

# LAMPIRAN

**Lampiran 1.** Prosedur Pengujian Kadar Kurkuminoid metode HPLC (*High Performance Liquid Chromatography*)

1.1 Penetapan kadar:

a. Fase gerak:

Buat campuran metanol : 0,01 M *phosphoric acid* ; 80:20

b. Larutan baku:

i. Timbang 25 mg *working standard curcuminoid*, masukkan ke dalam labu ukur 20 ml.

ii. Larutkan dan encerkan dengan fase gerak hingga tanda batas.

c. Larutan uji:

i. Timbang 25 mg sampel kunyit, masukkan ke dalam labu ukur 20 ml.

ii. Larutkan dan encerkan dengan fase gerak hingga tanda batas.

d. Sistem kromatografi:

i. Detektor : UV 428 nm

ii. Kolom : L1 Pendek atau C18 2,6 x 3,0 mm x 3  $\mu$ m

iii. *Flow rate* : 800  $\mu$ l/menit

iv. Suhu kolom : 40°C

v. Volume injek : 20  $\mu$ l

vi. SBR :  $\leq 2,00\%$

vii. Zat yang di analisis :

1. Kurkumin ( $C_{21}H_{20}O_6$ )

2. Desmethoxycurcumin ( $C_{20}H_{18}O_5$ )

3. Bisdsmethoxycurcumin ( $C_{19}H_{16}O_4$ )

e. Pengukuran:

Suntikkan secara terpisah sejumlah volume sama 20  $\mu$ l Larutan baku dan Larutan uji ke dalam kromatograf, rekam kromatogram dan ukur respons puncak utama.

f. Perhitungan kadar *curcuminoid* dalam sampel

$$\% = \frac{Lu}{Ls} \times \frac{Cs}{Cu} \times 100$$

Dimana :

*Lu* : Luas area larutan uji

*Ls* : Luas area larutan baku

*Cs* : Konsentrasi Larutan standar (mg/ml)

*Cu* : Konsentrasi Larutan uji (mg/ml)

## **Lampiran 2.** Prosedur Penetapan Kadar Air Metode Gravimetri

### Metode Pengovenan (Gravimetri)

Timbang sejumlah sampel dan masukkan ke dalam oven untuk suhu dan waktu tertentu (misal: 3 jam pada suhu 105°C) sampai didapatkan massa pengeringan sampel atau massa sampel telah mencapai massa konstan. Energi termal yang digunakan untuk menguapkan air diterapkan langsung ke sampel melalui rak dan udara yang mengelilinginya. (AOAC, 1999)

Prosedur pengerjaan :

1. Timbang botol atau cawan porselen kosong yang sudah dikeringkan sebelumnya, atau jika belum dikeringkan oven botol atau cawan porselen kosong tersebut selama 15 menit, hal ini berfungsi untuk menghilangkan kandungan air yang ada pada botol atau cawan porselen. Kemudian, masukkan dalam desikator selama 5 menit untuk menjaga kelembaban (RH).
2. Selanjutnya botol atau cawan porselen ditimbang sebagai (a) gram untuk mengetahui berat awal botol. Setelah sebelumnya telah didapat massa konstan terhadap botol atau cawan porselen kosong tersebut.
3. Kemudian, timbang 4 gram sampel untuk analisa. Lakukan penimbangan sebagai (b) gram untuk mengetahui berat botol atau cawan porselen dan bahan.
4. Kemudian dilakukan pengovenan selama 2 jam pada suhu 105°C, hal ini bertujuan untuk mengetahui perubahan kadar air pada bahan.
5. Selanjutnya masukkan dalam desikator selama 5 menit untuk pendinginan dan menstabilkan kelembaban (RH).
6. Kemudian, lakukan penimbangan dengan dua kali penimbangan sampai berat bahan konstan.

