 extract of *C. sappan* contains flavonoid compounds such as brazilin, 3'-O-methylbrazilin,
158 sappanin, and chalcone, which contribute to its strong antioxidant profile (Ngamwonglumlert
159 & Devahastin, 2023). In this study, peel-off gel mask formulations containing *C.*

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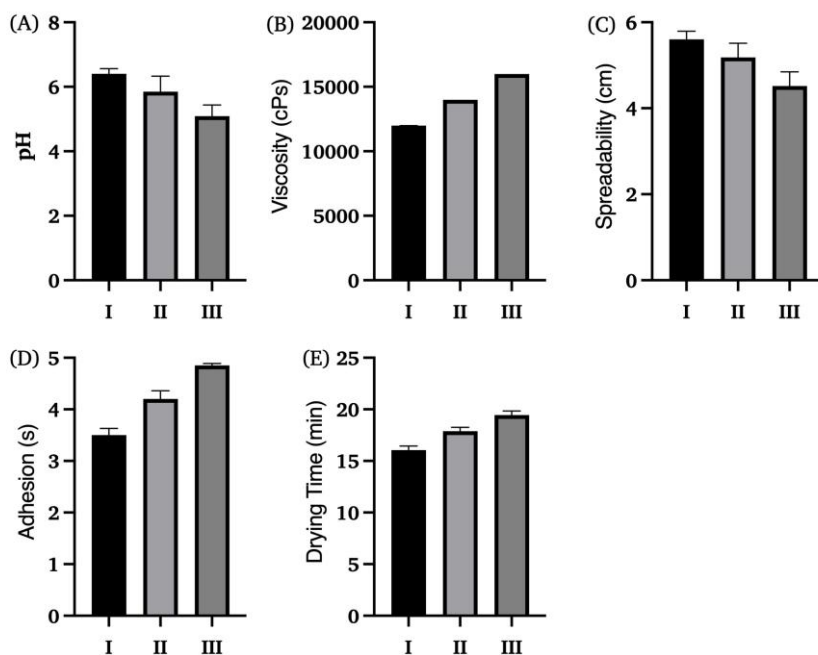
160 *sappan* extract at concentrations of 2.5%, 5%, and 7.5% were developed and evaluated for
161 their physical properties.

162 The organoleptic and homogeneity observations showed that all formulations had a
163 consistent orange color, a characteristic *C. sappan* odor, and a smooth, thick consistency.
164 Each gel was visually homogeneous, indicating even distribution of ingredients throughout
165 the formulation.

166 **Figure 1** illustrates the physical properties of the three formulations. The pH values
167 decreased slightly as the extract concentration increased. This trend is attributed to the acidic
168 nature of *C. sappan* extract (Muslimin et al., 2024), which becomes more influential as the
169 proportion of extract rises. The viscosity of the gels increased progressively with extract
170 concentration, affecting other parameters such as spreadability, adhesiveness, and drying
171 time. A higher viscosity reduced spreadability but enhanced adhesiveness and prolonged the
172 drying time. These relationships are evident in the trends presented in Figure 1.

173 Such changes in physical characteristics are consistent with the structural influence of
174 extract constituents and the thickening effect they exert in the gel base. Although no
175 statistical tests were applied, the consistent trends across all parameters support the
176 influence of *C. sappan* extract concentration on the physical performance of the peel-off
177 mask.

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178
179 **Figure 1.** Physical characteristics of peel-off gel mask containing *C. sappan* extract in
180 Formulation I (2.5%), Formulation II (5.0%), and Formulation III (7.5%): (a) pH, (b) viscosity, (c)
181 spreadability, (d) adhesiveness, and (e) drying time.

182

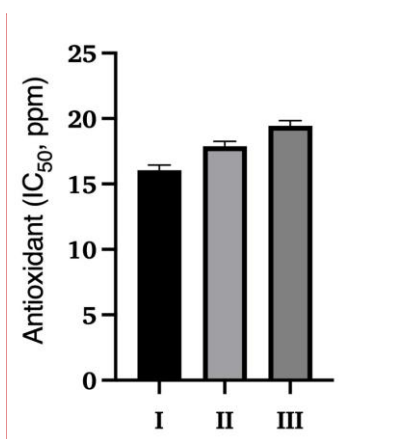
183 3.2 Antioxidant Activity of Peel-Off Gel Mask Containing *C. sappan* Extract

184 The antioxidant activity of the peel-off gel mask formulations was evaluated using the
185 DPPH free radical scavenging assay. All formulations demonstrated strong antioxidant
186 capacity, with IC_{50} values within the range of 50–100 $\mu\text{g/mL}$, indicating effective radical
187 scavenging potential.

188 As shown in **Figure 2**, the IC_{50} values decreased with increasing extract
189 concentration: 88.71 $\mu\text{g/mL}$ for Formulation I (2.5%), 81.58 $\mu\text{g/mL}$ for Formulation II (5.0%),
190 and 79.04 $\mu\text{g/mL}$ for Formulation III (7.5%). This trend suggests that higher concentrations
191 of *C. sappan* extract contribute to enhanced antioxidant performance, likely due to increased
192 levels of flavonoid compounds such as brazilin.

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193 Although statistical testing was not applied, the progressive decrease in IC_{50} values
194 clearly indicates the influence of extract concentration on antioxidant activity. These results
195 are consistent with the literature, which identifies *C. sappan* as a potent natural antioxidant
196 source (Tanzaq et al., 2019). Compared to its pure extract IC_{50} value of 74.44 $\mu\text{g/mL}$, the
197 formulated gels retained high antioxidant potential. However, when compared to vitamin C
198 ($IC_{50} = 3.04 \mu\text{g/mL}$), the formulations were less potent, which is expected given the superior
199 radical scavenging efficiency of pure ascorbic acid.



200
201 **Figure 2.** IC_{50} values of peel-off gel mask containing *C. sappan* extract in Formulation I
202 (2.5%), Formulation II (5.0%), and Formulation III (7.5%).

204 4. Conclusion

205 This study demonstrated that peel-off gel masks containing *C. sappan* extract can be
206 effectively formulated using polyvinyl alcohol, sodium carboxymethyl cellulose, and
207 propylene glycol as base components. Increasing the extract concentration from 2.5% to 7.5%
208 affected the physical properties of the formulation by increasing viscosity, adhesiveness, and
209 drying time, while decreasing pH and spreadability. All formulations exhibited strong
210 antioxidant activity, with IC_{50} values ranging from 88.71 to 79.04 $\mu\text{g/mL}$, indicating that higher
211 extract concentrations enhance antioxidant performance. Overall, the 7.5% extract
212 formulation showed the most favorable combination of physical characteristics and
213 antioxidant activity, supporting its potential as a natural, effective peel-off gel mask for skin
214 health applications.

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References

- 217 Andini, T., Yusriadi, Y., & Yuliet, Y. (2017). Optimasi pembentuk film polivinil alkohol dan
218 humektan propilen glikol pada formula masker gel peel off sari buah labu kuning
219 (*Cucurbita moschata* Duchesne) sebagai antioksidan. *Jurnal Farmasi Galenika (Galenika*
220 *Journal of Pharmacy)*, 3(2), 101–108.
- 221 Anindhita, M. A., Prastiwi, D., Lu, N., Fitriyani, L., & Nanda Rini, S. (2023). Pengaruh
222 penggunaan polivinil alkohol sebagai *gelling agent* terhadap sifat fisikokimia sediaan
223 gel *peel-off* ekstrak etanol buah pedada. *Parapemikir: Jurnal Ilmiah Farmasi*, 12(1), 18–
224 29. <https://doi.org/10.30591/pjif.v12i1.3990>
- 225 Cahyani, I. M., Hanhadyanaputri, E. S., Wulan, A. H., & Sulistyarini, I. (2025). Optimization
226 formula of kolang-kaling (*Arenga pinnata*) peel-off gel mask with combination PVA–CMC
227 Na as *gelling agent* on simplex lattice design. *Media Farmasi Indonesia*, 20(1), 67–
228 75. <https://doi.org/10.53359/mfi.v20i1.316>
- 229 Cahyani, I. M., & Putri, I. D. C. (2017). Efektivitas karbopol 940 dalam formula masker gel *peel-*
230 *off* ekstrak temu giring (*Curcuma heyneana* Val & Zijp). *Journal of Pharmaceutical and*
231 *Medicinal Sciences*, 2(2), 48–51.
- 232 Dwi Mulyani, A., Rahayu, P., Aini, N., Purnamasari, D., & Mulyani, A. D. (2023). Formulasi dan
233 evaluasi mutu fisik sediaan masker gel *peel-off* ekstrak biji pinang (*Areca catechu* L.)
234 sebagai antioksidan. *Indonesian Journal of Pharmaceutical Education*, 3(3), 1–
235 9. <https://doi.org/10.37311/ijpe.v3i3.22033>
- 236 Eka, R., Susanti, E., & A'yun, Q. (2022). Formulation and antioxidant activity of *peel-off* gel
237 mask from *Paederia foetida* extract. *JKPK (Jurnal Kimia dan Pendidikan Kimia)*, 7(1), 12–
238 19. <https://doi.org/10.20961/jkpk.v7i1.45798>
- 239 Faizah, U. N., Maula, N. N., Mustika, R. A., & Wahyuni, S. (2023). Potensi senyawa antioksidan
240 yang terkandung dalam kayu secang (*Caesalpinia sappan*) untuk perawatan kulit
241 alami. *Symbiotic: Journal of Biological Education and Science*, 4(1), 41–
242 49. <https://doi.org/10.32939/symbiotic.v4i1.90>
- 243 Hasibuan, N. E., Azka, A., Basri, & Mujiyanti, A. (2024). Aktivitas antioksidan dan karakteristik
244 masker gel *peel-off* dari ekstrak daun mangrove (*Avicennia marina*). *Jurnal Pengolahan*
245 *Hasil Perikanan Indonesia*, 2(9), 42–55. <https://doi.org/10.17844/jphpi.v27i9.52083>
- 246 Hu, J., Yan, X., Wang, W., Wu, H., Hua, L., & Du, L. (2008). Antioxidant activity in vitro of three
247 constituents from *Caesalpinia sappan* L. *Tsinghua Science & Technology*, 13(4), 474–
248 479. [https://doi.org/10.1016/s1007-0214\(08\)70076-2](https://doi.org/10.1016/s1007-0214(08)70076-2)
- 249 Maharani, N. P. D. S., Cahyani, I. M., & Hanhadyanaputri, E. S. (2022). Optimization of polyvinyl
250 alcohol (PVA) and glycerin in kolang-kaling *peel-off* gel mask formula (*Arenga*
251 *pinnata*). *Journal of Food and Pharmaceutical Sciences*, 2022(3), 746–
252 753. <https://doi.org/10.22146/jfps.5718>
- 253 Muslimin, M. K., Rahayuningsih, E., & Mindaryani, A. (2024). Optimasi proses metilasi
254 brazilein hasil ekstrak kayu secang (*Caesalpinia sappan* Linn) sebagai bahan pewarna
255 merah alami untuk tekstil. *Jurnal Rekayasa Proses*, 18(2), 89–
256 99. <https://doi.org/10.22146/jrekpros.82068>
- 257 Ngamwonglumlert, L., & Devahastin, S. (2023). Brazilein as an alternative pigment: Isolation,
258 characterization, stability enhancement and food applications. *Food Chemistry*, 398,
259 Article 133898. <https://doi.org/10.1016/j.foodchem.2022.133898>

