

## LAMPIRAN

### Lampiran 1. Surat Keterangan Selesai Penelitian

Surat Keterangan Selesai Penelitian - Litta 'Ifina

13/03/25 12:19



**Program Studi Farmasi**  
**Fakultas Sains, Teknologi, dan Kesehatan**  
**Universitas Sahid Surakarta**  
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**SURAT KETERANGAN PENELITIAN**  
**003/FAR/FSTK/Usahid-Ska/III/2025**

Assalamualaikum Wr. Wb

Dengan surat ini Kami memberitahukan bahwa mahasiswa dibawah ini:

Nama : Litta 'Ifina  
NIM : 2020141017  
Program Studi : Farmasi  
Instansi : Universitas Sahid Surakarta

Telah melaksanakan penelitian di Laboratorium Farmasi Universitas Sahid Surakarta mulai tanggal 09 Desember sampai 23 Januari 2025 dengan judul penelitian "Penentuan Nilai Sun Protection Factor (SPF) Ekstrak Air dan Kloroform Daun Kelor (*Moringa oleifera* L.)".

Demikian surat keterangan ini dibuat untuk dipergunakan semestinya.  
Wassalamualaikum Wr. Wb.

Surakarta, 13 Maret 2025

Mengetahui

**Ketua Program Studi Farmasi**

**apt. Khotimatul Khusna, M.Sc.**  
**NIDN. 0605078703**

**Kepala Laboratorium Farmasi**

**Fadilah Qonitah, S.Pd., M.Sc.**  
**NIDN. 0612129002**

## Lampiran 2. Determinasi Tanaman



**LABORATORIUM PEMBELAJARAN BIOLOGI**  
**FAKULTAS SAINS DAN TEKNOLOGI TERAPAN**  
**UNIVERSITAS AHMAD DAHLAN**

Jl. Ringroad Selatan, Tamanan, Banguntapan, Bantul

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**SURAT KETERANGAN**

Nomor : 447/Lab.Bio/B/VIII/2024

Yang bertanda tangan di bawah ini Kepala Laboratorium Pembelajaran Biologi Universitas Ahmad Dahlan menerangkan bahwa :

Nama : Litta 'Ifina  
NIM : 2020141017  
Prodi, PT : Farmasi/ Fakultas Sains, Teknologi dan Kesehatan,  
Universitas Sahid Surakarta

Telah melakukan determinasi daun tanaman di Laboratorium Pembelajaran Biologi Universitas Ahmad Dahlan, pada tanggal 12 Agustus 2024

Tanaman tersebut adalah :  
*Moringa oleifera* Lam.

Demikian Surat Keterangan ini untuk dapat dipergunakan seperlunya.

Yogyakarta, 16 Agustus 2024

Kepala Lab. Pembelajaran Biologi



Ichsan Luqmana Indra Putra, S. Si., M.Sc.

1b – 2b – 3b – 4b – 12b – 13b – 14b – 17b – 18b – 19b – 20b – 21b – 22b – 23b – 24b – 25b  
– 26b – 27a – 28b – 29b – 30b – 21a – 32a – 33a – 34a – 35a – 36d – 37b – 38b – 39b – 41b –  
42b – 44b – 45b – 46a – 47a Moringaceae  
1 Moringa  
1 *Moringa oleifera* Lam.

Flora of Java (Backer, 1965)

### Lampiran 3. Persiapan Sampel

|                                                                                    |                                                                                    |                                                                                     |
|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|   |   |   |
| Daun Kelor                                                                         | Penimbangan Daun Kelor                                                             | Pengovenan Daun Kelor                                                               |
|  |  |  |
| Pencucian Daun Kelor                                                               | Pengeringan Daun Kelor                                                             | Daun Kelor kering                                                                   |

#### Lampiran 4. Pembuatan Ekstrak

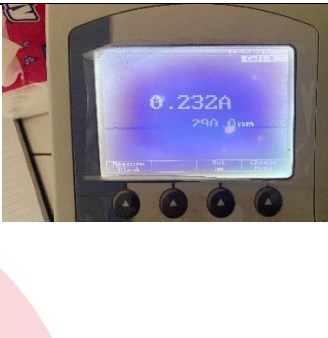
|                                                                                    |                                                                                    |                                                                                     |                                                                                      |
|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|   |   |   |   |
| Daun Kelor Kering                                                                  | Daun Keor dihaluskan                                                               | Serbuk Daun Kleor                                                                   | Pengayakan                                                                           |
|  |  |  |  |
| Infusa Daun Kelor                                                                  | Penyaringan                                                                        | Penguapan                                                                           | Hasil estrak kental                                                                  |

Tabel Pengamatan Berat Ekstrak dan Rendemen Ekstrak

| Sampel                                     | Berat Simplisia (g) | Berat Ekstrak (g) | %Rendemen |
|--------------------------------------------|---------------------|-------------------|-----------|
| Simplisia Daun Kelor (Moringa oleifera L.) | 165,00              | 58,00             | 35,15     |

$$\begin{aligned}
 \%Rendemen &= \frac{\text{berat ekstrak}}{\text{berat simplisia}} \times 100\% \\
 &= \frac{58 \text{ g}}{165 \text{ g}} \times 100\% \\
 &= 35,15\%
 \end{aligned}$$

