LAMPIRAN

Lampiran 1. Perhitungan Formulasi

Volume sediaan tiap botol = 30 mL Rumus yang digunakan:

Volume tiap bahan (mL) = $\frac{\%}{100} \times$ Vtotal

dengan Vtotal = 30 mL

Aquadest dihitung dengan rumus: Vaquadest = Vtotal − Σ(V bahan lain)

Formula I (FI) Infusa Daun Bidara 10%

Perhitungan 1 botol (30 mL):

1. Infusa daun bidara 10% $= \frac{10}{100} \times 30 = 3$ mL
2. Etanol 70% 20% $= \frac{20}{100} \times 30 = 6$ mL
3. Gliserin 6,7% $= \frac{6,7}{100} \times 30 = 2,01$ mL
4. Parfum 1% $= \frac{1}{100} \times 30 = 0,3$ mL
5. Aquadest (q.s ad 30 mL) $= 30 - (3 + 6 + 2,01 + 0,3)$

$= 18,69$ mL

Komposisi per botol (30 mL):

Infusa 3 mL + Etanol 70% 6 mL + Gliserin 2,01 mL + Parfum 0,3 mL +

Aquadest 18,69 mL

Formula II (F2) Infusa Daun Bidara 15%

Perhitungan 1 botol (30 mL):

1. Infusa daun bidara 15% $= \frac{15}{100} \times 30 = 4,5$ mL
2. Etanol 70% 20% $= \frac{20}{100} \times 30 = 6$ mL
3. Gliserin 6,7% $= \frac{6,7}{100} \times 30 = 2,01$ mL

100

4. Parfum 1% $= \frac{1}{100} \times 30 = 0{,}3$ mL

5. Aquadest (q.s ad 30 mL) $= 30 - (4{,}5 + 6 + 2{,}01 + 0{,}3)$

$= 17{,}19$ mL

Komposisi per botol (30 mL):

Infusa 4,5 mL + Etanol 70% 6 mL + Gliserin 2,01 mL + Parfum 0,3 mL + Aquadest 17,19 mL

Formula III (F3) Infusa Daun Bidara 20%

Perhitungan 1 botol (30 mL):

1. Infusa daun bidara 20% $= \frac{20}{100} \times 30 = 6$ mL

2. Etanol 70% 20% $= \frac{20}{100} \times 30 = 6$ mL

3. Gliserin 6,7% $= \frac{6{,}7}{100} \times 30 = 2{,}01$ mL

4. Parfum 1% / q.s $= \frac{1}{100} \times 30 = 0{,}3$ mL

5. Aquadest (q.s ad 30 mL) $= 30 - (6 + 6 + 2{,}01 + 0{,}3)$

$= 15{,}69$ mL

Komposisi per botol (30 mL): Infusa 6 mL + Etanol 70% 6 mL + Gliserin 2,01 mL + Parfum 0,3 mL + Aquadest 15,69 mL

Lampiran 2. Perhitungan Uji Berat Jenis

Formula I	Aquadest		Sampel		
Berat pikno kosong (Aquadest)	Pikno + aquadest (g)	Massa air (g)	Berat pikno kosong (sampel)	Pikno + sampel (g)	Massa sampel (g)
19,52 g	49,15 g	29,63 g	19,67 g	46,38 g	26,71
	49,15 g	29,63 g		45,76 g	26,09
	49,15 g	26,63 g		47,96 g	28,29
Rata-Rata	49,15	26,63	Rata-Rata	46,83 g	27,03 g

Rumus:

$$\boldsymbol{\rho\ air} = \frac{\boldsymbol{W1-Wo}}{\boldsymbol{V\ air}} \quad \boldsymbol{\rho\ spray} = \frac{\boldsymbol{W2-Wo}}{\boldsymbol{V\ spray}}$$

Keterangan:

ρ	: berat jenis (g/ml)
Wo	: berat piknometer kosong
W1	: berat piknometer yang berisi air
W2	: berat piknometer yang berisi zat uji
V air	: volume air (ml)
V spray	: volume sediaan (ml)

a) Berat jenis air

$$\rho\ air = \frac{W1 - Wo}{V\ air}$$

$$= \frac{49{,}15\ g - 19{,}52\ g}{25}$$

= 1,1852 g/ml

b) **Berat jenis *spray***

- **Formula I**

  - Replikasi I

    ρ sediaan $= \frac{W2-Wo}{V\ Sediaan}$

    $= \frac{46,38-19,67}{25}$

    = 1,0684 g/ml

  - Replikasi II

    ρ sediaan $= \frac{W2-Wo}{V\ Sediaan}$

    $= \frac{45,76-19,67}{25}$

    = 1,0436 g/ml

  - Replikasi III

    ρ sediaan $= \frac{W2-Wo}{V\ sediaan}$

    $= \frac{47,96-19,67}{25}$

    = 1,1316 g/ml

Formula II	Aquadest		Sampel		
Berat pikno kosong (Aquadest)	Pikno + aquadest (g)	Massa air (g)	Berat pikno kosong (sampel)	Pikno + sampel (g)	Massa sampel (g)
19,52 g	49,15 g	29,63 g	19,78 g	46,31 g	26,53
	49,15 g	29,63 g		47,46 g	27,68
	49,15 g	26,63 g		46,73 g	26,95
Rata-Rata	49,15	26,63	Rata-Rata	46,83 g	27,05 g

- **Formula II**

  - Replikasi I

    ρ sediaan $= \frac{W2-Wo}{V\ Sediaan}$

    $= \frac{46,31-19,78}{25}$

    = 1,0612 g/ml

  - Replikasi II

    ρ sediaan $= \frac{W2-Wo}{V\ Sediaan}$

    $= \frac{47,46-19,78}{25}$

    = 1,1072 g/ml

  - Replikasi III

    ρ sediaan $= \frac{W2-Wo}{V\ Sediaan}$

    $= \frac{46,73-19,78}{25}$

    = 1,0780 g/ml

Formula III	Aquadest		Sampel		
Berat pikno kosong (Aquadest)	Pikno + aquadest (g)	Massa air (g)	Berat pikno kosong (sampel)	Pikno + sampel (g)	Massa sampel (g)
19,52 g	49,15 g	29,63 g	19,81 g	45,89 g	26,08
	49,15 g	29,63 g		46,01 g	26,20
	49,15 g	26,63 g		45,45 g	25,64
Rata-Rata	49,15	26,63	Rata-Rata	45,78 g	25,98 g