**BUKTI KORESPONDENSI MINOR REVISION REQUEST FROM THE
AUTHOR ON COPYEDITING RESULTS**

- 260 Rahmawanty, D., Yulianti, N., & Fitriana, M. (2015). Formulasi dan evaluasi masker
261 wajah *peel-off* mengandung kuersetin dengan variasi konsentrasi gelatin dan
262 gliserin. *Media Farmasi: Jurnal Ilmu Farmasi*, 12(1), 17–
263 32. <https://doi.org/10.12928/mf.v12i1.3019>
- 264 Rina, O., Sanusi, I., Abdidharma, Afrizal, Utami, C., & Widodo, Y. (2017). Stabilities of natural
265 colorant of sappan wood (*Caesalpinia sappan* L.) for food and beverages in various pH,
266 temperature and food matrices. *International Journal of ChemTech Research*, 10(1), 98–
267 103.
- 268 Sugiyanto, R. N., Putri, S. R., Damanik, F. S., & Sasmita, G. M. A. (2013). Aplikasi kayu secang
269 (*Caesalpinia sappan* L.) dalam upaya prevensi kerusakan DNA akibat paparan zat
270 potensial karsinogenik melalui MNPCE assay. *Pekan Ilmiah Mahasiswa Nasional – PKM*
271 *Penelitian 2013*. <https://www.neliti.com/id/publications/171018>
- 272 Syam, N., Lestari, U., & Muhaimin. (2021). Formulasi dan uji sifat masker gel *peel-off* dari
273 minyak sawit murni dengan basis carbomer 940. *Indonesian Journal of Pharma Science*,
274 3(1), 42–55.
- 275 Tanzaq, T. T., Agustina, R. D., Setiawati, K. E., & Cahyani, I. M. (2019). Uji aktivitas
276 penangkapan radikal DPPH (1,1-diphenyl-2-picrylhydrazyl) ekstrak etanol kayu secang
277 (*Caesalpinia sappan* L.). *Media Farmasi Indonesia*, 14(1), 1461–
278 1465. <https://mfi.stifar.ac.id/mfi/article/view/105/86>
- 279 Utari, F. D. (2017). Produksi antioksidan dari ekstrak kayu secang (*Caesalpinia sappan* L.)
280 menggunakan pengering berkelembaban rendah. *Jurnal Aplikasi Teknologi Pangan*,
281 6(3). <https://doi.org/10.17728/jatp.241>
- 282 Wahdaningsih, S., Budilaksono, W., & Fahrurroji, A. (2015). Uji aktivitas antioksidan fraksi n-
283 heksana kulit buah naga merah menggunakan metode 1,1-difenil-2-pikrilhidrazil. *Jurnal*
284 *Kesehatan Khatulistiwa*, 1(2), 115–136. <https://doi.org/10.26418/jurkeswa.v1i2.42997>
- 285 Welly, S., Supriyanto, & Saraswati, M. (2022). Antioxidant test and *peel-off* mask formulation
286 extract of red spinach (*Amaranthus tricolor* L.) leaves with variations of *gelling*
287 *agent* types. *Joseph (Journal of Pharmacy)*, 2(1), 42–55.
- 288 Widowati, W. (2011). Uji fitokimia dan potensi antioksidan ekstrak etanol kayu secang
289 (*Caesalpinia sappan* L.). *Maranatha Journal of Medicine and Health*, 11(1),
290 151615. <https://www.neliti.com/id/publications/151615/>
- 291

1 **Formulation and Characterization of Peel-Off Gel Mask Containing Secang**
2 **(*Caesalpinia sappan* L.) Wood Extract with Strong Antioxidant Activity**
3 **Formulasi dan Karakterisasi Masker Gel Peel-Off Mengandung Ekstrak Kayu**
4 **Secang (*Caesalpinia sappan* L.) dengan Aktivitas Antioksidan yang Kuat**

5
6 Intan Martha Cahyani^{1*}, Tan Tanando Tanzaq¹, Ruth Ditya Agustina¹, Kemala Ender Setiawati¹

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9 **Abstract**

10 Secang (*Caesalpinia sappan* L.) wood contains flavonoid compounds such as brazilin, 3'-O-
11 methylbrazilin, sappanin chalcone, and sappan chalcone, which act as primary and secondary
12 antioxidants. Antioxidants are substances that can inhibit oxidation reactions by neutralizing
13 free radicals. Enhancing the antioxidant potential of *C. sappan* wood can be achieved by
14 developing a topical dosage form. Peel-off gel masks are an ideal form due to their ability to
15 improve skin health and provide ease and comfort in application. This study aimed to
16 formulate a peel-off gel mask containing *C. sappan* extract and evaluate its physical
17 properties and antioxidant activity. The formulations were prepared using 2.5%, 5%, and 7.5%
18 extract with sodium carboxymethyl cellulose, polyvinyl alcohol, and propylene glycol as the
19 base. The resulting masks were assessed for physical characteristics (pH, viscosity,
20 spreadability, adhesiveness, and drying time) and antioxidant activity using the DPPH method.
21 The results indicated that increasing the extract concentration significantly ($p < 0.05$)
22 increased viscosity, adhesiveness, and drying time, while decreasing pH, spreadability,
23 and IC₅₀ value. All formulations demonstrated strong antioxidant activity (IC₅₀ between 50–
24 100 µg/mL), with IC₅₀ values of 88.71 µg/mL, 81.58 µg/mL, and 79.04 µg/mL, respectively.

25
26 Keywords: *Caesalpinia sappan*, peel-off gel mask, formulation, antioxidant, physical
27 characterization

28 **Abstrak**

29 Kayu secang (*Caesalpinia sappan* L.) mengandung senyawa flavonoid seperti brazilin, 3'-O-
30 metilbrazilin, sappanin chalcone, dan sappan chalcone yang berfungsi sebagai antioksidan
31 primer maupun sekunder. Antioksidan merupakan senyawa yang mampu menghambat reaksi
32 oksidasi dengan menetralkan radikal bebas. Upaya peningkatan potensi antioksidan kayu *C.*
33 *sappan* dapat dilakukan melalui pengembangan sediaan topikal. Masker gel peel-off
34 merupakan bentuk sediaan yang sesuai karena dapat menjaga kesehatan kulit sekaligus
35 memberikan kenyamanan dan kemudahan saat pemakaian. Penelitian ini bertujuan untuk
36 merumuskan dan mengevaluasi masker gel peel-off yang mengandung ekstrak kayu *C.*
37 *sappan* berdasarkan karakteristik fisik dan aktivitas antioksidannya. Formulasi dibuat dengan
38 konsentrasi ekstrak 2,5%, 5%, dan 7,5% menggunakan natrium karboksimetil selulosa,
39 polivinil alkohol, dan propilen glikol sebagai basis gel. Evaluasi dilakukan terhadap parameter
40 fisik (pH, viskositas, daya sebar, daya lekat, dan waktu kering) serta aktivitas antioksidan
41 menggunakan metode DPPH. Hasil menunjukkan bahwa peningkatan konsentrasi ekstrak
42 secara signifikan ($p < 0,05$) meningkatkan viskositas, daya lekat, dan waktu kering serta
43 menurunkan pH, daya sebar, dan nilai IC₅₀. Seluruh formula menunjukkan aktivitas

BUKTI KORESPONDENSI CONFIRMATION OF REVISION – FIGURE 2 ADJUSTMENT AND UNIT CORRECTION

44 antioksidan yang kuat (IC_{50} antara 50–100 $\mu\text{g/mL}$), dengan nilai IC_{50} berturut-turut
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47 **Kata Kunci:** *Caesalpinia sappan*, masker gel peel-off, formulasi, antioksidan, karakteristik fisik

48

1. Introduction

49 Air pollution has increased significantly in recent years, with levels rising by up to 20%,
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51 exposure (Wahdaningsih et al., 2015). One of the primary mechanisms through which
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55 particularly in the skin (Widowati, 2011).

56 Flavonoids are natural compounds widely recognized for their antioxidant properties.
57 They are capable of scavenging a variety of free radicals, including hydroxyl, peroxide, alkoxyl,
58 superoxide anions, singlet oxygen, and hydrogen peroxide (Utari, 2017). One promising
59 source of flavonoids is the wood of secang (*Caesalpinia sappan* L.), which contains active
60 constituents such as brazilin, 3'-O-methylbrazilin, sappanin, and chalcone. These compounds
61 act as both primary and secondary antioxidants. Among them, brazilin has shown particularly
62 strong antioxidant activity, reportedly exceeding that of synthetic antioxidants such as
63 butylated hydroxytoluene (BHT) and butylated hydroxyanisole (BHA) (Sugiyanto et al., 2013).
64 In previous studies, the extract of *C. sappan* demonstrated strong antioxidant potential with
65 an IC_{50} value of 74.44 $\mu\text{g/mL}$ (Tanzaq et al., 2019).

66 Facial masks are among the most popular cosmetic products for skin care. However,
67 traditional mask types are often considered less practical due to lengthy application and
68 removal processes. Peel-off gel masks have emerged as a more efficient alternative, offering
69 ease of use, user comfort, and the ability to deliver active ingredients effectively without
70 requiring rinsing (Rahmawanty et al., 2015). Furthermore, peel-off gel formulations have
71 been shown to enhance antioxidant efficacy when natural extracts are incorporated.
72 Successful applications have been reported using extracts such as *Paederia foetida* (Eka et al.,
73 2022), areca seed (*Areca catechu*) (Dwi Mulyani et al., 2023), red spinach (*Amaranthus*

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74 *tricolor*) leaves (Welly et al., 2022), and mangrove (*Avicennia marina*) leaves (Hasibuan et al.,
75 2024).

76 Despite its promising properties, the application of *C. sappan* extract in peel-off gel
77 mask formulations remains underexplored. Therefore, the aim of this study was to formulate
78 and evaluate a peel-off gel mask containing *C. sappan* extract, with a focus on its physical
79 characteristics and antioxidant activity. This formulation is expected to serve as a natural,
80 effective skincare solution by maximizing the antioxidant potential of *C. sappan* in a user-
81 friendly topical preparation.

82 2. Methods

83 2.1 Materials and Equipment

84 The materials used in this study included *C. sappan* (secang) wood, 96% ethanol
85 (Merck), sodium carboxymethyl cellulose (CMC-Na), polyvinyl alcohol (PVA), propylene glycol,
86 vitamin C, and 1,1-diphenyl-2-picrylhydrazyl (DPPH).

87 The instruments employed were a rotary evaporator (Heidolph), standard laboratory
88 glassware (Pyrex), pH meter (Hanna Instruments pH 210 Microprocessor), viscometer
89 (Brookfield DV-I Prime), and UV-Vis spectrophotometer (Shimadzu UV-1240 Mini).

90 2.2 Extraction of *C. sappan* Wood

91 Secang wood was extracted by maceration. The wood powder was soaked in 96%
92 ethanol at a ratio of 1:10 (w/v) for 72 hours. The extract was filtered and concentrated using
93 a rotary evaporator until a thick extract was obtained (Tanzaq et al., 2019).