Lampiran 5. Uji Spektrofotometer Uv-Vis

|                                                                                    |                                                                                     |                                                                                      |
|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|   |   |   |
| <p>Penimbangan Ekstrak</p>                                                         | <p>Larutan Blanko (R1,R2,R3)</p>                                                    | <p>Larutan Uji R1</p>                                                                |
|  |  |  |
| <p>Larutan Uji R2</p>                                                              | <p>Larutan Uji R3</p>                                                               | <p>Uji Spektrofotometer Uv-Vis (Absorbansi)</p>                                      |

Lampiran 6. Hasil Perhitungan Nilai SPF Ekstrak Air Daun Kelor (*Moringa oleifera* L.)

1. Perhitungan Nilai SPF Konsentrasi 50 ppm

a. Data Absorbansi Replikasi 1

| Panjang gelombang (nm) | (EE ( $\lambda$ ) x I ( $\lambda$ )) | Abs   | $\sum_{320}^{290} (EE(\lambda) \times I(\lambda) \times \text{Abs})$ | CF | SPF            |
|------------------------|--------------------------------------|-------|----------------------------------------------------------------------|----|----------------|
| 290                    | 0,015                                | 0,277 | 0,004155                                                             | 10 | <b>2,98942</b> |
| 295                    | 0,0817                               | 0,258 | 0,021079                                                             |    |                |
| 300                    | 0,02874                              | 0,217 | 0,006237                                                             |    |                |
| 305                    | 0,3278                               | 0,201 | 0,065888                                                             |    |                |
| 310                    | 0,1864                               | 0,199 | 0,037094                                                             |    |                |
| 315                    | 0,839                                | 0,192 | 0,161088                                                             |    |                |
| 320                    | 0,018                                | 0,189 | 0,003402                                                             |    |                |
| <b>Total</b>           |                                      |       | <b>0,298942</b>                                                      |    |                |

b. Data Absorbansi Replikasi 2

| Panjang gelombang (nm) | (EE ( $\lambda$ ) x I ( $\lambda$ )) | Abs   | $\sum_{320}^{290} (EE(\lambda) \times I(\lambda) \times \text{Abs})$ | CF | SPF            |
|------------------------|--------------------------------------|-------|----------------------------------------------------------------------|----|----------------|
| 290                    | 0,015                                | 0,229 | 0,003435                                                             | 10 | <b>2,53807</b> |
| 295                    | 0,0817                               | 0,218 | 0,017811                                                             |    |                |
| 300                    | 0,02874                              | 0,205 | 0,005892                                                             |    |                |
| 305                    | 0,3278                               | 0,189 | 0,061954                                                             |    |                |
| 310                    | 0,1864                               | 0,172 | 0,032061                                                             |    |                |
| 315                    | 0,839                                | 0,155 | 0,130045                                                             |    |                |
| 320                    | 0,018                                | 0,145 | 0,00261                                                              |    |                |
| <b>Total</b>           |                                      |       | <b>0,253807</b>                                                      |    |                |

c. Data Absorbansi Replikasi 3

| Panjang gelombang (nm) | (EE ( $\lambda$ ) x I ( $\lambda$ )) | Abs   | $\sum_{320}^{290} (EE(\lambda) \times I(\lambda) \times \text{Abs})$ | CF | SPF            |
|------------------------|--------------------------------------|-------|----------------------------------------------------------------------|----|----------------|
| 290                    | 0,015                                | 0,211 | 0,003165                                                             | 10 | <b>2,51364</b> |
| 295                    | 0,0817                               | 0,201 | 0,016422                                                             |    |                |
| 300                    | 0,02874                              | 0,198 | 0,005691                                                             |    |                |
| 305                    | 0,3278                               | 0,188 | 0,061626                                                             |    |                |
| 310                    | 0,1864                               | 0,167 | 0,031129                                                             |    |                |
| 315                    | 0,839                                | 0,156 | 0,130884                                                             |    |                |
| 320                    | 0,018                                | 0,136 | 0,002448                                                             |    |                |
| <b>Total</b>           |                                      |       | <b>0,251364</b>                                                      |    |                |

## 2. Perhitungan Nilai SPF Konsentrasi 100 ppm

### a. Data Absorbansi Replikasi 1

| Panjang gelombang (nm) | (EE ( $\lambda$ ) x I ( $\lambda$ )) | Abs   | $\sum_{320}^{290} \frac{(EE(\lambda) \times I(\lambda) \times \text{Abs})}{\text{Abs}}$ | CF | SPF            |
|------------------------|--------------------------------------|-------|-----------------------------------------------------------------------------------------|----|----------------|
| 290                    | 0,015                                | 0,388 | 0,00582                                                                                 | 10 | <b>3,05493</b> |
| 295                    | 0,0817                               | 0,312 | 0,02549                                                                                 |    |                |
| 300                    | 0,02874                              | 0,289 | 0,008306                                                                                |    |                |
| 305                    | 0,3278                               | 0,243 | 0,079655                                                                                |    |                |
| 310                    | 0,1864                               | 0,187 | 0,034857                                                                                |    |                |
| 315                    | 0,839                                | 0,177 | 0,148503                                                                                |    |                |
| 320                    | 0,018                                | 0,159 | 0,002862                                                                                |    |                |
| <b>Total</b>           |                                      |       | <b>0,305493</b>                                                                         |    |                |