- **Formula III**

  - Replikasi I

    ρ sediaan $= \frac{W2-Wo}{V\ Sediaan}$

    $= \frac{45,89-19,81}{25}$

    =1,0480 g/ml

  - Replikasi II

    ρ sediaan $= \frac{W2-Wo}{V\ Sediaan}$

    $= \frac{46,01-19,81}{25}$

    =1,0432 g/ml

  - Replikasi III

    ρ sediaan $= \frac{W2-Wo}{V\ Sediaan}$

    $= \frac{45,45-19,81}{25}$

    =1,0256

Lampiran 3. Perhitungan Uji Viskositas

Replikasi	t. air (detik)	Formula I	Formula II	Formula III
		t. sampel	t. sampel	t. sampel
1	0,50	01.21	01.28	01.30
2	0,73	01.27	01.30	01.38
3	0,78	01.35	01.35	01.43
Rata-Rata	0,67	01.28	01.31	01.37

Rumus:

$$\frac{\mu\ air}{\mu\ Sediaan} = \frac{\rho\ air\ x\ t\ air}{\rho\ sediaan\ x\ t\ sediaan}$$

Keterangan:

$\mu 1$: Kekentalan air (0,8904)
$\mu 2$: Kekentalan *spray* (Cp)
$\rho 1$: Berat jenis air (g/ml)
$\rho 2$: Berat jenis *spray* (g/ml) t1 : Waktu alir air (detik)
t2 : Waktu alir *spray* (detik)

- **Formula I**

  - Replikasi I

$$\frac{\mu 1}{\mu 2} = \frac{\rho 1 - t1}{\rho 2 - t2}$$

$$\frac{0,8904}{\mu 2} = \frac{1,1852 - 0,50}{1,0684 - 01.21}$$

$$\frac{0,8904}{\mu 2} = \frac{0,5926}{1,2928}$$

$$0,5926 \text{ x } \mu 2 = 1,1511\ Cp$$

$$\mu 2 = 1,9424$$

  - Replikasi II

$$\frac{\mu 1}{\mu 2} = \frac{\rho 1 - t1}{\rho 2 - t2}$$

$$\frac{0,8904}{\mu 2} = \frac{1,1852-0,73}{1,0612-01.27}$$

$$\frac{0,8904}{\mu 2} = \frac{0,8652}{1,3477}$$

$$0,8652 \text{ x } \mu 2 = 1,1999$$

$$\mu 2 = 1,3869\ Cp$$

- Replikasi III

$$\frac{\mu 1}{\mu 2} = \frac{\rho 1-t1}{\rho 2-t2}$$

$$\frac{0,8904}{\mu 2} = \frac{1,1852-0,78}{1,0432-01.35}$$

$$\frac{0,8904}{\mu 2} = \frac{0,9245}{1,4083}$$

$$0,9245\ x\ \mu 2 = 1,2539$$

$$\mu 2\ = 1,3564\ Cp$$

➢ **Formula II**

- Replikasi I

$$\frac{\mu 1}{\mu 2} = \frac{\rho 1-t1}{\rho 2-t2}$$

$$\frac{0,8904}{\mu 2} = \frac{1,1852-0,50}{1,0436-01.28}$$

$$\frac{0,8904}{\mu 2} = \frac{0,5926}{1,3358}$$

$$0,5926\ X\ \mu 2 = 1,1894$$

$$\mu 2 = 2,0071\ Cp$$

- Replikasi II

$$\frac{\mu 1}{\mu 2} = \frac{\rho 1-t1}{\rho 2-t2}$$

$$\frac{0,8904}{\mu 2} = \frac{1,1852-0,73}{1,1072-01.30}$$

$$\frac{0,8904}{\mu 2} = \frac{0,8652}{1,4394}$$

$$0,8652\ x\ \mu 2 = 1,2816$$

$$\mu 2 = 1,4813\ Cp$$

- Replikasi III

$$\frac{\mu 1}{\mu 2} = \frac{\rho 1 - t1}{\rho 2 - t2}$$

$$\frac{0,8904}{\mu 2} = \frac{1,1852 - 0,78}{1,0480 - 01.35}$$

$$\frac{0,8904}{\mu 2} = \frac{0,9245}{1,4148}$$

$$0,9245\ x\ \mu 2 = 1,2597$$

$$\mu 2 = 1,3626\ Cp$$

➢ **Formula III**

- Replikasi I

$$\frac{\mu 1}{\mu 2} = \frac{\rho 1 - t1}{\rho 2 - t2}$$

$$\frac{0,8904}{\mu 2} = \frac{1,1852 - 0,50}{1,1316 - 01.30}$$

$$\frac{0,8904}{\mu 2} = \frac{0,5926}{1,4711}$$

$$0,5926\ x\ \mu 2 = 1,3098$$

$$\mu 2 = 2,2104\ Cp$$

- Replikasi II

$$\frac{\mu 1}{\mu 2} = \frac{\rho 1 - t1}{\rho 2 - t2}$$

$$\frac{0,8904}{\mu 2} = \frac{1,1852 - 0,73}{1,0780 - 01.38}$$

$$\frac{0,8904}{\mu 2} = \frac{0,8652}{1,4876}$$

$$0{,}8652\ x\ \mu 2 = 1{,}3246$$

$$\mu 2 = 1{,}5309\ Cp$$

- Replikasi III

$$\frac{\mu 1}{\mu 2} = \frac{\rho 1 - t1}{\rho 2 - t2}$$

$$\frac{0{,}8904}{\mu 2} = \frac{1{,}1852 - 0{,}78}{1{,}0256 - 01.43}$$

$$\frac{0{,}8904}{\mu 2} = \frac{0{,}9245}{1{,}4666}$$

$$0{,}9245\ x\ \mu 2 = 1{,}3059$$

$$\mu 2 = 1{,}4125\ Cp$$

Lampiran 4. Perhitungan Presentase Uji Bau Kesukaan

Formula	Presentase Respon Bau			
	Netral	Agak Suka	Suka	Sangat Suka
1	50%	-	-	50%
2	50%	-	5%	45%
3	55%	5%	30%	10%