94 2.3 Formulation of Peel-Off Gel Mask

95 The peel-off gel mask was formulated using *C. sappan* extract at concentrations of 2.5%,
96 5%, and 7.5%, as shown in **Table 1**. The gel base consisted of polyvinyl alcohol (PVA), sodium
97 carboxymethyl cellulose (CMC-Na), and propylene glycol. PVA and CMC-Na were dispersed in
98 distilled water heated to 80°C until fully swollen. Afterward, propylene glycol was added and
99 the mixture was stirred until homogeneous. The ethanol extract of *C. sappan* was then
100 incorporated gradually into the base while stirring, and distilled water was added to reach
101 100% total weight. The final mixture was stirred continuously to ensure uniformity (Cahyani
102 et al., 2025).

103 **Table 1.** Composition of Peel-Off Gel Mask Formulations Containing *C. sappan* Extract

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Ingredient	Formula I (%)	Formula II (%)	Formula III (%)
<i>C. sappan</i> extract	2.5	5.0	7.5
Sodium CMC (CMC-Na)	1.26	1.26	1.26
Polyvinyl alcohol (PVA)	6.74	6.74	6.74
Propylene glycol	4.0	4.0	4.0
Distilled water (ad)	100	100	100

104

105 **2.4 Evaluation of Physical Characteristics**

106 The physical characteristics of the peel-off gel masks were evaluated to assess their
107 suitability as topical cosmetic formulations. Organoleptic properties including color, odor, and
108 consistency were observed visually, while homogeneity was examined by spreading a small
109 sample of the gel on a glass slide to check for uniform dispersion of components (Syam et al.,
110 2021).

111 The pH of each formulation was measured by immersing the electrode of a calibrated
112 digital pH meter into the gel and recording the stabilized value (Andini et al., 2017). Viscosity
113 was determined using a Brookfield viscometer equipped with spindle number 64, operated
114 at a speed of 1 rpm. A viscosity range of 2000–50000 cps is considered acceptable for peel-
115 off gel masks (SNI 16-4399-1996).

116 To evaluate spreadability, 0.5 g of the formulation were placed at the center of a glass
117 plate, then covered with another glass plate of known weight. The diameter of the spread
118 was measured, and additional weight was added incrementally until the diameter stabilized.
119 Adhesiveness was assessed by placing a 0.25 g sample between two glass slides, applying a
120 100 g load for five minutes, and measuring the time it took for the plates to separate after
121 load removal (Syam et al., 2021).

122 The drying time was tested by applying 0.1 gram of gel to a 2.5 × 2.5 cm area on the
123 inner forearm. The time required for the film to dry completely at room temperature was
124 recorded. An ideal drying time for peel-off gel masks ranges from 15 to 30 minutes (Silvia et
125 al., 2021).

126 **2.5 Antioxidant Activity Test Using DPPH Method**

127 The antioxidant activity of the peel-off gel mask formulations was evaluated using the
128 DPPH (2,2-diphenyl-1-picrylhydrazyl) free radical scavenging method. Initially, the maximum

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129 absorbance wavelength (λ_{\max}) of the DPPH solution (30 $\mu\text{g}/\text{mL}$) was determined using a UV-
130 Vis spectrophotometer within the 400–800 nm range. The optimal reaction time was also
131 established by reacting a 1:1 volume ratio of vitamin C (as the standard antioxidant) with the
132 DPPH solution and measuring the absorbance over a 60-minute period.

133 Each sample (0.05 g) was dissolved in methanol and diluted to 50 mL. From this stock
134 solution, working concentrations of 60, 70, 80, 100, and 120 $\mu\text{g}/\text{mL}$ were prepared. Equal
135 volumes of the sample solution and DPPH solution (30 $\mu\text{g}/\text{mL}$) were mixed, incubated at room
136 temperature for the predetermined optimal time, and their absorbance measured at the
137 previously identified λ_{\max} . The same procedure was applied to vitamin C standard solutions
138 at concentrations of 2, 4, 6, 8, and 10 $\mu\text{g}/\text{mL}$.

139 The percentage inhibition of DPPH radicals was calculated for each concentration, and
140 the IC_{50} value—the concentration required to inhibit 50% of the DPPH radicals—was
141 determined by linear regression analysis of the inhibition percentage versus sample
142 concentration (Maharani et al., 2022).

143 **2.6 Data Analysis**

144 The evaluation of the peel-off gel mask formulations was conducted using descriptive
145 analysis. Observational data such as organoleptic characteristics and homogeneity were
146 assessed qualitatively. Physical parameters including pH, viscosity, spreadability,
147 adhesiveness, and drying time were compared across formulations to identify trends related
148 to increasing concentrations of *C. sappan* extract. Similarly, antioxidant activity data were
149 interpreted by comparing the IC_{50} values of each formulation. The significance of observed
150 changes was discussed in terms of their relative magnitude and consistency rather than based
151 on formal statistical tests.

152

153 **3. Results and Discussion**

154 **3.1 Physical Characteristics of Peel Off Gel Mask Containing *C. sappan* Extract**

155 *Caesalpinia sappan* has traditionally been recognized for its therapeutic properties,
156 including antibacterial, anti-inflammatory, antidiabetic, and antioxidant effects. The ethanol
157 extract of *C. sappan* contains flavonoid compounds such as brazilin, 3'-O-methylbrazilin,
158 sappanin, and chalcone, which contribute to its strong antioxidant profile (Ngamwonglumlert
159 & Devahastin, 2023). In this study, peel-off gel mask formulations containing *C.*

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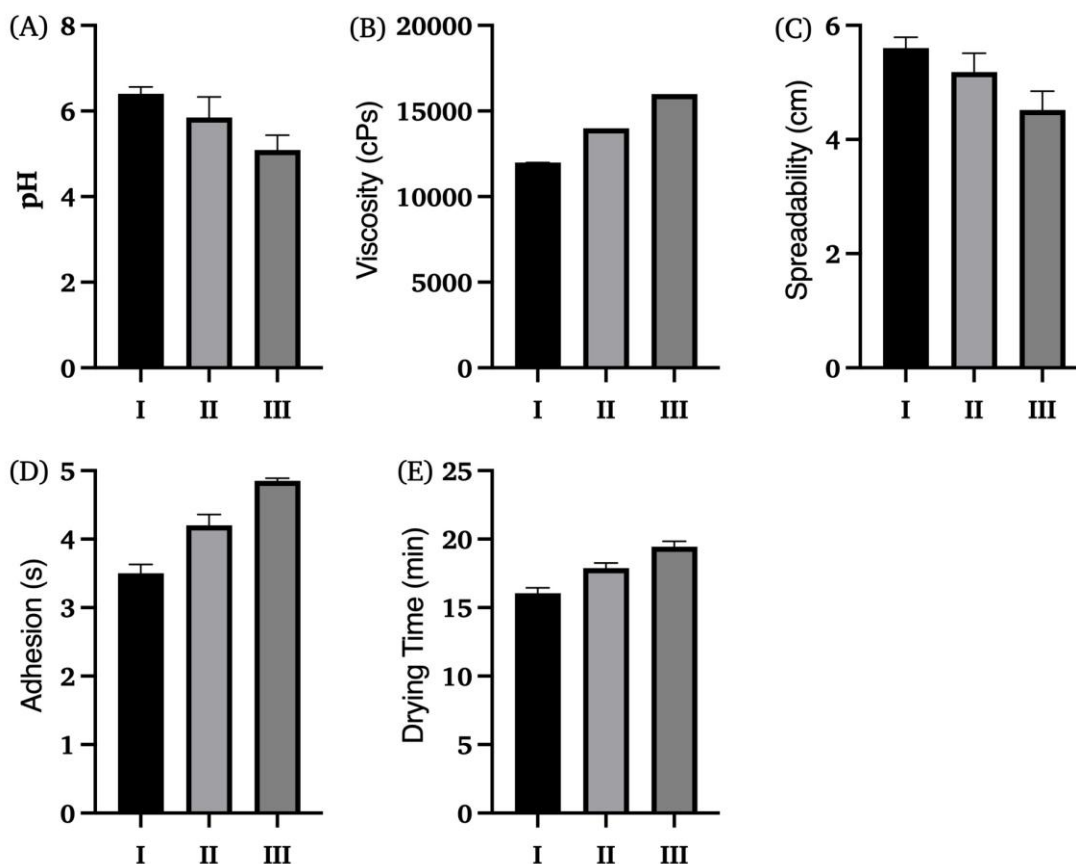
160 *sappan* extract at concentrations of 2.5%, 5%, and 7.5% were developed and evaluated for
161 their physical properties.

162 The organoleptic and homogeneity observations showed that all formulations had a
163 consistent orange color, a characteristic *C. sappan* odor, and a smooth, thick consistency.
164 Each gel was visually homogeneous, indicating even distribution of ingredients throughout
165 the formulation.

166 **Figure 1** illustrates the physical properties of the three formulations. The pH values
167 decreased slightly as the extract concentration increased. This trend is attributed to the acidic
168 nature of *C. sappan* extract (Muslimin et al., 2024), which becomes more influential as the
169 proportion of extract rises. The viscosity of the gels increased progressively with extract
170 concentration, affecting other parameters such as spreadability, adhesiveness, and drying
171 time. A higher viscosity reduced spreadability but enhanced adhesiveness and prolonged the
172 drying time. These relationships are evident in the trends presented in Figure 1.

173 Such changes in physical characteristics are consistent with the structural influence of
174 extract constituents and the thickening effect they exert in the gel base. Although no
175 statistical tests were applied, the consistent trends across all parameters support the
176 influence of *C. sappan* extract concentration on the physical performance of the peel-off
177 mask.

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178
179 **Figure 1.** Physical characteristics of peel-off gel mask containing *C. sappan* extract in
180 Formulation I (2.5%), Formulation II (5.0%), and Formulation III (7.5%): (a) pH, (b) viscosity, (c)
181 spreadability, (d) adhesiveness, and (e) drying time.

182

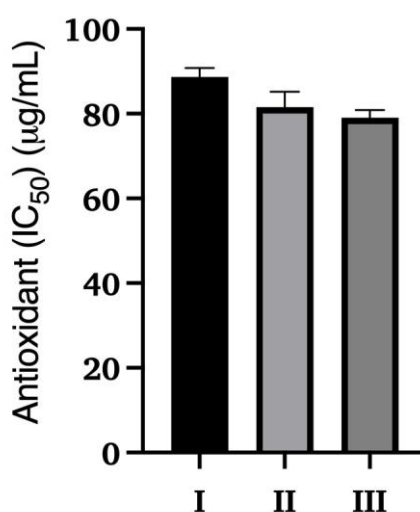
183 **3.2 Antioxidant Activity of Peel-Off Gel Mask Containing *C. sappan* Extract**

184 The antioxidant activity of the peel-off gel mask formulations was evaluated using the
185 DPPH free radical scavenging assay. All formulations demonstrated strong antioxidant
186 capacity, with IC_{50} values within the range of 50–100 $\mu\text{g/mL}$, indicating effective radical
187 scavenging potential.

188 As shown in **Figure 2**, the IC_{50} values decreased with increasing extract
189 concentration: 88.71 $\mu\text{g/mL}$ for Formulation I (2.5%), 81.58 $\mu\text{g/mL}$ for Formulation II (5.0%),
190 and 79.04 $\mu\text{g/mL}$ for Formulation III (7.5%). This trend suggests that higher concentrations
191 of *C. sappan* extract contribute to enhanced antioxidant performance, likely due to increased
192 levels of flavonoid compounds such as brazilin.