### b. Data Absorbansi Replikasi 2

| Panjang gelombang (nm) | (EE ( $\lambda$ ) x I ( $\lambda$ )) | Abs   | $\sum_{320}^{290} \frac{(EE(\lambda) \times I(\lambda) \times \text{Abs})}{\text{Abs}}$ | CF | SPF            |
|------------------------|--------------------------------------|-------|-----------------------------------------------------------------------------------------|----|----------------|
| 290                    | 0,015                                | 0,401 | 0,006015                                                                                | 10 | <b>3,77169</b> |
| 295                    | 0,0817                               | 0,395 | 0,032272                                                                                |    |                |
| 300                    | 0,02874                              | 0,368 | 0,010576                                                                                |    |                |
| 305                    | 0,3278                               | 0,304 | 0,099651                                                                                |    |                |
| 310                    | 0,1864                               | 0,289 | 0,05387                                                                                 |    |                |
| 315                    | 0,839                                | 0,205 | 0,171995                                                                                |    |                |
| 320                    | 0,018                                | 0,155 | 0,00279                                                                                 |    |                |
| <b>Total</b>           |                                      |       | <b>0,377169</b>                                                                         |    |                |

### c. Data Absorbansi Replikasi 3

| Panjang gelombang (nm) | (EE ( $\lambda$ ) x I ( $\lambda$ )) | Abs   | $\sum_{320}^{290} \frac{(EE(\lambda) \times I(\lambda) \times \text{Abs})}{\text{Abs}}$ | CF | SPF            |
|------------------------|--------------------------------------|-------|-----------------------------------------------------------------------------------------|----|----------------|
| 290                    | 0,015                                | 0,357 | 0,005355                                                                                | 10 | <b>3,43526</b> |
| 295                    | 0,0817                               | 0,300 | 0,02451                                                                                 |    |                |
| 300                    | 0,02874                              | 0,296 | 0,008507                                                                                |    |                |
| 305                    | 0,3278                               | 0,277 | 0,090801                                                                                |    |                |
| 310                    | 0,1864                               | 0,245 | 0,045668                                                                                |    |                |
| 315                    | 0,839                                | 0,197 | 0,165283                                                                                |    |                |
| 320                    | 0,018                                | 0,189 | 0,003402                                                                                |    |                |
| <b>Total</b>           |                                      |       | <b>0,343526</b>                                                                         |    |                |

### 3. Perhitungan Nilai SPF Konsentrasi 150 ppm

#### a. Data Absorbansi Replikasi 1

| Panjang gelombang (nm) | (EE (λ) x I (λ)) | Abs   | $\sum_{320}^{290} (EE(\lambda) \times I(\lambda) \times Abs)$ | CF | SPF            |
|------------------------|------------------|-------|---------------------------------------------------------------|----|----------------|
| 290                    | 0,015            | 0,455 | 0,006825                                                      | 10 | <b>4,34269</b> |
| 295                    | 0,0817           | 0,407 | 0,033252                                                      |    |                |
| 300                    | 0,02874          | 0,367 | 0,010548                                                      |    |                |
| 305                    | 0,3278           | 0,311 | 0,101946                                                      |    |                |
| 310                    | 0,1864           | 0,289 | 0,05387                                                       |    |                |
| 315                    | 0,839            | 0,267 | 0,224013                                                      |    |                |
| 320                    | 0,018            | 0,212 | 0,003816                                                      |    |                |
| <b>Total</b>           |                  |       | <b>0,434269</b>                                               |    |                |

#### b. Data Absorbansi Replikasi 2

| Panjang gelombang (nm) | (EE (λ) x I (λ)) | Abs   | $\sum_{320}^{290} (EE(\lambda) \times I(\lambda) \times Abs)$ | CF | SPF            |
|------------------------|------------------|-------|---------------------------------------------------------------|----|----------------|
| 290                    | 0,015            | 0,512 | 0,00768                                                       | 10 | <b>4,34033</b> |
| 295                    | 0,0817           | 0,397 | 0,032435                                                      |    |                |
| 300                    | 0,02874          | 0,365 | 0,01049                                                       |    |                |
| 305                    | 0,3278           | 0,311 | 0,101946                                                      |    |                |
| 310                    | 0,1864           | 0,289 | 0,05387                                                       |    |                |
| 315                    | 0,839            | 0,267 | 0,224013                                                      |    |                |
| 320                    | 0,018            | 0,200 | 0,0036                                                        |    |                |
| <b>Total</b>           |                  |       | <b>0,434033</b>                                               |    |                |