Uji kesan bau kesukaan pada sediaan deodorant spray dilakukan kepada 20 responden, berikut data yang diperoleh:

1. Formula I (Konsentrasi Infusa Daun Bidara 10%)

   Netral 10 respondem $= \frac{10}{20} x\ 100\% = 50\%$

   Agak suka = Tida ada

   Suka = Tidak ada

   Sangat suka 10 responden $= \frac{10}{20} x\ 100\% = 50\%$

2. Formula II (Konsentrasi Infusa Daun Bidara 15%)

   Netral 10 responden $= \frac{10}{20} x\ 100\% = 50\%$

   Agak suka = Tidak ada

   Suka 1 responden $= \frac{1}{20} x\ 100\% = 5\%$

   Sangat suka 9 responden $= \frac{9}{20} x\ 100\% = 45\%$

3. Formula III (Konsentrasi Infusa Daun Bidara 20%)

Netral 11 responden $= \frac{11}{20} x\ 100\% = 55\%$

Agak suka 1 responden $= \frac{1}{20} x\ 100\% = 5\%$

Suka 6 responden $= \frac{6}{20} x\ 100\% = 30\%$

Sangat suka 2 responden $= \frac{2}{20} x\ 100\% = 10\%$

Lampiran 5. Perhitungan Presentase Uji Kelembutan

Formula	Presentase Kelembutan (%)			
	Tidak Lembut	Agak Lembut	Netral	Lembut
1	10%	15%	30%	45%
2	10%	20%	35%	35%
3	5%	10%	40%	40%

Uji kesan kelembutan pada sediaan deodoran spray dilakukan kepada 20 responden, berikut data yang diperoleh :

1. Formula I (Konsentrasi Infusa 10%)

   Tidak lembut 2 responden $= \frac{2}{20} x\ 100\% = 10\%$

   Agak lembut 3 responden $= \frac{3}{20} x\ 100\% = 10\%$

   Netral 6 responden $= \frac{6}{20} x\ 100\% = 30\%$

   Lembut 9 responden $= \frac{9}{20} x\ 100\% = 45\%$

2. Formulasi II (Konsentrasi Infusa 15%)

   Tidak lembut 2 responden $= \frac{2}{20} x\ 100\% = 10\%$

   Agak lembut 4 responden $= \frac{4}{20} x\ 100\% = 20\%$

   Netral 7 responden $= \frac{7}{20} x\ 100\% = 35\%$

   Lembut 7 responden $= \frac{7}{20} x\ 100\% = 35\%$

3. Formulasi III (Konsentrasi Infusa 20%)

Tidak lembut 1 responden $= \frac{1}{20} x\ 100\% = 5\%$

Agak lembut 2 responden $= \frac{2}{20} x\ 100\% = 10\%$

Netral 8 responden $= \frac{8}{20} x\ 100\% = 40\%$

Lembut 9 responden $= \frac{9}{20} x\ 100\% = 45\%$

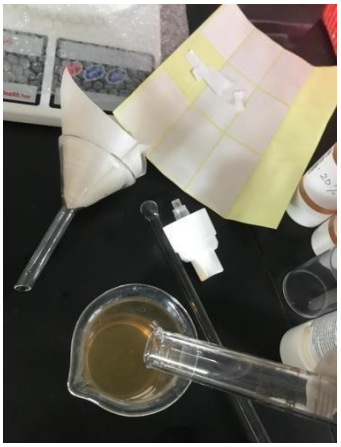
Lampiran 6. Pembuatan Infusa Daun Bidara

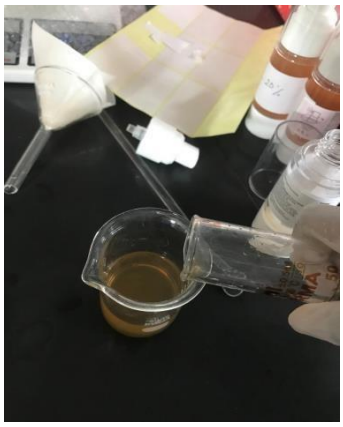
No	Gambar	Keterangan
1		Daun bidara (*Ziziphus mauritina* L.) segar dipisahkan dari ranting dan duri
2		Daun bidara (*Ziziphus mauritina* L.) dicuci menggunakan air mengalir hingga bersih

3		Daun bidara (*Ziziphus mauritina* L.) ditiriskan dan dikeringkan pada suhu ruang
4		Daun bidara (*Ziziphus mauritina* L.) dipotong kecil-kecil
5		Daun bidara (*Ziziphus mauritina* L.) ditimbang menggunakan timbangan digital

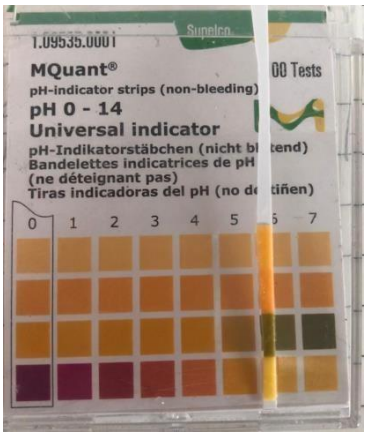
6		Daun bidara (*Ziziphus mauritina* L.) direbus dengan aquadest selama 15 menit
7		Infusa disaring menggunakan kertas saring untuk memisahkan ampas
8		Filtrat infusa daun bidara (*Ziziphus mauritina* L.) diperoleh dan siap digunakan. Volume akhir infusa $\pm$ 95 mL

Lampiran 7. Pembuatan Deodoran Spray

No	Gambar	Keterangan
1		Menambahkan gliserin sedikit demi sedikit
2		Menambahkan etanol 70% sedikit demi sedikit

3		Menambahkan aquadest hingga volume akhir 30 mL aduk ad. homogen
4		Sediaan deodorant *spray* herbal infusa daun bidara (*Ziziphus mauritina* L.)