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193 Although statistical testing was not applied, the progressive decrease in IC_{50} values
194 clearly indicates the influence of extract concentration on antioxidant activity. These results
195 are consistent with the literature, which identifies *C. sappan* as a potent natural antioxidant
196 source (Tanzaq et al., 2019). Compared to its pure extract IC_{50} value of 74.44 $\mu\text{g/mL}$, the
197 formulated gels retained high antioxidant potential. However, when compared to vitamin C
198 ($IC_{50} = 3.04 \mu\text{g/mL}$), the formulations were less potent, which is expected given the superior
199 radical scavenging efficiency of pure ascorbic acid.



200
201 **Figure 2.** IC_{50} values of peel-off gel mask containing *C. sappan* extract in Formulation I
202 (2.5%), Formulation II (5.0%), and Formulation III (7.5%).

204 4. Conclusion

205 This study demonstrated that peel-off gel masks containing *C. sappan* extract can be
206 effectively formulated using polyvinyl alcohol, sodium carboxymethyl cellulose, and
207 propylene glycol as base components. Increasing the extract concentration from 2.5% to 7.5%
208 affected the physical properties of the formulation by increasing viscosity, adhesiveness, and
209 drying time, while decreasing pH and spreadability. All formulations exhibited strong
210 antioxidant activity, with IC_{50} values ranging from 88.71 to 79.04 $\mu\text{g/mL}$, indicating that higher
211 extract concentrations enhance antioxidant performance. Overall, the 7.5% extract
212 formulation showed the most favorable combination of physical characteristics and
213 antioxidant activity, supporting its potential as a natural, effective peel-off gel mask for skin
214 health applications.

**BUKTI KORESPONDENSI CONFIRMATION OF REVISION – FIGURE 2
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References

- 217 Andini, T., Yusriadi, Y., & Yuliet, Y. (2017). Optimasi pembentuk film polivinil alkohol dan
218 humektan propilen glikol pada formula masker gel peel off sari buah labu kuning
219 (*Cucurbita moschata* Duchesne) sebagai antioksidan. *Jurnal Farmasi Galenika (Galenika*
220 *Journal of Pharmacy)*, 3(2), 101–108.
- 221 Anindhita, M. A., Prastiwi, D., Lu, N., Fitriyani, L., & Nanda Rini, S. (2023). Pengaruh
222 penggunaan polivinil alkohol sebagai *gelling agent* terhadap sifat fisikokimia sediaan
223 gel *peel-off* ekstrak etanol buah pedada. *Parapemikir: Jurnal Ilmiah Farmasi*, 12(1), 18–
224 29. <https://doi.org/10.30591/piif.v12i1.3990>
- 225 Cahyani, I. M., Hanhadyanaputri, E. S., Wulan, A. H., & Sulistyarini, I. (2025). Optimization
226 formula of kolang-kaling (*Arenga pinnata*) peel-off gel mask with combination PVA–CMC
227 Na as *gelling agent* on simplex lattice design. *Media Farmasi Indonesia*, 20(1), 67–
228 75. <https://doi.org/10.53359/mfi.v20i1.316>
- 229 Cahyani, I. M., & Putri, I. D. C. (2017). Efektivitas karbopol 940 dalam formula masker gel *peel-*
230 *off* ekstrak temu giring (*Curcuma heyneana* Val & Zijp). *Journal of Pharmaceutical and*
231 *Medicinal Sciences*, 2(2), 48–51.
- 232 Dwi Mulyani, A., Rahayu, P., Aini, N., Purnamasari, D., & Mulyani, A. D. (2023). Formulasi dan
233 evaluasi mutu fisik sediaan masker gel *peel-off* ekstrak biji pinang (*Areca catechu* L.)
234 sebagai antioksidan. *Indonesian Journal of Pharmaceutical Education*, 3(3), 1–
235 9. <https://doi.org/10.37311/ijpe.v3i3.22033>
- 236 Eka, R., Susanti, E., & A'yun, Q. (2022). Formulation and antioxidant activity of *peel-off* gel
237 mask from *Paederia foetida* extract. *JKPK (Jurnal Kimia dan Pendidikan Kimia)*, 7(1), 12–
238 19. <https://doi.org/10.20961/jkpk.v7i1.45798>
- 239 Faizah, U. N., Maula, N. N., Mustika, R. A., & Wahyuni, S. (2023). Potensi senyawa antioksidan
240 yang terkandung dalam kayu secang (*Caesalpinia sappan*) untuk perawatan kulit
241 alami. *Symbiotic: Journal of Biological Education and Science*, 4(1), 41–
242 49. <https://doi.org/10.32939/symbiotic.v4i1.90>
- 243 Hasibuan, N. E., Azka, A., Basri, & Mujiyanti, A. (2024). Aktivitas antioksidan dan karakteristik
244 masker gel *peel-off* dari ekstrak daun mangrove (*Avicennia marina*). *Jurnal Pengolahan*
245 *Hasil Perikanan Indonesia*, 2(9), 42–55. <https://doi.org/10.17844/jphpi.v27i9.52083>
- 246 Hu, J., Yan, X., Wang, W., Wu, H., Hua, L., & Du, L. (2008). Antioxidant activity in vitro of three
247 constituents from *Caesalpinia sappan* L. *Tsinghua Science & Technology*, 13(4), 474–
248 479. [https://doi.org/10.1016/s1007-0214\(08\)70076-2](https://doi.org/10.1016/s1007-0214(08)70076-2)
- 249 Maharani, N. P. D. S., Cahyani, I. M., & Hanhadyanaputri, E. S. (2022). Optimization of polyvinyl
250 alcohol (PVA) and glycerin in kolang-kaling *peel-off* gel mask formula (*Arenga*
251 *pinnata*). *Journal of Food and Pharmaceutical Sciences*, 2022(3), 746–
252 753. <https://doi.org/10.22146/jfps.5718>
- 253 Muslimin, M. K., Rahayuningsih, E., & Mindaryani, A. (2024). Optimasi proses metilasi
254 brazilein hasil ekstrak kayu secang (*Caesalpinia sappan* Linn) sebagai bahan pewarna
255 merah alami untuk tekstil. *Jurnal Rekayasa Proses*, 18(2), 89–
256 99. <https://doi.org/10.22146/jrekpros.82068>
- 257 Ngamwonglumlert, L., & Devahastin, S. (2023). Brazilein as an alternative pigment: Isolation,
258 characterization, stability enhancement and food applications. *Food Chemistry*, 398,
259 Article 133898. <https://doi.org/10.1016/j.foodchem.2022.133898>

**BUKTI KORESPONDENSI CONFIRMATION OF REVISION – FIGURE 2
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- 260 Rahmawanty, D., Yulianti, N., & Fitriana, M. (2015). Formulasi dan evaluasi masker
261 wajah *peel-off* mengandung kuersetin dengan variasi konsentrasi gelatin dan
262 gliserin. *Media Farmasi: Jurnal Ilmu Farmasi*, 12(1), 17–
263 32. <https://doi.org/10.12928/mf.v12i1.3019>
- 264 Rina, O., Sanusi, I., Abdidharma, Afrizal, Utami, C., & Widodo, Y. (2017). Stabilities of natural
265 colorant of sappan wood (*Caesalpinia sappan* L.) for food and beverages in various pH,
266 temperature and food matrices. *International Journal of ChemTech Research*, 10(1), 98–
267 103.
- 268 Sugiyanto, R. N., Putri, S. R., Damanik, F. S., & Sasmita, G. M. A. (2013). Aplikasi kayu secang
269 (*Caesalpinia sappan* L.) dalam upaya prevensi kerusakan DNA akibat paparan zat
270 potensial karsinogenik melalui MNPCE assay. *Pekan Ilmiah Mahasiswa Nasional – PKM*
271 *Penelitian 2013*. <https://www.neliti.com/id/publications/171018>
- 272 Syam, N., Lestari, U., & Muhaimin. (2021). Formulasi dan uji sifat masker gel *peel-off* dari
273 minyak sawit murni dengan basis carbomer 940. *Indonesian Journal of Pharma Science*,
274 3(1), 42–55.
- 275 Tanzaq, T. T., Agustina, R. D., Setiawati, K. E., & Cahyani, I. M. (2019). Uji aktivitas
276 penangkapan radikal DPPH (1,1-diphenyl-2-picrylhydrazyl) ekstrak etanol kayu secang
277 (*Caesalpinia sappan* L.). *Media Farmasi Indonesia*, 14(1), 1461–
278 1465. <https://mfi.stifar.ac.id/mfi/article/view/105/86>
- 279 Utari, F. D. (2017). Produksi antioksidan dari ekstrak kayu secang (*Caesalpinia sappan* L.)
280 menggunakan pengering berkelembaban rendah. *Jurnal Aplikasi Teknologi Pangan*,
281 6(3). <https://doi.org/10.17728/jatp.241>
- 282 Wahdaningsih, S., Budilaksono, W., & Fahrurroji, A. (2015). Uji aktivitas antioksidan fraksi n-
283 heksana kulit buah naga merah menggunakan metode 1,1-difenil-2-pikrilhidrazil. *Jurnal*
284 *Kesehatan Khatulistiwa*, 1(2), 115–136. <https://doi.org/10.26418/jurkeswa.v1i2.42997>
- 285 Welly, S., Supriyanto, & Saraswati, M. (2022). Antioxidant test and *peel-off* mask formulation
286 extract of red spinach (*Amaranthus tricolor* L.) leaves with variations of *gelling*
287 *agent* types. *Joseph (Journal of Pharmacy)*, 2(1), 42–55.
- 288 Widowati, W. (2011). Uji fitokimia dan potensi antioksidan ekstrak etanol kayu secang
289 (*Caesalpinia sappan* L.). *Maranatha Journal of Medicine and Health*, 11(1),
290 151615. <https://www.neliti.com/id/publications/151615/>
- 291



Formulation and Characterization of Peel-Off Gel Mask Containing Secang (*Caesalpinia sappan* L.) Wood Extract with Strong Antioxidant Activity

[Formulasi dan Karakterisasi Masker Gel Peel-Off Mengandung Ekstrak Kayu Secang (*Caesalpinia sappan* L.) dengan Aktivitas Antioksidan yang Kuat]

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ABSTRACT

Secang (*Caesalpinia sappan* L.) wood contains flavonoid compounds such as brazilin, 3'-O-methylbrazilin, sappanin chalcone, and sappan chalcone, which act as primary and secondary antioxidants. Antioxidants are substances that can inhibit oxidation reactions by neutralizing free radicals. Enhancing the antioxidant potential of *C. sappan* wood can be achieved by developing a topical dosage form. Peel-off gel masks are an ideal form due to their ability to improve skin health and provide ease and comfort in application. This study aimed to formulate a peel-off gel mask containing *C. sappan* extract and evaluate its physical properties and antioxidant activity. The formulations were prepared using 2.5%, 5%, and 7.5% extract with sodium carboxymethyl cellulose, polyvinyl alcohol, and propylene glycol as the base. The resulting masks were assessed for physical characteristics (pH, viscosity, spreadability, adhesiveness, and drying time) and antioxidant activity using the DPPH method. The results indicated that increasing the extract concentration significantly ($p < 0.05$) increased viscosity, adhesiveness, and drying time, while decreasing pH, spreadability, and IC_{50} value. All formulations demonstrated strong antioxidant activity (IC_{50} between 50–100 $\mu\text{g/mL}$), with IC_{50} values of 88.71 $\mu\text{g/mL}$, 81.58 $\mu\text{g/mL}$, and 79.04 $\mu\text{g/mL}$, respectively.