#### c. Data Absorbansi Replikasi 3

| Panjang gelombang (nm) | (EE (λ) x I (λ)) | Abs   | $\sum_{320}^{290} (EE(\lambda) \times I(\lambda) \times Abs)$ | CF | SPF            |
|------------------------|------------------|-------|---------------------------------------------------------------|----|----------------|
| 290                    | 0,015            | 0,467 | 0,007005                                                      | 10 | <b>4,45821</b> |
| 295                    | 0,0817           | 0,432 | 0,035294                                                      |    |                |
| 300                    | 0,02874          | 0,387 | 0,011122                                                      |    |                |
| 305                    | 0,3278           | 0,354 | 0,116041                                                      |    |                |
| 310                    | 0,1864           | 0,298 | 0,055547                                                      |    |                |
| 315                    | 0,839            | 0,259 | 0,217301                                                      |    |                |
| 320                    | 0,018            | 0,195 | 0,00351                                                       |    |                |
| <b>Total</b>           |                  |       | <b>0,445821</b>                                               |    |                |

#### 4. Perhitungan Nilai SPF Konsentrasi 200 ppm

##### a. Data Absorbansi Replikasi 1

| Panjang gelombang (nm) | (EE ( $\lambda$ ) x I ( $\lambda$ )) | Abs   | $\sum_{320}^{290} (EE(\lambda) \times I(\lambda) \times \text{Abs})$ | CF | SPF            |
|------------------------|--------------------------------------|-------|----------------------------------------------------------------------|----|----------------|
| 290                    | 0,015                                | 0,577 | 0,008655                                                             | 10 | <b>5,02506</b> |
| 295                    | 0,0817                               | 0,457 | 0,037337                                                             |    |                |
| 300                    | 0,02874                              | 0,402 | 0,011553                                                             |    |                |
| 305                    | 0,3278                               | 0,396 | 0,129809                                                             |    |                |
| 310                    | 0,1864                               | 0,356 | 0,066358                                                             |    |                |
| 315                    | 0,839                                | 0,291 | 0,244149                                                             |    |                |
| 320                    | 0,018                                | 0,258 | 0,004644                                                             |    |                |
| <b>Total</b>           |                                      |       | <b>0,502506</b>                                                      |    |                |

##### b. Data Absorbansi Replikasi 2

| Panjang gelombang (nm) | (EE ( $\lambda$ ) x I ( $\lambda$ )) | Abs   | $\sum_{320}^{290} (EE(\lambda) \times I(\lambda) \times \text{Abs})$ | CF | SPF            |
|------------------------|--------------------------------------|-------|----------------------------------------------------------------------|----|----------------|
| 290                    | 0,015                                | 0,544 | 0,00816                                                              | 10 | <b>5,03127</b> |
| 295                    | 0,0817                               | 0,496 | 0,040523                                                             |    |                |
| 300                    | 0,02874                              | 0,485 | 0,013939                                                             |    |                |
| 305                    | 0,3278                               | 0,407 | 0,133415                                                             |    |                |
| 310                    | 0,1864                               | 0,376 | 0,070086                                                             |    |                |
| 315                    | 0,839                                | 0,278 | 0,233242                                                             |    |                |
| 320                    | 0,018                                | 0,209 | 0,003762                                                             |    |                |
| <b>Total</b>           |                                      |       | <b>0,503127</b>                                                      |    |                |

##### c. Data Absorbansi Replikasi 3

| Panjang gelombang (nm) | (EE ( $\lambda$ ) x I ( $\lambda$ )) | Abs   | $\sum_{320}^{290} (EE(\lambda) \times I(\lambda) \times \text{Abs})$ | CF | SPF            |
|------------------------|--------------------------------------|-------|----------------------------------------------------------------------|----|----------------|
| 290                    | 0,015                                | 0,567 | 0,008505                                                             | 10 | <b>6,06328</b> |
| 295                    | 0,0817                               | 0,502 | 0,041013                                                             |    |                |
| 300                    | 0,02874                              | 0,489 | 0,014054                                                             |    |                |
| 305                    | 0,3278                               | 0,443 | 0,145215                                                             |    |                |
| 310                    | 0,1864                               | 0,401 | 0,074746                                                             |    |                |
| 315                    | 0,839                                | 0,378 | 0,317142                                                             |    |                |
| 320                    | 0,018                                | 0,314 | 0,005652                                                             |    |                |
| <b>Total</b>           |                                      |       | <b>0,606328</b>                                                      |    |                |