Lampiran 8. Uji Sifat Fisik Sediaan Deodoran *Spray*

No	Gambar	Keterangan
1		Hasil uji pH
2		Hasil uji kejernihan sediaan
3		Hasil uji iritasi

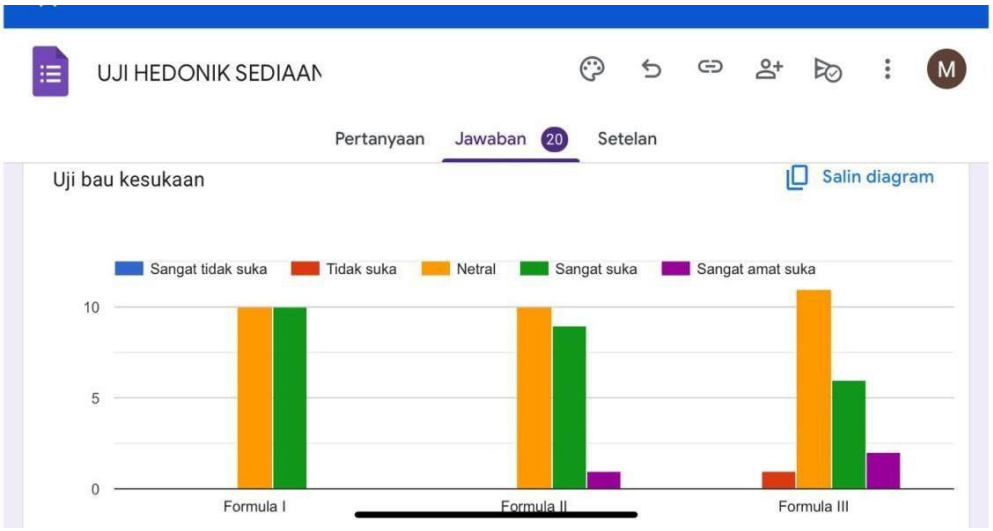
4		Hasil uji berat jenis
5		Hasil uji viskositas

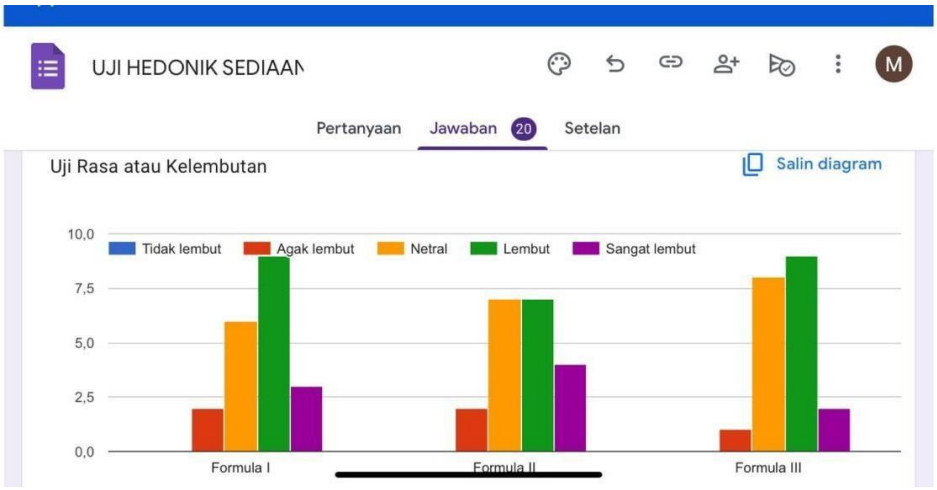
Lampiran 9. Uji Simpan Sediaan Deodoran *Spray*

No	Gambar	Keterangan
1		Uji pH
2		Uji Homogenitas

3		Uji Kejernihan
4		Uji Volume Semprot

Lampiran 10. Instrumen Uji Hedonik Sediaan Deodoran Spray





Lampiran 11. Surat Keterangan Praktik Laboratorium

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Fakultas Sekolah Vokasi
Program Studi D-3 Farmasi

No : 020.06/FAR-HN/II/2026
Hal : Keterangan Praktek Laboratorium

SURAT KETERANGAN

Dengan ini menerangkan bahwa mahasiswa berikut :

Nama	: Mam. Miladea
NIM	: 23080053
Judul Tugas Akhir	: Evaluasi Sifat Fisik Dan Uji Stabilitas Sediaan Deodorant Spray Herbal Berbasis Infusa Daun Bidara

Benar – benar telah melakukan penelitian di Laboratorium Diploma III Farmasi Universitas Harkat Negeri.
Demikian surat keterangan ini untuk digunakan sebagaimana mestinya.

Tegal, 18 Februari 2026

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apt. Rizki Febriyanti, M.Farm.
NIPY. 09.012.117

Lampiran 12. Surat keterangan hasil plagiasi

Universitas Harkat Negeri

Sekolah Vokasi
Program Studi D-3 Farmasi

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Yang bertanda tangan di bawah ini:

Nama : apt. Rizki Febriyanti, M.Farm

NIPY : 09.012.117

Jabatan : Ketua Program Studi D-3 Farmasi

Menerangkan bahwa Laporan Tugas Akhir:

Judul : Evaluasi Sifat Fisik Dan Uji Stabilitas Sediaan Deodoran Spray Herbal Berbasis Infusa Daun Bidara (Ziziphus mauritiana L.)