ABSTRAK

Kayu secang (*Caesalpinia sappan* L.) mengandung senyawa flavonoid seperti brazilin, 3'-O-metilbrazilin, sappanin chalcone, dan sappan chalcone yang berfungsi sebagai antioksidan primer maupun sekunder. Antioksidan merupakan senyawa yang mampu menghambat reaksi oksidasi dengan menetralkan radikal bebas. Upaya peningkatan potensi antioksidan kayu *C. sappan* dapat dilakukan melalui pengembangan sediaan topikal. Masker gel peel-off merupakan bentuk sediaan yang sesuai karena dapat menjaga kesehatan kulit sekaligus memberikan kenyamanan dan kemudahan saat pemakaian. Penelitian ini bertujuan untuk merumuskan dan mengevaluasi masker gel peel-off yang mengandung ekstrak kayu *C. sappan* berdasarkan karakteristik fisik dan aktivitas antioksidannya. Formulasi dibuat dengan konsentrasi ekstrak 2,5%, 5%, dan 7,5% menggunakan natrium karboksimetil selulosa, polivinil alkohol, dan propilen glikol sebagai basis gel. Evaluasi dilakukan terhadap parameter fisik (pH, viskositas, daya sebar, daya lekat, dan waktu kering) serta aktivitas antioksidan menggunakan metode DPPH. Hasil menunjukkan bahwa peningkatan konsentrasi ekstrak secara signifikan ($p < 0,05$) meningkatkan viskositas, daya lekat, dan waktu kering serta menurunkan pH, daya sebar, dan nilai IC_{50} . Seluruh formula menunjukkan aktivitas antioksidan yang kuat (IC_{50} antara 50–100 $\mu\text{g/mL}$), dengan nilai IC_{50} berturut-turut sebesar 88,71 $\mu\text{g/mL}$, 81,58 $\mu\text{g/mL}$, dan 79,04 $\mu\text{g/mL}$.

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1. INTRODUCTION

Air pollution has increased significantly in recent years, with levels rising by up to 20%, and has been identified as a major contributor to various health problems due to prolonged exposure (Wahdaningsih et al., 2015). One of the primary mechanisms through which pollution causes harm is oxidative stress, a condition arising from an overproduction of free radicals in the body. These reactive species can damage biological molecules, highlighting the importance of antioxidants in neutralizing free radicals and preventing oxidative damage, particularly in the skin (Widowati, 2011).

Flavonoids are natural compounds widely recognized for their antioxidant properties. They are capable of scavenging a variety of free radicals, including hydroxyl, peroxide, alkoxyl, superoxide anions, singlet oxygen, and hydrogen peroxide (Utari, 2017). One promising source of

flavonoids is the wood of secang (*Caesalpinia sappan* L.), which contains active constituents such as brazilin, 3'-O-methylbrazilin, sappanin, and chalcone. These compounds act as both primary and secondary antioxidants. Among them, brazilin has shown particularly strong antioxidant activity, reportedly exceeding that of synthetic antioxidants such as butylated hydroxytoluene (BHT) and butylated hydroxyanisole (BHA) (Sugiyanto et al., 2013). In previous studies, the extract of *C. sappan* demonstrated strong antioxidant potential with an IC_{50} value of 74.44 $\mu\text{g/mL}$ (Tanzaq et al., 2019).

Facial masks are among the most popular cosmetic products for skin care. However, traditional mask types are often considered less practical due to lengthy application and removal processes. Peel-off gel masks have emerged as a more efficient alternative, offering ease of use, user comfort, and the ability to deliver active ingredients effectively without requiring rinsing (Rahmawanti et al., 2015). Furthermore, peel-off gel



formulations have been shown to enhance antioxidant efficacy when natural extracts are incorporated. Successful applications have been reported using extracts such as *Paederia foetida* (Eka et al., 2022), areca seed (*Areca catechu*) (Dwi Mulyani et al., 2023), red spinach (*Amaranthus tricolor*) leaves (Welly et al., 2022), and mangrove (*Avicennia marina*) leaves (Hasibuan et al., 2024).

Despite its promising properties, the application of *C. sappan* extract in peel-off gel mask formulations remains underexplored. Therefore, the aim of this study was to formulate and evaluate a peel-off gel mask containing *C. sappan* extract, with a focus on its physical characteristics and antioxidant activity. This formulation is expected to serve as a natural, effective skincare solution by maximizing the antioxidant potential of *C. sappan* in a user-friendly topical preparation.

2. METHOD

2.1. Materials and Equipment

The materials used in this study included *C. sappan* (secang) wood, 96% ethanol (Merck), sodium carboxymethyl cellulose (CMC-Na), polyvinyl alcohol (PVA), propylene glycol, vitamin C, and 1,1-diphenyl-2-picrylhydrazyl (DPPH).

Table 1. Composition of Peel-Off Gel Mask Formulations Containing *C. sappan* Extract

Ingredient	Formula I (%)	Formula II (%)	Formula III (%)
<i>C. sappan</i> extract	2.5	5.0	7.5
Sodium CMC (CMC-Na)	1.26	1.26	1.26
Polyvinyl alcohol (PVA)	6.74	6.74	6.74
Propylene glycol	4.0	4.0	4.0
Distilled water (ad)	100	100	100

2.4. Evaluation of Physical Characteristics

The physical characteristics of the peel-off gel masks were evaluated to assess their suitability as topical cosmetic formulations. Organoleptic properties including color, odor, and consistency were observed visually, while homogeneity was examined by spreading a small sample of the gel on a glass slide to check for uniform dispersion of components (Syam et al., 2021).

The pH of each formulation was measured by immersing the electrode of a calibrated digital pH meter into the gel and recording the stabilized value (Andini et al., 2017). Viscosity was determined using a Brookfield viscometer equipped with spindle number 64, operated at a speed of 1 rpm. A viscosity range of 2000–50000 cps is considered acceptable for peel-off gel masks (SNI 16-4399-1996).

To evaluate spreadability, 0.5 g of the formulation were placed at the center of a glass plate, then covered with another glass plate of known weight. The diameter of the spread was measured, and additional weight was added incrementally until the diameter stabilized. Adhesiveness was assessed by placing a 0.25 g sample between two glass slides, applying a 100 g load for five minutes, and measuring the time it took for the plates to separate after load removal (Syam et al., 2021).

The drying time was tested by applying 0.1 gram of gel to a 2.5 × 2.5 cm area on the inner forearm. The time required for the film to dry completely at room temperature was recorded. An ideal drying time for peel-off gel masks ranges from 15 to 30 minutes (Silvia et al., 2021).

2.5. Antioxidant Activity Test Using DPPH Method

The antioxidant activity of the peel-off gel mask formulations was evaluated using the DPPH (2,2-diphenyl-1-picrylhydrazyl) free radical scavenging method. Initially, the maximum absorbance wavelength (λ_{max}) of the DPPH solution (30 $\mu\text{g}/\text{mL}$) was determined using a UV-Vis spectrophotometer within the 400–800 nm range. The optimal reaction time was also established by reacting a 1:1 volume ratio of vitamin C (as the standard antioxidant) with the DPPH solution and measuring the absorbance over a 60-minute period.

Each sample (0.05 g) was dissolved in methanol and diluted to 50 mL. From this stock solution, working concentrations of 60, 70, 80, 100, and 120 $\mu\text{g}/\text{mL}$ were prepared. Equal volumes of the sample solution and

The instruments employed were a rotary evaporator (Heidolph), standard laboratory glassware (Pyrex), pH meter (Hanna Instruments pH 210 Microprocessor), viscometer (Brookfield DV-I Prime), and UV-Vis spectrophotometer (Shimadzu UV-1240 Mini).

2.2. Extraction of *C. sappan* Wood

Secang wood was extracted by maceration. The wood powder was soaked in 96% ethanol at a ratio of 1:10 (w/v) for 72 hours. The extract was filtered and concentrated using a rotary evaporator until a thick extract was obtained (Tanzaq et al., 2019).

2.3. Formulation of Peel-Off Gel Mask

The peel-off gel mask was formulated using *C. sappan* extract at concentrations of 2.5%, 5%, and 7.5%, as shown in **Table 1**. The gel base consisted of polyvinyl alcohol (PVA), sodium carboxymethyl cellulose (CMC-Na), and propylene glycol. PVA and CMC-Na were dispersed in distilled water heated to 80°C until fully swollen. Afterward, propylene glycol was added and the mixture was stirred until homogeneous. The ethanol extract of *C. sappan* was then incorporated gradually into the base while stirring, and distilled water was added to reach 100% total weight. The final mixture was stirred continuously to ensure uniformity (Cahyani et al., 2025).

DPPH solution (30 $\mu\text{g}/\text{mL}$) were mixed, incubated at room temperature for the predetermined optimal time, and their absorbance measured at the previously identified λ_{max} . The same procedure was applied to vitamin C standard solutions at concentrations of 2, 4, 6, 8, and 10 $\mu\text{g}/\text{mL}$.

The percentage inhibition of DPPH radicals was calculated for each concentration, and the IC_{50} value—the concentration required to inhibit 50% of the DPPH radicals—was determined by linear regression analysis of the inhibition percentage versus sample concentration (Maharani et al., 2022).

2.6. Data Analysis

The evaluation of the peel-off gel mask formulations was conducted using descriptive analysis. Observational data such as organoleptic characteristics and homogeneity were assessed qualitatively. Physical parameters including pH, viscosity, spreadability, adhesiveness, and drying time were compared across formulations to identify trends related to increasing concentrations of *C. sappan* extract. Similarly, antioxidant activity data were interpreted by comparing the IC_{50} values of each formulation. The significance of observed changes was discussed in terms of their relative magnitude and consistency rather than based on formal statistical tests.

3. RESULTS AND DISCUSSION

3.1. Physical Characteristics of Peel Off Gel Mask Containing *C. sappan* Extract

Caesalpinia sappan has traditionally been recognized for its therapeutic properties, including antibacterial, anti-inflammatory, antidiabetic, and antioxidant effects. The ethanol extract of *C. sappan* contains flavonoid compounds such as brazilin, 3'-O-methylbrazilin, sappanin, and chalcone, which contribute to its strong antioxidant profile (Ngamwonglumlert & Devahastin, 2023). In this study, peel-off gel mask formulations containing *C. sappan* extract at concentrations of 2.5%, 5%, and 7.5% were developed and evaluated for their physical properties.

The organoleptic and homogeneity observations showed that all formulations had a consistent orange color, a characteristic *C. sappan* odor, and a smooth, thick consistency. Each gel was visually

homogeneous, indicating even distribution of ingredients throughout the formulation.

Figure 1 illustrates the physical properties of the three formulations. The pH values decreased slightly as the extract concentration increased. This trend is attributed to the acidic nature of *C. sappan* extract (Muslimin et al., 2024), which becomes more influential as the proportion of extract rises. The viscosity of the gels increased progressively with extract concentration, affecting other parameters such as spreadability, adhesiveness, and drying time. A higher viscosity reduced spreadability

but enhanced adhesiveness and prolonged the drying time. These relationships are evident in the trends presented in Figure 1.