5. Perhitungan Nilai SPF Konsentrasi 250 ppm

a. Data Absorbansi Replikasi 1

| Panjang gelombang (nm) | (EE ( $\lambda$ ) x I ( $\lambda$ )) | Abs   | $\sum_{320}^{290} (EE(\lambda) \times I(\lambda) \times \text{Abs})$ | CF | SPF            |
|------------------------|--------------------------------------|-------|----------------------------------------------------------------------|----|----------------|
| 290                    | 0,015                                | 0,765 | 0,011475                                                             | 10 | <b>7,98803</b> |
| 295                    | 0,0817                               | 0,700 | 0,05719                                                              |    |                |
| 300                    | 0,02874                              | 0,678 | 0,019486                                                             |    |                |
| 305                    | 0,3278                               | 0,599 | 0,196352                                                             |    |                |
| 310                    | 0,1864                               | 0,513 | 0,095623                                                             |    |                |
| 315                    | 0,839                                | 0,489 | 0,410271                                                             |    |                |
| 320                    | 0,018                                | 0,467 | 0,008406                                                             |    |                |
| <b>Total</b>           |                                      |       | <b>0,798803</b>                                                      |    |                |

b. Data Absorbansi Replikasi 2

| Panjang gelombang (nm) | (EE ( $\lambda$ ) x I ( $\lambda$ )) | Abs   | $\sum_{320}^{290} (EE(\lambda) \times I(\lambda) \times \text{Abs})$ | CF | SPF           |
|------------------------|--------------------------------------|-------|----------------------------------------------------------------------|----|---------------|
| 290                    | 0,015                                | 0,172 | 0,01068                                                              | 10 | <b>8,0406</b> |
| 295                    | 0,0817                               | 0,689 | 0,05629                                                              |    |               |
| 300                    | 0,02874                              | 0,612 | 0,01759                                                              |    |               |
| 305                    | 0,3278                               | 0,599 | 0,19635                                                              |    |               |
| 310                    | 0,1864                               | 0,525 | 0,09786                                                              |    |               |
| 315                    | 0,839                                | 0,498 | 0,41782                                                              |    |               |
| 320                    | 0,018                                | 0,415 | 0,00747                                                              |    |               |
| <b>Total</b>           |                                      |       | <b>0,80406</b>                                                       |    |               |

c. Data Absorbansi Replikasi 3

| Panjang gelombang (nm) | (EE ( $\lambda$ ) x I ( $\lambda$ )) | Abs   | $\sum_{320}^{290} (EE(\lambda) \times I(\lambda) \times \text{Abs})$ | CF | SPF           |
|------------------------|--------------------------------------|-------|----------------------------------------------------------------------|----|---------------|
| 290                    | 0,015                                | 0,720 | 0,0108                                                               | 10 | <b>7,8836</b> |
| 295                    | 0,0817                               | 0,683 | 0,0558                                                               |    |               |
| 300                    | 0,02874                              | 0,602 | 0,0173                                                               |    |               |
| 305                    | 0,3278                               | 0,576 | 0,18881                                                              |    |               |
| 310                    | 0,1864                               | 0,521 | 0,09711                                                              |    |               |
| 315                    | 0,839                                | 0,489 | 0,41027                                                              |    |               |
| 320                    | 0,018                                | 0,459 | 0,00826                                                              |    |               |
| <b>Total</b>           |                                      |       | <b>0,78836</b>                                                       |    |               |

Lampiran 6. Hasil Perhitungan Nilai SPF Ekstrak Koroform Daun Kelor (*Moringa oleifera* L.)

1. Perhitungan Nilai SPF Konsentrasi 50 ppm

a. Data Absorbansi Replikasi 1

| Panjang gelombang (nm) | (EE ( $\lambda$ ) x I ( $\lambda$ )) | Abs   | $\sum_{320}^{290} (EE(\lambda) \times I(\lambda) \times Abs$ | CF | SPF              |
|------------------------|--------------------------------------|-------|--------------------------------------------------------------|----|------------------|
| 290                    | 0,015                                | 0,211 | 0,003165                                                     | 10 | <b>2,4782958</b> |
| 295                    | 0,0817                               | 0,207 | 0,0169119                                                    |    |                  |
| 300                    | 0,02874                              | 0,192 | 0,00551808                                                   |    |                  |
| 305                    | 0,3278                               | 0,191 | 0,0626098                                                    |    |                  |
| 310                    | 0,1864                               | 0,167 | 0,0311288                                                    |    |                  |
| 315                    | 0,839                                | 0,150 | 0,12585                                                      |    |                  |
| 320                    | 0,018                                | 0,147 | 0,002646                                                     |    |                  |
| <b>Total</b>           |                                      |       | <b>0,24782958</b>                                            |    |                  |

b. Data Absorbansi Replikasi 2

| Panjang gelombang (nm) | (EE ( $\lambda$ ) x I ( $\lambda$ )) | Abs   | $\sum_{320}^{290} (EE(\lambda) \times I(\lambda) \times Abs$ | CF | SPF              |
|------------------------|--------------------------------------|-------|--------------------------------------------------------------|----|------------------|
| 290                    | 0,015                                | 0,230 | 0,00345                                                      | 10 | <b>2,3098262</b> |
| 295                    | 0,0817                               | 0,200 | 0,01634                                                      |    |                  |
| 300                    | 0,02874                              | 0,183 | 0,00525942                                                   |    |                  |
| 305                    | 0,3278                               | 0,166 | 0,0544148                                                    |    |                  |
| 310                    | 0,1864                               | 0,151 | 0,0281464                                                    |    |                  |
| 315                    | 0,839                                | 0,144 | 0,120816                                                     |    |                  |
| 320                    | 0,018                                | 0,142 | 0,002556                                                     |    |                  |
| <b>Total</b>           |                                      |       | <b>0,23098262</b>                                            |    |                  |