Yang ditulis oleh :

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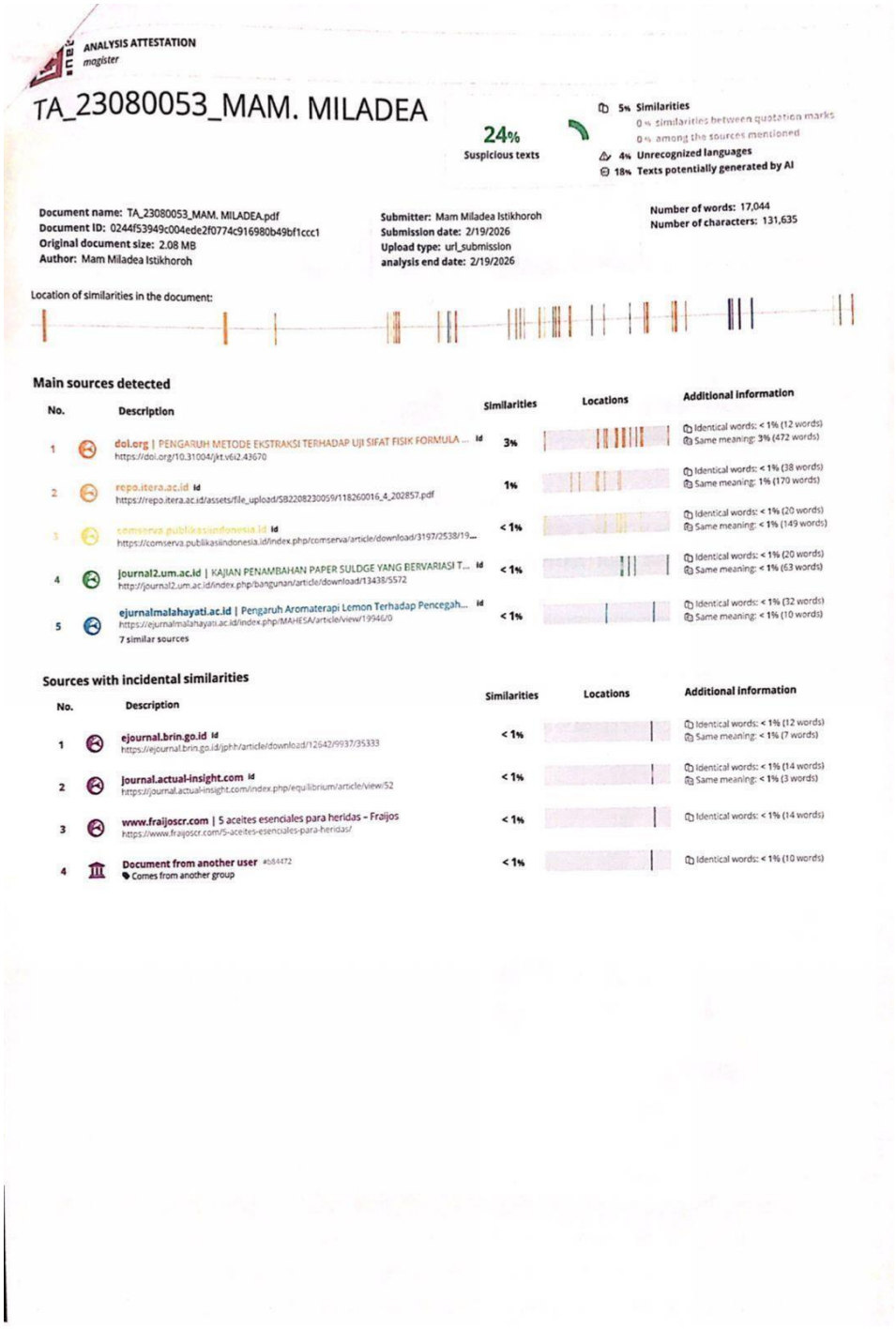

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SERTIFIKAT
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Jurnal DIALEKTIKA : Jurnal Ilmu Sosial

EISSN : 2828545X
Publisher : Pengurus Pusat Perkumpulan Ilmuwan Administrasi Negara Indonesia

Peringkat Akreditasi Jurnal Ilmiah Periode I 2025

Akreditasi Ulang di Peringkat 5 mulai
Volume 20 Nomor 2 Tahun 2022 sampai Volume 25 Nomor 1 Tahun 2027

I Ketut Adnyana
NIP 196805151994031004

Lampiran 14. LoA Jurnal

P-ISSN : 1412-9736
E-ISSN : 2828-545X
Dialektika : Journal of Social Sciences
Journal Homepage: http://jurnaldialektika.com/index.php/piani/ET

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Respected	Mam. Miladea Istikhoroh, Heru Nurcahyo & Inur Tivani
Author(s) ID	P-DIAL-233103
Manuskrip Tittle	EVALUATION OF PHYSICAL PROPERTIES AND STABILITY TEST OF HERBAL SPRAY DEODORANT PREPARATIONS BASED ON JUJUBE LEAF INFUSION (ZIZIPHUS MAURITIANA L.)

We are pleased to inform you that the manuscript **Has been Accepted** based on the review results and will be published on **03 March 2026**, in Dialektika: Journal of Social Sciences, **Vol. 24, No. 01, 2026.**

This information is conveyed to you, and the team at Dialektika: Journal of Social Sciences congratulates you. Thank you for your attention.

Best Regard,
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Bandung City.
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Lampiran 15. Artikel

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ARTICLE

EVALUATION OF PHYSICAL PROPERTIES AND SHELF-LIFE TEST OF HERBAL DEODORANT SPRAY PREPARATION BASED ON BIDARA LEAF INFUSION (ZIZIPHUS MAURITIANA L.)

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Article history:
Received: 12 January 2026
Accepted: 12 February 2026
Published: 3 March 2026

Abstract

Deodorant is a topical preparation used to help reduce body odor caused by bacterial activity on the skin, such as Staphylococcus epidermidis. Along with the increasing interest in natural-based products, bidara leaves (Ziziphus mauritiana L.) have the potential to be used as an active ingredient due to their antibacterial activity. This study aims to formulate a herbal deodorant spray containing bidara leaf infusion and to evaluate its physical characteristics and stability. Bidara leaf infusion will be prepared using the infusion (infundation) method and formulated into a deodorant spray in three different concentrations, namely 10%, 15%, and 20%. The formulated deodorant sprays will be evaluated through organoleptic test, pH, homogeneity, clarity, and spray volume. Quantitative data will be analyzed using One-Way ANOVA, while organoleptic data will be analyzed descriptively. Stability testing will be conducted at room temperature and analyzed using Repeated Measures ANOVA if the parametric requirements are fulfilled.