Such changes in physical characteristics are consistent with the structural influence of extract constituents and the thickening effect they exert in the gel base. Although no statistical tests were applied, the consistent trends across all parameters support the influence of *C. sappan* extract concentration on the physical performance of the peel-off mask.

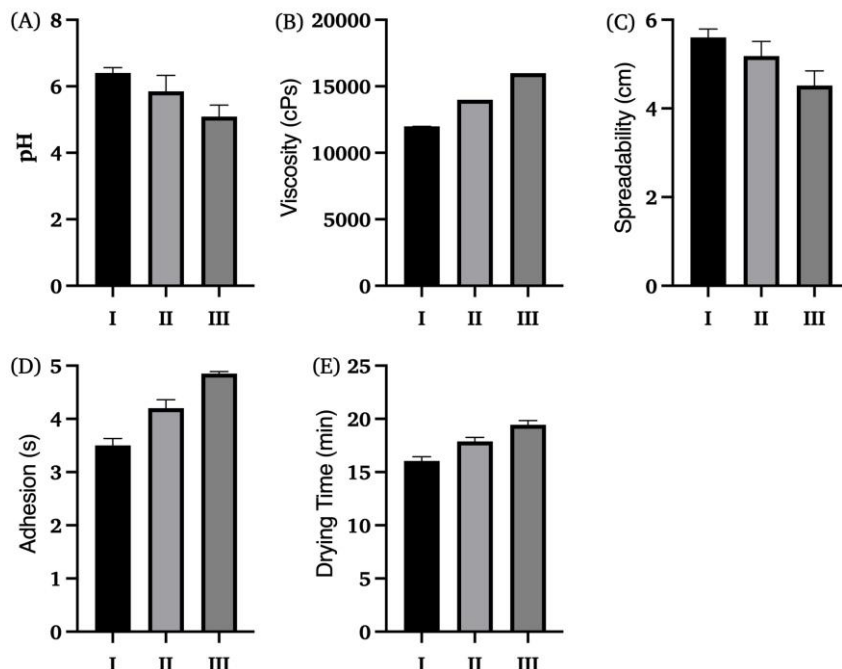


Figure 1. Physical characteristics of peel-off gel mask containing *C. sappan* extract in Formulation I (2.5%), Formulation II (5.0%), and Formulation III (7.5%): (a) pH, (b) viscosity, (c) spreadability, (d) adhesiveness, and (e) drying time.

3.2. Antioxidant Activity of Peel-Off Gel Mask Containing *C. sappan* Extract

The antioxidant activity of the peel-off gel mask formulations was evaluated using the DPPH free radical scavenging assay. All formulations demonstrated strong antioxidant capacity, with IC_{50} values within the range of 50–100 $\mu\text{g/mL}$, indicating effective radical scavenging potential.

As shown in **Figure 2**, the IC_{50} values decreased with increasing extract concentration: 88.71 $\mu\text{g/mL}$ for Formulation I (2.5%), 81.58 $\mu\text{g/mL}$ for Formulation II (5.0%), and 79.04 $\mu\text{g/mL}$ for Formulation III (7.5%). This trend suggests that higher concentrations of *C. sappan* extract

contribute to enhanced antioxidant performance, likely due to increased levels of flavonoid compounds such as brazilin.

Although statistical testing was not applied, the progressive decrease in IC_{50} values clearly indicates the influence of extract concentration on antioxidant activity. These results are consistent with the literature, which identifies *C. sappan* as a potent natural antioxidant source (Tanzaq et al., 2019). Compared to its pure extract IC_{50} value of 74.44 $\mu\text{g/mL}$, the formulated gels retained high antioxidant potential. However, when compared to vitamin C ($IC_{50} = 3.04 \mu\text{g/mL}$), the formulations were less potent, which is expected given the superior radical scavenging efficiency of pure ascorbic acid.

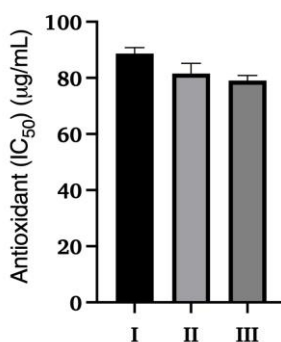


Figure 2. IC_{50} values of peel-off gel mask containing *C. sappan* extract in Formulation I (2.5%), Formulation II (5.0%), and Formulation III (7.5%).

CONCLUSION

This study demonstrated that peel-off gel masks containing *C. sappan* extract can be effectively formulated using polyvinyl alcohol, sodium carboxymethyl cellulose, and propylene glycol as base

components. Increasing the extract concentration from 2.5% to 7.5% affected the physical properties of the formulation by increasing viscosity, adhesiveness, and drying time, while decreasing pH and spreadability. All formulations exhibited strong antioxidant activity, with IC_{50} values ranging from 88.71 to 79.04 $\mu\text{g/mL}$, indicating that higher

extract concentrations enhance antioxidant performance. Overall, the 7.5% extract formulation showed the most favorable combination of physical characteristics and antioxidant activity, supporting its potential as a natural, effective peel-off gel mask for skin health applications.

REFERENCES

- Andini, T., Yusriadi, Y., & Yuliet, Y. (2017). Optimasi pembentuk film polivinil alkohol dan humektan propilen glikol pada formula masker gel peel off sari buah labu kuning (*Cucurbita moschata* Duchesne) sebagai antioksidan. *Jurnal Farmasi Galenika (Galenika Journal of Pharmacy)*, 3(2), 101–108.
- Anindhita, M. A., Prastiwi, D., Lu, N., Fitriyani, L., & Nanda Rini, S. (2023). Pengaruh penggunaan polivinil alkohol sebagai gelling agent terhadap sifat fisikokimia sediaan gel peel-off ekstrak etanol buah pedada. *Parapemikir: Jurnal Ilmiah Farmasi*, 12(1), 18–29. <https://doi.org/10.30591/pjif.v12i1.3990>
- Cahyani, I. M., Hanhadyanaputri, E. S., Wulan, A. H., & Sulistyarini, I. (2025). Optimization formula of kolang-kaling (*Arenga pinnata*) peel-off gel mask with combination PVA–CMC Na as gelling agent on simplex lattice design. *Media Farmasi Indonesia*, 20(1), 67–75. <https://doi.org/10.53359/mfi.v20i1.316>
- Cahyani, I. M., & Putri, I. D. C. (2017). Efektivitas karbopol 940 dalam formula masker gel peel-off ekstrak temu giring (*Curcuma heyneana* Val & Zijp). *Journal of Pharmaceutical and Medicinal Sciences*, 2(2), 48–51.
- Dwi Mulyani, A., Rahayu, P., Aini, N., Purnamasari, D., & Mulyani, A. D. (2023). Formulasi dan evaluasi mutu fisik sediaan masker gel peel-off ekstrak biji pinang (*Areca catechu* L.) sebagai antioksidan. *Indonesian Journal of Pharmaceutical Education*, 3(3), 1–9. <https://doi.org/10.37311/ijpe.v3i3.22033>
- Eka, R., Susanti, E., & A'yun, Q. (2022). Formulation and antioxidant activity of peel-off gel mask from *Paederia foetida* extract. *JPKP (Jurnal Kimia dan Pendidikan Kimia)*, 7(1), 12–19. <https://doi.org/10.20961/jkpk.v7i1.45798>
- Faizah, U. N., Maula, N. N., Mustika, R. A., & Wahyuni, S. (2023). Potensi senyawa antioksidan yang terkandung dalam kayu secang (*Caesalpinia sappan*) untuk perawatan kulit alami. *Symbiotic: Journal of Biological Education and Science*, 4(1), 41–49. <https://doi.org/10.32939/symbiotic.v4i1.90>
- Hasibuan, N. E., Azka, A., Basri, & Mujiyanti, A. (2024). Aktivitas antioksidan dan karakteristik masker gel peel-off dari ekstrak daun mangrove (*Avicennia marina*). *Jurnal Pengolahan Hasil Perikanan Indonesia*, 2(9), 42–55. <https://doi.org/10.17844/jphpi.v27i9.52083>
- Hu, J., Yan, X., Wang, W., Wu, H., Hua, L., & Du, L. (2008). Antioxidant activity in vitro of three constituents from *Caesalpinia sappan* L. *Tsinghua Science & Technology*, 13(4), 474–479. [https://doi.org/10.1016/s1007-0214\(08\)70076-2](https://doi.org/10.1016/s1007-0214(08)70076-2)
- Maharani, N. P. D. S., Cahyani, I. M., & Hanhadyanaputri, E. S. (2022). Optimization of polyvinyl alcohol (PVA) and glycerin in kolang-kaling peel-off gel mask formula (*Arenga pinnata*). *Journal of Food and Pharmaceutical Sciences*, 2022(3), 746–753. <https://doi.org/10.22146/jfpps.5718>
- Muslimin, M. K., Rahayuningsih, E., & Mindaryani, A. (2024). Optimasi proses metilasi brazilin hasil ekstrak kayu secang (*Caesalpinia sappan* Linn) sebagai bahan pewarna merah alami untuk tekstil. *Jurnal Rekayasa Proses*, 18(2), 89–99. <https://doi.org/10.22146/jrekpros.82068>
- Ngamwonglumert, L., & Devahastin, S. (2023). Brazilin as an alternative pigment: Isolation, characterization, stability enhancement and food applications. *Food Chemistry*, 398, Article 133898. <https://doi.org/10.1016/j.foodchem.2022.133898>
- Rahmawanty, D., Yulianti, N., & Fitriana, M. (2015). Formulasi dan evaluasi masker wajah peel-off mengandung kuersetin dengan variasi konsentrasi gelatin dan gliserin. *Media Farmasi: Jurnal Ilmu Farmasi*, 12(1), 17–32. <https://doi.org/10.12928/mf.v12i1.3019>
- Rina, O., Sanusi, I., Abdidharma, Afrizal, Utami, C., & Widodo, Y. (2017). Stabilities of natural colorant of sappan wood (*Caesalpinia sappan* L.) for food and beverages in various pH, temperature and food matrices. *International Journal of ChemTech Research*, 10(1), 98–103.
- Sugiyanto, R. N., Putri, S. R., Damanik, F. S., & Sasmita, G. M. A. (2013). Aplikasi kayu secang (*Caesalpinia sappan* L.) dalam upaya pencegahan kerusakan DNA akibat paparan zat potensial karsinogenik melalui MNPCE assay. *Pekan Ilmiah Mahasiswa Nasional – PKM Penelitian 2013*. <https://www.neliti.com/id/publications/171018>
- Syam, N., Lestari, U., & Muhaimin. (2021). Formulasi dan uji sifat masker gel peel-off dari minyak sawit murni dengan basis carbomer 940. *Indonesian Journal of Pharma Science*, 3(1), 42–55.
- Tanzaq, T. T., Agustina, R. D., Setiawati, K. E., & Cahyani, I. M. (2019). Uji aktivitas penangkapan radikal DPPH (1,1-diphenyl-2-picrylhydrazyl) ekstrak etanol kayu secang (*Caesalpinia sappan* L.). *Media Farmasi Indonesia*, 14(1), 1461–1465. <https://mfi.stifar.ac.id/mfi/article/view/105/86>
- Utari, F. D. (2017). Produksi antioksidan dari ekstrak kayu secang (*Caesalpinia sappan* L.) menggunakan pengering berkelembaban rendah. *Jurnal Aplikasi Teknologi Pangan*, 6(3). <https://doi.org/10.17728/jatp.241>
- Wahdaningsih, S., Budilaksono, W., & Fahrurroji, A. (2015). Uji aktivitas antioksidan fraksi n-heksana kulit buah naga merah menggunakan metode 1,1-difenil-2-pikrilhidrazil. *Jurnal Kesehatan Khatulistiwa*, 1(2), 115–136. <https://doi.org/10.26418/jurkeswa.v1i2.42997>
- Welly, S., Supriyanto, & Saraswati, M. (2022). Antioxidant test and peel-off mask formulation extract of red spinach (*Amaranthus tricolor* L.) leaves with variations of gelling agent types. *Joseph (Journal of Pharmacy)*, 2(1), 42–55.
- Widowati, W. (2011). Uji fitokimia dan potensi antioksidan ekstrak etanol kayu secang (*Caesalpinia sappan* L.). *Maranatha Journal of Medicine and Health*, 11(1), 151615. <https://www.neliti.com/id/publications/151615/>