c. Data Absorbansi Replikasi 3

| Panjang gelombang (nm) | (EE ( $\lambda$ ) x I ( $\lambda$ )) | Abs   | $\sum_{320}^{290} (EE(\lambda) \times I(\lambda) \times Abs$ | CF | SPF             |
|------------------------|--------------------------------------|-------|--------------------------------------------------------------|----|-----------------|
| 290                    | 0,015                                | 0,215 | 0,003225                                                     | 10 | <b>2,070698</b> |
| 295                    | 0,0817                               | 0,158 | 0,0129086                                                    |    |                 |
| 300                    | 0,02874                              | 0,140 | 0,0040236                                                    |    |                 |
| 305                    | 0,3278                               | 0,113 | 0,0370414                                                    |    |                 |
| 310                    | 0,1864                               | 0,153 | 0,0285192                                                    |    |                 |
| 315                    | 0,839                                | 0,142 | 0,119138                                                     |    |                 |
| 320                    | 0,018                                | 0,123 | 0,002214                                                     |    |                 |
| <b>Total</b>           |                                      |       | <b>0,2070698</b>                                             |    |                 |

2. Perhitungan Nilai SPF Konsentrasi 100 ppm

a. Data Absorbansi Replikasi 1

| Panjang gelombang (nm) | (EE ( $\lambda$ ) x I ( $\lambda$ )) | Abs   | $\sum_{320}^{290} (EE(\lambda) \times I(\lambda) \times \text{Abs})$ | CF | SPF             |
|------------------------|--------------------------------------|-------|----------------------------------------------------------------------|----|-----------------|
| 290                    | 0,015                                | 0,350 | 0,00525                                                              | 10 | <b>2,033911</b> |
| 295                    | 0,0817                               | 0,291 | 0,0237747                                                            |    |                 |
| 300                    | 0,02874                              | 0,200 | 0,005748                                                             |    |                 |
| 305                    | 0,3278                               | 0,192 | 0,0629376                                                            |    |                 |
| 310                    | 0,1864                               | 0,107 | 0,0199448                                                            |    |                 |
| 315                    | 0,839                                | 0,100 | 0,0839                                                               |    |                 |
| 320                    | 0,018                                | 0,102 | 0,001836                                                             |    |                 |
| <b>Total</b>           |                                      |       | <b>0,2033911</b>                                                     |    |                 |

b. Data Absorbansi Replikasi 2

| Panjang gelombang (nm) | (EE ( $\lambda$ ) x I ( $\lambda$ )) | Abs   | $\sum_{320}^{290} (EE(\lambda) \times I(\lambda) \times \text{Abs})$ | CF | SPF              |
|------------------------|--------------------------------------|-------|----------------------------------------------------------------------|----|------------------|
| 290                    | 0,015                                | 0,301 | 0,004515                                                             | 10 | <b>3,4258074</b> |
| 295                    | 0,0817                               | 0,300 | 0,02451                                                              |    |                  |
| 300                    | 0,02874                              | 0,271 | 0,00778854                                                           |    |                  |
| 305                    | 0,3278                               | 0,262 | 0,0858836                                                            |    |                  |
| 310                    | 0,1864                               | 0,254 | 0,0473456                                                            |    |                  |
| 315                    | 0,839                                | 0,202 | 0,169478                                                             |    |                  |
| 320                    | 0,018                                | 0,170 | 0,00306                                                              |    |                  |
| <b>Total</b>           |                                      |       | <b>0,34258074</b>                                                    |    |                  |

c. Data Absorbansi Replikasi 3

| Panjang gelombang (nm) | (EE ( $\lambda$ ) x I ( $\lambda$ )) | Abs   | $\sum_{320}^{290} (EE(\lambda) \times I(\lambda) \times \text{Abs})$ | CF | SPF             |
|------------------------|--------------------------------------|-------|----------------------------------------------------------------------|----|-----------------|
| 290                    | 0,015                                | 0,341 | 0,005115                                                             | 10 | <b>3,635611</b> |
| 295                    | 0,0817                               | 0,150 | 0,012255                                                             |    |                 |
| 300                    | 0,02874                              | 0,125 | 0,0035925                                                            |    |                 |
| 305                    | 0,3278                               | 0,239 | 0,0783442                                                            |    |                 |
| 310                    | 0,1864                               | 0,231 | 0,0430584                                                            |    |                 |
| 315                    | 0,839                                | 0,258 | 0,216462                                                             |    |                 |
| 320                    | 0,018                                | 0,263 | 0,004734                                                             |    |                 |
| <b>Total</b>           |                                      |       | <b>0,3635611</b>                                                     |    |                 |