Keyword: Bidara Leaves, Deodorant spray, Formulation, Infusion, Physical Stability.

A. INTRODUCTION

Indonesia has a tropical climate with relatively high temperatures (27–32°C) and high humidity, which increases sweat production, especially in body folds. Sweat is inherently odorless, but it can become a breeding ground for bacteria such as Staphylococcus aureus, which breaks down sweat components into volatile compounds that cause unpleasant odors (Rizka et al., 2021). This can interfere with comfort and lower self-confidence.

To address these issues, people use topical deodorants that inhibit bacterial growth or mask odors with added fragrances (Madliya et al., 2022). As awareness of product safety increases, consumer preference is shifting to natural ingredients, which are considered safer and more environmentally friendly.

Bidara leaves (Ziziphus mauritiana L.) have the potential to be developed as an active ingredient in herbal deodorants due to their antibacterial flavonoid, saponin, and tannin content (Pratiwi et al., 2021). One extraction method that can be used is infusion, which is simpler, free of organic solvents, and relatively safe for topical use.

This study aims to formulate a spray deodorant made from bidara leaf infusion with varying

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concentrations and to evaluate the physical properties and short-term storage stability in order to obtain an effective and stable preparation.

B. LITERATURE REVIEW

Formation of Body Odor and Working Principles of Deodorants

Body odor (especially in the axilla) is primarily formed when initially relatively odorless sweat secretions are metabolized by the skin microbiota into odorous volatile compounds (James et al., 2013). Organisms often dominant and strongly associated with axillary malodor include the Corynebacterium and Staphylococcus groups, which break down precursors into volatile acids and sulfur compounds (James et al., 2013). Therefore, deodorant approaches generally target reducing microbial activity, inhibiting odor-forming pathways, or neutralizing already formed volatile molecules (Kanlayavattanakul & Lourith, 2011). Recent trends emphasize the use of "naturally derived" agents (including plant extracts) as active deodorant candidates, but their effectiveness is heavily influenced by their phytochemical composition and delivery system (Teerasumran et al., 2023). Within the framework of formulation research, this theory provides a rationale for herbal active ingredients to be appropriate for formulation, while also helping to link formulation choices to logical biological targets before engaging in physical and stability evaluation. (Kanlayavattanakul & Lourith, 2011; Teerasumran et al., 2023) Indicators:

- Target the malodor-causing microbiota (e.g. Corynebacterium/Staphylococcus dominance).
- Relevant odor precursor type (volatile acids/sulfur compounds).
- Mechanism direction: antibacterial, anti-odor-forming enzyme, odor neutralizer/adsorbent.
- Performance parameters (when tested): reduction in odor intensity, duration of protection, skin tolerability.

C. RESEARCH METHODOLOGY

The object of this study was a deodorant spray preparation based on infusion of bidara leaves (Ziziphus mauritiana L.) which was analyzed to determine the formulation with the best physical characteristics and stability. The samples consisted of several formulas made in triplicate using total sampling technique. The data used included qualitative (organoleptic: color, aroma, homogeneity, spray pattern) and quantitative (pH, viscosity, spray volume, and specific gravity) data. Data collection was carried out experimentally at the Pharmacy Laboratory of Harkat Negeri University, Tegal City through testing the physical properties and stability of the preparation.

Tools and Materials Used

The tools needed are Analytical Scales, Beaker Glass, Measuring Cup, Erlenmeyer, Hot Plate / Water Bath, Gauze Filter or Filter Paper, 30mL Spray Bottle, Digital pH Meter or pH Indicator Paper, Viscometer or simple flow method, Lamp or Bright Light, Stopwatch / Digital Clock, Camera / Cell Phone, Labels and Laboratory Notebook. The materials used in this study were fresh bidara leaves (Ziziphus mauritiana L.), distilled water, 70% ethanol, perfume, 1% CMC.

Deodorant Spray Manufacturing Formula

Table 1. Deodorant Spray Preparation Formulation

Material	F1	F2	F3	Stand	Literature	Function

Publisher: Perkumpulan Ilmuwan Administrasi Negara Indonesia

P-ISSN: 1412 -9736
E-ISSN: 2828-545X

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				ard		
Bidara Leaf Infusion	10%	15%	20%	-	Phytochemical and antibacterial studies of Z. mauritiana	Active ingredient
Ethanol 70%	20%	20%	20%	60-90 %	Sari et al., 2018	Solvent
Glycerin	6,7%	6,7%	6,7%	5-30%	Nugroho et al., 2021	Softener
Parfume	± 1%	± 1%	± 1%	0,1-0,	Dewi et al., 2019	Fragrance
Aquadest	Ad 30 ml	Ad 30 ml	Ad 30 ml	-	Farmakope Indonesia, 2020	Main solvent

Source: Processed by Researchers, 2026

Description: Each formula is made into a 30 ml deodorant spray preparation.

Research Procedures making bidara leaves

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Figure 1. Scheme for Making Bidara Leaf Infusion

Physical Properties Test of Deodorant Spray

- Organoleptic test: Observing the form, color, odor, and taste of the preparation.
- pH test: Determining the suitability of the preparation's pH to skin pH (4.5–7.0).
- Clarity test: Observing the clarity of the preparation in a test tube under the aid of light.
- Specific gravity test: Measured using a pycnometer by comparing the weight of an empty pycnometer and one containing the sample.
- Viscosity test: Determining the viscosity of a liquid by comparing it to a standard liquid (Wulandari et al., 2023).
- Preference test (hedonic): Assessing the respondent's level of acceptance of aroma and softness on a scale of 1–5 (Rahmawati et al., 2019).
- Irritation test: Conducted on rabbits by observing erythema and edema for 72 hours (Madliya et al., 2022).