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Research Article

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Formulation and Characterization of Peel-Off Gel Mask Containing Secang (*Caesalpinia sappan* L.) Wood Extract with Strong Antioxidant Activity

[Formulasi dan Karakterisasi Masker Gel Peel-Off Mengandung Ekstrak Kayu Secang (*Caesalpinia sappan* L.) dengan Aktivitas Antioksidan yang Kuat]

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ABSTRACT

Secang (*Caesalpinia sappan* L.) wood contains flavonoid compounds such as brazilin, 3'-O-methylbrazilin, sappanin chalcone, and sappan chalcone, which act as primary and secondary antioxidants. Antioxidants are substances that can inhibit oxidation reactions by neutralizing free radicals. Enhancing the antioxidant potential of *C. sappan* wood can be achieved by developing a topical dosage form. Peel-off gel masks are an ideal form due to their ability to improve skin health and provide ease and comfort in application. This study aimed to formulate a peel-off gel mask containing *C. sappan* extract and evaluate its physical properties and antioxidant activity. The formulations were prepared using 2.5%, 5%, and 7.5% extract with sodium carboxymethyl cellulose, polyvinyl alcohol, and propylene glycol as the base. The resulting masks were assessed for physical characteristics (pH, viscosity, spreadability, adhesiveness, and drying time) and antioxidant activity using the DPPH method. The results indicated that increasing the extract concentration significantly ($p < 0.05$) increased viscosity, adhesiveness, and drying time, while decreasing pH, spreadability, and IC_{50} value. All formulations demonstrated strong antioxidant activity (IC_{50} between 50–100 $\mu\text{g/mL}$), with IC_{50} values of 88.71 $\mu\text{g/mL}$, 81.58 $\mu\text{g/mL}$, and 79.04 $\mu\text{g/mL}$, respectively.

ABSTRAK

Kayu secang (*Caesalpinia sappan* L.) mengandung senyawa flavonoid seperti brazilin, 3'-O-metilbrazilin, sappanin chalcone, dan sappan chalcone yang berfungsi sebagai antioksidan primer maupun sekunder. Antioksidan merupakan senyawa yang mampu menghambat reaksi oksidasi dengan menetralkan radikal bebas. Upaya peningkatan potensi antioksidan kayu *C. sappan* dapat dilakukan melalui pengembangan sediaan topikal. Masker gel peel-off merupakan bentuk sediaan yang sesuai karena dapat menjaga kesehatan kulit sekaligus memberikan kenyamanan dan kemudahan saat pemakaian. Penelitian ini bertujuan untuk merumuskan dan mengevaluasi masker gel peel-off yang mengandung ekstrak kayu *C. sappan* berdasarkan karakteristik fisik dan aktivitas antioksidannya. Formulasi dibuat dengan konsentrasi ekstrak 2,5%, 5%, dan 7,5% menggunakan natrium karboksimetil selulosa, polivinil alkohol, dan propilen glikol sebagai basis gel. Evaluasi dilakukan terhadap parameter fisik (pH, viskositas, daya sebar, daya lekat, dan waktu kering) serta aktivitas antioksidan menggunakan metode DPPH. Hasil menunjukkan bahwa peningkatan konsentrasi ekstrak secara signifikan ($p < 0,05$) meningkatkan viskositas, daya lekat, dan waktu kering serta menurunkan pH, daya sebar, dan nilai IC_{50} . Seluruh formula menunjukkan aktivitas antioksidan yang kuat (IC_{50} antara 50–100 $\mu\text{g/mL}$), dengan nilai IC_{50} berturut-turut sebesar 88,71 $\mu\text{g/mL}$, 81,58 $\mu\text{g/mL}$, dan 79,04 $\mu\text{g/mL}$.



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1. INTRODUCTION

Air pollution has increased significantly in recent years, with levels rising by up to 20%, and has been identified as a major contributor to various health problems due to prolonged exposure (Wahdaningsih et al., 2015). One of the primary mechanisms through which pollution causes harm is oxidative stress, a condition arising from an overproduction of free radicals in the body. These reactive species can damage biological molecules, highlighting the importance of antioxidants in neutralizing free radicals and preventing oxidative damage, particularly in the skin (Widowati, 2011).

Flavonoids are natural compounds widely recognized for their antioxidant properties. They are capable of scavenging a variety of free radicals, including hydroxyl, peroxide, alkoxy, superoxide anions, singlet oxygen, and hydrogen peroxide (Utari, 2017). One promising source of flavonoids is the wood of secang (*Caesalpinia sappan* L.), which contains active constituents such as brazilin, 3'-O-methylbrazilin, sappanin, and chalcone. These compounds act as both primary and secondary antioxidants. Among them, brazilin has shown particularly strong antioxidant activity, reportedly exceeding that of synthetic antioxidants such as butylated hydroxytoluene (BHT) and butylated hydroxyanisole (BHA) (Sugiyanto et al., 2013). In previous studies, the extract of *C. sappan* demonstrated strong antioxidant potential with an IC₅₀ value of 74.44 µg/mL (Tanzaq et al., 2019).

Facial masks are among the most popular cosmetic products for skin care. However, traditional mask types are often considered less practical due to lengthy application and removal processes. Peel-off gel masks have emerged as a more efficient alternative, offering ease of use, user comfort, and the ability to deliver active ingredients effectively without requiring rinsing (Rahmawanty et al., 2015). Furthermore, peel-off gel formulations have been

shown to enhance antioxidant efficacy when natural extracts are incorporated. Successful applications have been reported using extracts such as *Paederia foetida* (Eka et al., 2022), areca seed (*Areca catechu*) (Dwi Mulyani et al., 2023), red spinach (*Amaranthus tricolor*) leaves (Welly et al., 2022), and mangrove (*Avicennia marina*) leaves (Hasibuan et al., 2024).

Despite its promising properties, the application of *C. sappan* extract in peel-off gel mask formulations remains underexplored. Therefore, the aim of this study was to formulate and evaluate a peel-off gel mask containing *C. sappan* extract, with a focus on its physical characteristics and antioxidant activity. This formulation is expected to serve as a natural, effective skincare solution by maximizing the antioxidant potential of *C. sappan* in a user-friendly topical preparation.

2. METHOD

2.1. Materials and Equipment

The materials used in this study included *C. sappan* (secang) wood, 96% ethanol (Merck), sodium carboxymethyl cellulose (CMC-Na), polyvinyl alcohol (PVA), propylene glycol, vitamin C, and 1,1-diphenyl-2-picrylhydrazyl (DPPH).

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The peel-off gel mask was formulated using *C. sappan* extract at concentrations of 2.5%, 5%, and 7.5%, as shown in **Table 1**. The gel base consisted of polyvinyl alcohol (PVA), sodium carboxymethyl cellulose (CMC-Na), and propylene glycol. PVA and CMC-Na were dispersed in distilled water heated to 80°C until fully swollen. Afterward, propylene glycol was added and the mixture was stirred until homogeneous. The ethanol extract of *C.*

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The drying time was tested by applying 0.1 gram of gel to a 2.5 × 2.5 cm area on the inner forearm. The time required for the film to dry completely at room temperature was recorded. An ideal drying time for peel-off gel masks ranges from 15 to 30 minutes (Silvia et al., 2021).

2.5. Antioxidant Activity Test Using DPPH Method

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Each sample (0.05 g) was dissolved in methanol and diluted to 50 mL. From this stock solution, working concentrations of 60, 70, 80, 100, and 120 $\mu\text{g/mL}$ were prepared. Equal volumes of the sample solution and DPPH solution (30 $\mu\text{g/mL}$) were mixed, incubated at room temperature for the predetermined optimal time, and their absorbance measured at the previously identified λ_{max} . The same procedure was applied to vitamin C standard solutions at concentrations of 2, 4, 6, 8, and 10 $\mu\text{g/mL}$.

The percentage inhibition of DPPH radicals was calculated for each concentration, and the IC_{50} value—the concentration required to inhibit 50% of the DPPH radicals—was determined by linear regression analysis of the inhibition percentage versus sample concentration (Maharani et al., 2022).

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3. RESULTS AND DISCUSSION

3.1. Physical Characteristics of Peel Off Gel Mask Containing *C. sappan* Extract

Caesalpinia sappan has traditionally been recognized for its therapeutic properties, including antibacterial, anti-inflammatory, antidiabetic, and antioxidant effects. The ethanol extract of *C. sappan* contains flavonoid compounds such as brazilin, 3'-O-methylbrazilin, sappanin, and chalcone, which contribute to its strong antioxidant profile (Ngamwonglumlert & Devahastin, 2023). In this study, peel-off gel mask formulations containing *C. sappan* extract at concentrations of 2.5%, 5%, and 7.5% were developed and evaluated for their physical properties.

The organoleptic and homogeneity observations showed that all formulations had a consistent orange color, a characteristic *C. sappan* odor, and a smooth, thick consistency. Each gel was visually homogeneous, indicating even distribution of ingredients throughout the formulation.

Figure 1 illustrates the physical properties of the three formulations. The pH values decreased slightly as the extract concentration increased. This trend is attributed to the acidic nature of *C. sappan* extract (Muslimin et al., 2024), which becomes more influential as the proportion of extract rises. The viscosity of the gels increased progressively with extract concentration, affecting other parameters such as spreadability, adhesiveness, and drying time. A higher viscosity reduced spreadability but enhanced adhesiveness and prolonged the drying time. These relationships are evident in the trends presented in **Figure 1**.

Such changes in physical characteristics are consistent with the structural influence of extract constituents and the thickening effect they exert in the gel base. Although no statistical tests were applied, the consistent trends across all parameters support the influence of *C. sappan* extract concentration on the physical performance of the peel-off mask.

3.2. Antioxidant Activity of Peel-Off Gel Mask Containing *C. sappan* Extract

The antioxidant activity of the peel-off gel mask formulations was evaluated using the DPPH free radical scavenging assay. All formulations demonstrated strong antioxidant capacity, with IC_{50} values within the range of 50–100 $\mu\text{g/mL}$, indicating effective radical scavenging potential.