3. Perhitungan Nilai SPF Konsentrasi 150 ppm

a. Data Absorbansi Replikasi 1

| Panjang gelombang (nm) | (EE (λ) x I (λ)) | Abs   | $\sum_{320}^{290} (EE(\lambda) \times I(\lambda) \times Abs)$ | CF | SPF              |
|------------------------|------------------|-------|---------------------------------------------------------------|----|------------------|
| 290                    | 0,015            | 0,331 | 0,004965                                                      | 10 | <b>3,8260528</b> |
| 295                    | 0,0817           | 0,300 | 0,02451                                                       |    |                  |
| 300                    | 0,02874          | 0,282 | 0,00810468                                                    |    |                  |
| 305                    | 0,3278           | 0,261 | 0,0855558                                                     |    |                  |
| 310                    | 0,1864           | 0,247 | 0,0460408                                                     |    |                  |
| 315                    | 0,839            | 0,249 | 0,208911                                                      |    |                  |
| 320                    | 0,018            | 0,251 | 0,004518                                                      |    |                  |
| <b>Total</b>           |                  |       | <b>0,38260528</b>                                             |    |                  |

b. Data Absorbansi Replikasi 2

| Panjang gelombang (nm) | (EE (λ) x I (λ)) | Abs   | $\sum_{320}^{290} (EE(\lambda) \times I(\lambda) \times Abs)$ | CF | SPF             |
|------------------------|------------------|-------|---------------------------------------------------------------|----|-----------------|
| 290                    | 0,015            | 0,320 | 0,0048                                                        | 10 | <b>3,997805</b> |
| 295                    | 0,0817           | 0,311 | 0,0254087                                                     |    |                 |
| 300                    | 0,02874          | 0,300 | 0,008622                                                      |    |                 |
| 305                    | 0,3278           | 0,291 | 0,0953898                                                     |    |                 |
| 310                    | 0,1864           | 0,280 | 0,052192                                                      |    |                 |
| 315                    | 0,839            | 0,250 | 0,20975                                                       |    |                 |
| 320                    | 0,018            | 0,201 | 0,003618                                                      |    |                 |
| <b>Total</b>           |                  |       | <b>0,3997805</b>                                              |    |                 |

c. Data Absorbansi Replikasi 3

| Panjang gelombang (nm) | (EE (λ) x I (λ)) | Abs   | $\sum_{320}^{290} (EE(\lambda) \times I(\lambda) \times Abs)$ | CF | SPF              |
|------------------------|------------------|-------|---------------------------------------------------------------|----|------------------|
| 290                    | 0,015            | 0,380 | 0,057                                                         | 10 | <b>3,8899878</b> |
| 295                    | 0,0817           | 0,351 | 0,0286767                                                     |    |                  |
| 300                    | 0,02874          | 0,302 | 0,00867948                                                    |    |                  |
| 305                    | 0,3278           | 0,251 | 0,0822778                                                     |    |                  |
| 310                    | 0,1864           | 0,202 | 0,0376528                                                     |    |                  |
| 315                    | 0,839            | 0,200 | 0,1678                                                        |    |                  |
| 320                    | 0,018            | 0,192 | 0,003456                                                      |    |                  |
| <b>Total</b>           |                  |       | <b>0,38899878</b>                                             |    |                  |

4. Perhitungan Nilai SPF Konsentrasi 200 ppm

a. Data Absorbansi Replikasi 1

| Panjang gelombang (nm) | (EE (λ) x I (λ)) | Abs   | $\sum_{320}^{290} \frac{(EE(\lambda) \times I(\lambda) \times \text{Abs})}{\text{Abs}}$ | CF | SPF             |
|------------------------|------------------|-------|-----------------------------------------------------------------------------------------|----|-----------------|
| 290                    | 0,015            | 0,551 | 0,008265                                                                                | 10 | <b>6,879557</b> |
| 295                    | 0,0817           | 0,493 | 0,0402781                                                                               |    |                 |
| 300                    | 0,02874          | 0,470 | 0,0135078                                                                               |    |                 |
| 305                    | 0,3278           | 0,455 | 0,149149                                                                                |    |                 |
| 310                    | 0,1864           | 0,447 | 0,0833208                                                                               |    |                 |
| 315                    | 0,839            | 0,459 | 0,385101                                                                                |    |                 |
| 320                    | 0,018            | 0,463 | 0,008334                                                                                |    |                 |
| <b>Total</b>           |                  |       | <b>0,6879557</b>                                                                        |    |                 |