Deodorant Spray Storage Test

Storage testing was conducted on a selected formula that demonstrated the best physical performance. The formulation was stored at room temperature for 14 days, and retested on days 7 and 14. Stability evaluation was performed using the same parameters as the previous test to determine the extent of physical quality changes during storage.

Data Analysis Techniques

Data analysis was performed using one-way ANOVA for pH, specific gravity, and viscosity, while organoleptic, preference, and irritation tests were analyzed descriptively. The best formula will then be tested for stability at room temperature storage using descriptive analysis.

D. RESULT AND DISCUSSION

Physical Properties Test of Deodorant Spray

Physical properties tests were conducted to evaluate the characteristics of a deodorant spray based on bidara leaf infusion (Ziziphus mauritiana L.) to ensure it meets quality, safety, and stability during storage. The parameters tested included organoleptic properties, pH, clarity, specific gravity, viscosity, spray pattern, and spray volume, as differences in active ingredient concentration can affect the appearance, viscosity, and spray performance (Harwansh et al., 2019). The organoleptic test was conducted visually by observing the shape, color, odor, and taste of the preparation. The results of the observations are presented in the following table.

Table 2. Organoleptic Test Results

Observation Day	*Formula*	*Shape*	*Odor*	*Flavour*	*Color*
days 1-14	**I**	Cair	Fresh herbal flavor	Soft	Yellow
	II	Liquid	Fresh herbal flavor	Soft	Yellow

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	III	Liquid	Fresh herbal flavor	Soft	Yellow	5/12

Source: Processed by Researchers, 2026

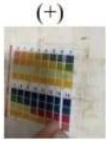
Description:
Formula I = 10% concentration of bidara leaf infusion.
Formula II = 15% concentration of bidara leaf infusion.
Formula III = 20% concentration of bidara leaf infusion.

Based on organoleptic tests on days 1, 7, and 14, all deodorant spray preparations based on bidara leaf infusion (Ziziphus mauritiana L.) maintained their liquid form suitable for spray systems. The yellow color derived from the bidara leaf infusion was stable during storage, and the aroma remained fresh and herbal without any changes or undesirable odors.

pH Test

pH testing is performed to ensure the deodorant spray matches the skin's pH, ensuring its safety. A pH that is too acidic can cause irritation, while a pH that is too alkaline can dry out the skin. A product is considered suitable if it falls within the topical pH range of 4.5–7.0 (Arfiani, 2017). The pH test results are presented in the following table:

Table 3. pH Test Results

Test Day	Formula I	Formula II	Formula III	Library	Result
Day 1	6	6	6	4,5 – 7,0	(+)
Day 7	6	6	6	(Arfiani, 2017)	
Day 14	6	6	6		
Average	6	6	6		

Source: Processed by Researchers, 2026

Description:
(+) = Meets the pH requirements of topical preparations

Based on the results of the pH test conducted on the bidara leaf infusion deodorant spray preparation, a pH value of 6 was obtained for all formulas and in each test replication. The pH value obtained indicates that the preparation has an acidity level that matches the skin's pH. During testing, the preparation's pH value was within the required pH range for topical preparations, which is between 4.5 and 7.0, so the preparation is declared to meet safety requirements for use on the skin (Arfiani, 2017).

Clarity Test

A clarity test was conducted to determine the clarity of the bidara leaf infusion deodorant spray and to ensure that the resulting product is homogeneous. Clarity is important because an inhomogeneous product can contain poorly mixed particles, potentially affecting ease of spraying and comfort when applied to the skin. Furthermore, clarity also reflects the quality of the blending of ingredients in the deodorant spray. The results of the clarity test are shown in the table below:

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Table 4. Clarity Test Results

Observation Da	*Formula I*	*Formula II*	*Formula III*	*Result*
Day 1	Clear	Clear	Clear	(+)
Day 7	Clear, few particles	Clear, few particles	Clear, few particles	
Day 14	Clear, few particles	Clear, few particles	Clear, few particles	

Source: Processed by Researchers, 2026

Description:
(+) = Meets clarity test requirements

Based on the clarity test results, the bidara leaf infusion deodorant spray preparations in Formula I, Formula II, and Formula III showed clear conditions with the presence of small particles on day 1, day 7, and day 14 of observation. The presence of small amounts of particles is still acceptable because it does not interfere with the overall appearance of the preparation and does not cause changes in the form of the preparation during storage.

Specific Gravity Test

The purpose of the specific gravity test is to determine the specific gravity of the deodorant spray preparation that has been prepared. The results of the specific gravity test can be seen in the table below:

Table 5. Specific Gravity Test Results

	Specific Gravity Test (g/ml)			
Day	*Formula I*	*Formula II*	*Formula III*	*Library*
1	1,0684	1,0436	1,1316	1,01 – 1,1 g/mL (Wulandari, 2019)
7	1,0690	1,0614	1,0438	
14	1,0670	1,0615	1,0434	
Average	1,0681	1,0555	1,0729	

Source: Processed by Researchers, 2026

The results of the specific gravity test on days 1, 7, and 14 (triplicate) showed that Formulas I, II, and III were in the range of 1.05–1.10 g/mL, thus still meeting the requirements for topical liquid preparations and in accordance with previous studies. The one-way ANOVA test produced $p > 0.05$, which means there was no significant difference between formulas during storage. Thus, all formulas were declared stable and had relatively similar physical characteristics until day 14.