As shown in **Figure 2**, the IC_{50} values decreased with increasing extract concentration: 88.71 $\mu\text{g/mL}$ for Formulation I (2.5%), 81.58 $\mu\text{g/mL}$ for Formulation II (5.0%), and 79.04 $\mu\text{g/mL}$

for Formulation III (7.5%). This trend suggests that higher concentrations of *C. sappan* extract contribute to enhanced antioxidant performance, likely due to increased levels of flavonoid compounds such as brazilin.

Although statistical testing was not applied, the progressive decrease in IC_{50} values clearly indicates the influence of extract concentration on antioxidant activity. These results are consistent

with the literature, which identifies *C. sappan* as a potent natural antioxidant source (Tanzaq et al., 2019). Compared to its pure extract IC_{50} value of 74.44 $\mu\text{g/mL}$, the formulated gels retained high antioxidant potential. However, when compared to vitamin C ($IC_{50} = 3.04 \mu\text{g/mL}$), the formulations were less potent, which is expected given the superior radical scavenging efficiency of pure ascorbic acid.

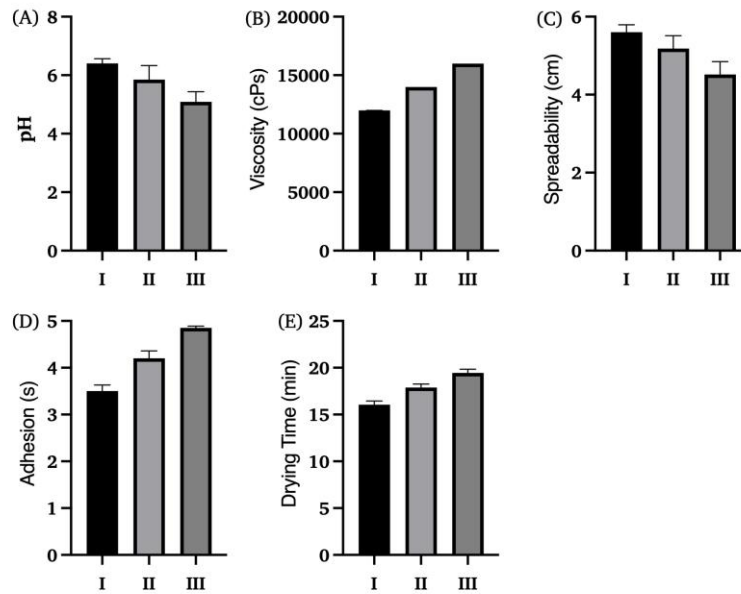


Figure 1. Physical characteristics of peel-off gel mask containing *C. sappan* extract in Formulation I (2.5%), Formulation II (5.0%), and Formulation III (7.5%): (a) pH, (b) viscosity, (c) spreadability, (d) adhesiveness, and (e) drying time.

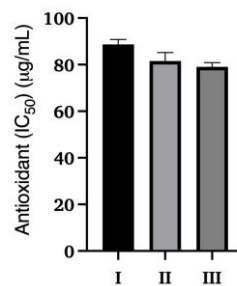


Figure 2. IC_{50} values of peel-off gel mask containing *C. sappan* extract in Formulation I (2.5%), Formulation II (5.0%), and Formulation III (7.5%).

CONCLUSION

This study demonstrated that peel-off gel masks containing *C. sappan* extract can be effectively formulated using polyvinyl alcohol, sodium carboxymethyl cellulose, and propylene glycol as base components. Increasing the extract concentration from 2.5% to 7.5% affected the physical properties of the formulation by increasing viscosity, adhesiveness, and drying time, while decreasing pH and spreadability. All formulations exhibited strong antioxidant activity, with IC_{50} values ranging from 88.71 to 79.04 $\mu\text{g/mL}$, indicating that higher extract concentrations enhance antioxidant performance. Overall, the 7.5% extract formulation showed the most favorable combination of physical characteristics and antioxidant activity, supporting its potential as a natural, effective peel-off gel mask for skin health applications.

REFERENCES

- Andini, T., Yusriadi, Y., & Yuliet, Y. (2017). Optimasi pembentuk film polivinil alkohol dan humektan propilen glikol pada formula masker gel peel off sari buah labu kuning (*Cucurbita moschata* Duchesne) sebagai antioksidan. *Jurnal Farmasi Galenika (Galenika Journal of Pharmacy)*, 3(2), 101–108.
- Anindhita, M. A., Prastiwi, D., Lu, N., Fitriyani, L., & Nanda Rini, S. (2023). Pengaruh penggunaan polivinil alkohol sebagai gelling agent terhadap sifat fisikokimia sediaan gel peel-off ekstrak etanol buah pedada. *Parapemikir: Jurnal Ilmiah Farmasi*, 12(1), 18–29. <https://doi.org/10.30591/pjif.v12i1.3990>
- Cahyani, I. M., Hanhadyanaputri, E. S., Wulan, A. H., & Sulistyarini, I. (2025). Optimization formula of kolang-kaling

- (*Arenga pinnata*) peel-off gel mask with combination PVA–CMC Na as gelling agent on simplex lattice design. *Media Farmasi Indonesia*, 20(1), 67–75. <https://doi.org/10.53359/mfi.v20i1.316>
- Cahyani, I. M., & Putri, I. D. C. (2017). Efektivitas karbopol 940 dalam formula masker gel peel-off ekstrak temu giring (*Curcuma heyneana* Val & Zijp). *Journal of Pharmaceutical and Medicinal Sciences*, 2(2), 48–51.
- Dwi Mulyani, A., Rahayu, P., Aini, N., Purnamasari, D., & Mulyani, A. D. (2023). Formulasi dan evaluasi mutu fisik sediaan masker gel peel-off ekstrak biji pinang (*Areca catechu* L.) sebagai antioksidan. *Indonesian Journal of Pharmaceutical Education*, 3(3), 1–9. <https://doi.org/10.37311/ijpe.v3i3.22033>
- Eka, R., Susanti, E., & A'yun, Q. (2022). Formulation and antioxidant activity of peel-off gel mask from *Paederia foetida* extract. *JKPK (Jurnal Kimia dan Pendidikan Kimia)*, 7(1), 12–19. <https://doi.org/10.20961/jkpk.v7i1.45798>
- Faizah, U. N., Maula, N. N., Mustika, R. A., & Wahyuni, S. (2023). Potensi senyawa antioksidan yang terkandung dalam kayu secang (*Caesalpinia sappan*) untuk perawatan kulit alami. *Symbiotic: Journal of Biological Education and Science*, 4(1), 41–49. <https://doi.org/10.32939/symbiotic.v4i1.90>
- Hasibuan, N. E., Azka, A., Basri, & Mujiyanti, A. (2024). Aktivitas antioksidan dan karakteristik masker gel peel-off dari ekstrak daun mangrove (*Avicennia marina*). *Jurnal Pengolahan Hasil Perikanan Indonesia*, 2(9), 42–55. <https://doi.org/10.17844/jphpi.v27i9.52083>
- Hu, J., Yan, X., Wang, W., Wu, H., Hua, L., & Du, L. (2008). Antioxidant activity in vitro of three constituents from *Caesalpinia sappan* L. *Tsinghua Science & Technology*, 13(4), 474–479. [https://doi.org/10.1016/s1007-0214\(08\)70076-2](https://doi.org/10.1016/s1007-0214(08)70076-2)
- Maharani, N. P. D. S., Cahyani, I. M., & Hanhadyanaputri, E. S. (2022). Optimization of polyvinyl alcohol (PVA) and glycerin in kolang-kaling peel-off gel mask formula (*Arenga pinnata*). *Journal of Food and Pharmaceutical Sciences*, 2022(3), 746–753. <https://doi.org/10.22146/jfps.5718>
- Muslimin, M. K., Rahayuningsih, E., & Mindaryani, A. (2024). Optimasi proses metilasi brazilein hasil ekstrak kayu secang (*Caesalpinia sappan* Linn) sebagai bahan pewarna merah alami untuk tekstil. *Jurnal Rekayasa Proses*, 18(2), 89–99. <https://doi.org/10.22146/jrekpros.82068>
- Ngamwonglumlert, L., & Devahastin, S. (2023). Brazilein as an alternative pigment: Isolation, characterization, stability enhancement and food applications. *Food Chemistry*, 398, Article 133898. <https://doi.org/10.1016/j.foodchem.2022.133898>
- Rahmawanty, D., Yulianti, N., & Fitriana, M. (2015). Formulasi dan evaluasi masker wajah peel-off mengandung kuersetin dengan variasi konsentrasi gelatin dan gliserin. *Media Farmasi: Jurnal Ilmu Farmasi*, 12(1), 17–32. <https://doi.org/10.12928/mf.v12i1.3019>
- Rina, O., Sanusi, I., Abdidharma, Afrizal, Utami, C., & Widodo, Y. (2017). Stabilities of natural colorant of sappan wood (*Caesalpinia sappan* L.) for food and beverages in various pH, temperature and food matrices. *International Journal of ChemTech Research*, 10(1), 98–103.
- Sugiyanto, R. N., Putri, S. R., Damanik, F. S., & Sasmita, G. M. A. (2013). Aplikasi kayu secang (*Caesalpinia sappan* L.) dalam upaya prevensi kerusakan DNA akibat paparan zat potensial karsinogenik melalui MNPCE assay. *Pekan Ilmiah Mahasiswa Nasional – PKM Penelitian 2013*. <https://www.neliti.com/id/publications/171018>
- Syam, N., Lestari, U., & Muhaimin. (2021). Formulasi dan uji sifat masker gel peel-off dari minyak sawit murni dengan basis carbomer 940. *Indonesian Journal of Pharma Science*, 3(1), 42–55.
- Tanzaq, T. T., Agustina, R. D., Setiawati, K. E., & Cahyani, I. M. (2019). Uji aktivitas penangkapan radikal DPPH (1,1-diphenyl-2-picrylhydrazyl) ekstrak etanol kayu secang (*Caesalpinia sappan* L.). *Media Farmasi Indonesia*, 14(1), 1461–1465. <https://mfi.stifar.ac.id/mfi/article/view/105/86>
- Utari, F. D. (2017). Produksi antioksidan dari ekstrak kayu secang (*Caesalpinia sappan* L.) menggunakan pengering berkelembaban rendah. *Jurnal Aplikasi Teknologi Pangan*, 6(3). <https://doi.org/10.17728/jatp.241>
- Wahdaningsih, S., Budilaksono, W., & Fahrurroji, A. (2015). Uji aktivitas antioksidan fraksi n-heksana kulit buah naga merah menggunakan metode 1,1-difenil-2-pikrilhidrazil. *Jurnal Kesehatan Khatulistiwa*, 1(2), 115–136. <https://doi.org/10.26418/jurkeswa.v1i2.42997>
- Welly, S., Supriyanto, & Saraswati, M. (2022). Antioxidant test and peel-off mask formulation extract of red spinach (*Amaranthus tricolor* L.) leaves with variations of gelling agent types. *Joseph (Journal of Pharmacy)*, 2(1), 42–55.
- Widowati, W. (2011). Uji fitokimia dan potensi antioksidan ekstrak etanol kayu secang (*Caesalpinia sappan* L.). *Maranatha Journal of Medicine and Health*, 11(1), 151615. <https://www.neliti.com/id/publications/151615/>

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