b. Data Absorbansi Replikasi 2

| Panjang gelombang (nm) | (EE (λ) x I (λ)) | Abs   | $\sum_{320}^{290} \frac{(EE(\lambda) \times I(\lambda) \times \text{Abs})}{\text{Abs}}$ | CF | SPF             |
|------------------------|------------------|-------|-----------------------------------------------------------------------------------------|----|-----------------|
| 290                    | 0,015            | 0,636 | 0,00954                                                                                 | 10 | <b>7,874662</b> |
| 295                    | 0,0817           | 0,588 | 0,0480396                                                                               |    |                 |
| 300                    | 0,02874          | 0,560 | 0,0160944                                                                               |    |                 |
| 305                    | 0,3278           | 0,538 | 0,1763564                                                                               |    |                 |
| 310                    | 0,1864           | 0,517 | 0,0963688                                                                               |    |                 |
| 315                    | 0,839            | 0,515 | 0,432085                                                                                |    |                 |
| 320                    | 0,018            | 0,499 | 0,008982                                                                                |    |                 |
| <b>Total</b>           |                  |       | <b>0,7874662</b>                                                                        |    |                 |

c. Data Absorbansi Replikasi 3

| Panjang gelombang (nm) | (EE (λ) x I (λ)) | Abs   | $\sum_{320}^{290} \frac{(EE(\lambda) \times I(\lambda) \times \text{Abs})}{\text{Abs}}$ | CF | SPF              |
|------------------------|------------------|-------|-----------------------------------------------------------------------------------------|----|------------------|
| 290                    | 0,015            | 0,640 | 0,0096                                                                                  | 10 | <b>8,0972304</b> |
| 295                    | 0,0817           | 0,570 | 0,046569                                                                                |    |                  |
| 300                    | 0,02874          | 0,536 | 0,01540464                                                                              |    |                  |
| 305                    | 0,3278           | 0,514 | 0,1684892                                                                               |    |                  |
| 310                    | 0,1864           | 0,508 | 0,0946912                                                                               |    |                  |
| 315                    | 0,839            | 0,555 | 0,465645                                                                                |    |                  |
| 320                    | 0,018            | 0,518 | 0,009324                                                                                |    |                  |
| <b>Total</b>           |                  |       | <b>0,80972304</b>                                                                       |    |                  |

5. Perhitungan Nilai SPF Konsentrasi 250 ppm

a. Data Absorbansi Replikasi 1

| Panjang gelombang (nm) | (EE (λ) x I (λ)) | Abs   | $\sum_{320}^{290} (EE(\lambda) \times I(\lambda) \times Abs)$ | CF | SPF      |
|------------------------|------------------|-------|---------------------------------------------------------------|----|----------|
| 290                    | 0,015            | 0,717 | 0,010755                                                      | 10 | 7,880352 |
| 295                    | 0,0817           | 0,581 | 0,0474677                                                     |    |          |
| 300                    | 0,02874          | 0,545 | 0,0156633                                                     |    |          |
| 305                    | 0,3278           | 0,525 | 0,172095                                                      |    |          |
| 310                    | 0,1864           | 0,523 | 0,0974872                                                     |    |          |
| 315                    | 0,839            | 0,519 | 0,435441                                                      |    |          |
| 320                    | 0,018            | 0,507 | 0,009126                                                      |    |          |
| <b>Total</b>           |                  |       | <b>0,7880352</b>                                              |    |          |

b. Data Absorbansi Replikasi 2

| Panjang gelombang (nm) | (EE (λ) x I (λ)) | Abs   | $\sum_{320}^{290} (EE(\lambda) \times I(\lambda) \times Abs)$ | CF | SPF       |
|------------------------|------------------|-------|---------------------------------------------------------------|----|-----------|
| 290                    | 0,015            | 0,775 | 0,011625                                                      | 10 | 7,4489836 |
| 295                    | 0,0817           | 0,615 | 0,0502455                                                     |    |           |
| 300                    | 0,02874          | 0,689 | 0,01980186                                                    |    |           |
| 305                    | 0,3278           | 0,572 | 0,1875016                                                     |    |           |
| 310                    | 0,1864           | 0,466 | 0,0868624                                                     |    |           |
| 315                    | 0,839            | 0,454 | 0,380906                                                      |    |           |
| 320                    | 0,018            | 0,442 | 0,007956                                                      |    |           |
| <b>Total</b>           |                  |       | <b>0,74489836</b>                                             |    |           |

c. Data Absorbansi Replikasi 3

| Panjang gelombang (nm) | (EE (λ) x I (λ)) | Abs   | $\sum_{320}^{290} (EE(\lambda) \times I(\lambda) \times Abs)$ | CF | SPF       |
|------------------------|------------------|-------|---------------------------------------------------------------|----|-----------|
| 290                    | 0,015            | 0,712 | 0,01068                                                       | 10 | 10,854927 |
| 295                    | 0,0817           | 0,663 | 0,0541671                                                     |    |           |
| 300                    | 0,02874          | 0,640 | 0,183936                                                      |    |           |
| 305                    | 0,3278           | 0,619 | 0,2029082                                                     |    |           |
| 310                    | 0,1864           | 0,611 | 0,1138904                                                     |    |           |
| 315                    | 0,839            | 0,607 | 0,509273                                                      |    |           |
| 320                    | 0,018            | 0,591 | 0,010638                                                      |    |           |
| <b>Total</b>           |                  |       | <b>1,0854927</b>                                              |    |           |