Viscosity Test

A viscosity test was conducted to determine the viscosity of a bidara leaf-infused deodorant spray. This parameter is important because it affects ease of spraying, comfort of use, and the product's ability to spread evenly on the skin. A good product has a low viscosity for easy

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spraying while still providing a smooth feel when applied. The viscosity test results are presented in the following table:

Table 6. Viscosity Test Results

Viscosity Test (Cp)				
Test Day	***Formula I***	***Formula II***	***Formula III***	***Library***
1	1,9424 Cp	2,0071 Cp	2,2104 Cp	
7	1,1802 Cp	1,4923 Cp	1,4900 Cp	**1,0–2,0 cP**
14	1,4428 Cp	1,5266 Cp	1,5230 Cp	Rowe *et al.* (2017)
	1,5619 Cp	1,6170 Cp	1,7179 Cp	

Source: Processed by Researchers, 2026

Based on viscosity test results, all formulas were in the range of 1.0–2.0 cP, as recommended by the literature for spray formulations (Rowe et al., 2017). This range is ideal because it facilitates pump dispensing, produces a fine mist, and prevents nozzle clogging.

The results of the one-way ANOVA test showed a p value > 0.05 from days 1 to 14, indicating no significant differences between Formulas I, II, and III during storage. Thus, all formulations had good physical properties and were relatively stable until the end of the observation.

Preference Test

The preference test is an assessment method that aims to determine the level of acceptance of a product based on the impression of good or bad product quality through the five senses, including sight, smell, touch and hearing (Anisa, 2025).

Table 7. Results of the Preferred Smell Impression Test

	Percentage of Odor Response (%)			
Formula	**Neutral**	**Quite Like**	**Like**	**Really Like**
1	50	-	-	50
2	50	-	5	45
3	55	5	30	10

Source: Processed by Researchers, 2026

The hedonic odor test results showed Formula I was the most preferred (50% strongly liked, 50% neutral). Formula II remained well-received, but its aroma began to become stronger. Formula III received mostly neutral ratings, with 5% disliking, indicating that the stronger aroma decreased the level of preference for some respondents.

Table 8. Softness Impression Test Results

	Percentage of Softness Impression (%)			
Formula	**Not Soft**	**a bit soft**	**Neutral**	**Soft**

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1	10	15	30	45
2	10	20	35	35
3	5	10	40	45

Source: Processed by Researchers, 2026

Based on Table 4.10, the softness test showed Formula I was the most comfortable to use (45% soft, 15% very soft). Formula II was predominantly rated as neutral and soft, while Formula III was rated more neutral. In general, increasing the concentration of bidara leaf infusion tended to decrease the perceived softness and comfort of use of the preparation.

Irritation Test

Table 9. Irritation Test

Replication	Time	Occurrence of Erythema			Occurrence of Edema		
		F1	F2	F3	F1	F2	F3
1	72 O'clock	–	–			–	–
2		–	–			–	–
3		–	–			–	–

Source: Processed by Researchers, 2026

Based on the irritation test results in this study, it was found that the deodorant spray preparations in formulas I, II, and III did not cause skin irritation in rabbits. The test results showed that application of the deodorant spray to the skin did not cause any irritating reactions, such as erythema or edema.

Deodorant Spray Storage Test

Storage testing was conducted on a selected formula that demonstrated the best physical performance. The formulation was stored at room temperature for 14 days, and retested on days 7 and 14. Stability evaluation was performed using the same parameters as the previous test to determine the extent of physical quality changes during storage.

Organoleptic Test Results

Table 10. Organoleptic Test Results

Observation Day	*Formula*	*Shape*	*Odor*	*Flavour*	*Color*
Day 7	I	Liquid	Fresh herbal flavor	Soft	Yellow
Day 14	I	Liquid	Fresh herbal flavor	Soft	Yellow

Source: Processed by Researchers, 2026

Description:
Formula I = 10% Concentration of Jujube Leaf Infusion

Organoleptic test results showed that the Formula I bidara leaf infusion-based deodorant spray maintained its liquid form, fresh herbal aroma, mild taste, and yellow color on days 7 and

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14 of storage. No changes in organoleptic characteristics were found during storage, thus the preparation was declared organoleptically stable.

Clarity Test Results

Table 11. Clarity Test Results

Observation Day	Formula I	Result
Day 7	Clear, few particles	(+)
Day 14	Clear, few particles	

Source: Processed by Researchers, 2026

Based on the clarity test results, the Formula I deodorant spray product showed a clear appearance with few particles on the 7th and 14th days of storage. This condition still meets the clarity requirements for liquid products, so the product was declared to have met the clarity test throughout the storage period.

Table 13. pH Test Results

Observation Day	Formula I	Result
Day 7	6	(+)
Day 14	6	(Arfiani, 2017)

Source: Processed by Researchers, 2026

The pH test results showed that Formula I deodorant spray had a pH value of 6 on days 7 and 14 of storage. This pH value is within the safe skin pH range for topical preparations, thus confirming the product's stability and non-irritating potential during storage.

Homogeneity Test

Table 13. Results of Homogeneity Test

Observation Day	Formula I	Result
Day 7	Still even, few particles visible	(+)
Day 14	Still even, few particles visible	

Source: Processed by Researchers, 2026

Based on the homogeneity test results, the Formula I deodorant spray remained uniform with few visible particles on days 7 and 14 of storage. This indicates that the product remained homogeneous and did not experience phase separation during storage.

Volume Test

Table 14. Volume Test Results

Observation Day	*Formula I*	*Result*
Day 7	28-29 mL	(+)
Day 14	28-29 mL	

Source: Processed by Researchers, 2026

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The volume stability of the preparation during storage indicates that the preparation has good physical stability, in line with the research of Rizka et al. (2021) on herbal deodorant spray preparations.

E. CONCLUSION

The results of physical properties and storage tests showed that the herbal deodorant spray preparation based on bidara leaf infusion had good physical stability during storage until the 14th day. All formulas showed relatively similar specific gravity and viscosity values and were still within the quality requirements for topical preparations. Based on the evaluation of physical characteristics, Formula I with a 10% infusion concentration provided the most optimal results and was close to the expected criteria. Analysis of quantitative parameters showed that there were no significant differences between formulas ($p>0.05$), so that all preparations could be declared physically stable. Therefore, herbal deodorant spray based on bidara leaf infusion has the potential to be developed as a stable topical preparation.

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http://jurnaldialektika.com/
Publisher: Perkumpulan Ilmuwan Administrasi Negara Indonesia
P-ISSN: 1412 –9736
E-ISSN: 2828-545X