**Lampiran 3.** Hasil pengujian Kadar Kurkuminoid (kurkumin, desmetoksikurkumin dan bisdesmetoksikurkumin)

**3.1 Kurkumin**

| Sampel             | Luas Area       |                 | Berat       |              | Konsentrasi standar | Kadar       |
|--------------------|-----------------|-----------------|-------------|--------------|---------------------|-------------|
|                    | Standar         | Sampel          | Standar     | Sampel       |                     |             |
| a1b1               | 88.56072        | 15.7694         | 20.1        | 20           | 19.57               | 3.50        |
|                    | 88.56072        | 15.67798        | 20.1        | 20           | 19.57               | 3.48        |
|                    | 88.56072        | 15.79054        | 20.1        | 20           | 19.57               | 3.51        |
| <b>Rata - rata</b> | <b>88.56072</b> | <b>15.74597</b> | <b>20.1</b> | <b>20</b>    | <b>19.57</b>        | <b>3.50</b> |
| a1b2               | 88.56072        | 19.56486        | 20.1        | 20.18        | 19.57               | 4.31        |
|                    | 88.56072        | 19.77258        | 20.1        | 20.18        | 19.57               | 4.35        |
|                    | 88.56072        | 19.67268        | 20.1        | 20.18        | 19.57               | 4.33        |
| <b>Rata - rata</b> | <b>88.56072</b> | <b>19.67004</b> | <b>20.1</b> | <b>20.18</b> | <b>19.57</b>        | <b>4.33</b> |
| a1b3 (RESIDU)      | 88.56072        | 28.24588        | 20.1        | 20.02        | 19.57               | 6.27        |
|                    | 88.56072        | 27.68024        | 20.1        | 20.02        | 19.57               | 6.14        |
|                    | 88.56072        | 27.92167        | 20.1        | 20.02        | 19.57               | 6.19        |
| <b>Rata - rata</b> | <b>88.56072</b> | <b>27.96306</b> | <b>20.1</b> | <b>20.02</b> | <b>19.57</b>        | <b>6.20</b> |
| a1b3 (FILTRAT)     | 88.56072        | 4.53645         | 20.1        | 21.08        | 19.57               | 0.96        |
|                    | 88.56072        | 4.40123         | 20.1        | 21.08        | 19.57               | 0.93        |
|                    | 88.56072        | 4.44174         | 20.1        | 21.08        | 19.57               | 0.94        |
| <b>Rata - rata</b> | <b>88.56072</b> | <b>4.459807</b> | <b>20.1</b> | <b>21.08</b> | <b>19.57</b>        | <b>0.94</b> |
| a2b1               | 88.56072        | 14.20465        | 20.1        | 20.19        | 19.57               | 3.12        |
|                    | 88.56072        | 14.16239        | 20.1        | 20.19        | 19.57               | 3.12        |
|                    | 88.56072        | 14.30269        | 20.1        | 20.19        | 19.57               | 3.15        |
| <b>Rata - rata</b> | <b>88.56072</b> | <b>14.22324</b> | <b>20.1</b> | <b>20.19</b> | <b>19.57</b>        | <b>3.13</b> |
| a2b2               | 88.56072        | 14.787          | 20.1        | 20.17        | 19.57               | 3.26        |
|                    | 88.56072        | 14.64016        | 20.1        | 20.17        | 19.57               | 3.22        |
|                    | 88.56072        | 14.75047        | 20.1        | 20.17        | 19.57               | 3.25        |
| <b>Rata - rata</b> | <b>88.56072</b> | <b>14.72588</b> | <b>20.1</b> | <b>20.17</b> | <b>19.57</b>        | <b>3.24</b> |
| a2b3 (RESIDU)      | 88.56072        | 18.85354        | 20.1        | 20.04        | 19.57               | 4.18        |
|                    | 88.56072        | 18.70291        | 20.1        | 20.04        | 19.57               | 4.15        |
|                    | 88.56072        | 18.84332        | 20.1        | 20.04        | 19.57               | 4.18        |
| <b>Rata - rata</b> | <b>88.56072</b> | <b>18.79992</b> | <b>20.1</b> | <b>20.04</b> | <b>19.57</b>        | <b>4.17</b> |
| a2b3 (FILTRAT)     | 88.56072        | 6.86018         | 20.1        | 25.48        | 19.57               | 1.20        |
|                    | 88.56072        | 6.84518         | 20.1        | 25.48        | 19.57               | 1.19        |
|                    | 88.56072        | 6.85962         | 20.1        | 25.48        | 19.57               | 1.20        |
| <b>Rata - rata</b> | <b>88.56072</b> | <b>6.854993</b> | <b>20.1</b> | <b>25.48</b> | <b>19.57</b>        | <b>1.19</b> |

**Keterangan: ulangan ke 1**

| Sampel             | Luas Area       |                 | Berat       |              | Konsentrasi standar | Kadar       |
|--------------------|-----------------|-----------------|-------------|--------------|---------------------|-------------|
|                    | Standar         | Sampel          | Standar     | Sampel       |                     |             |
| a1b1               | 87.01214        | 15.61534        | 20.1        | 20.01        | 19.57               | 3.53        |
|                    | 87.01214        | 15.37553        | 20.1        | 20.01        | 19.57               | 3.47        |
|                    | 87.01214        | 15.69348        | 20.1        | 20.01        | 19.57               | 3.55        |
| <b>Rata - rata</b> | <b>87.01214</b> | <b>15.56145</b> | <b>20.1</b> | <b>20.01</b> | <b>19.57</b>        | <b>3.52</b> |
| a1b2               | 87.01214        | 19.30342        | 20.1        | 20.14        | 19.57               | 4.33        |
|                    | 87.01214        | 19.51671        | 20.1        | 20.14        | 19.57               | 4.38        |
|                    | 87.01214        | 19.41523        | 20.1        | 20.14        | 19.57               | 4.36        |
| <b>Rata - rata</b> | <b>87.01214</b> | <b>19.41179</b> | <b>20.1</b> | <b>20.14</b> | <b>19.57</b>        | <b>4.36</b> |
| a1b3 (RESIDU)      | 87.01214        | 27.87859        | 20.1        | 20.02        | 19.57               | 6.30        |
|                    | 87.01214        | 27.28186        | 20.1        | 20.02        | 19.57               | 6.16        |
|                    | 87.01214        | 27.45615        | 20.1        | 20.02        | 19.57               | 6.20        |
| <b>Rata - rata</b> | <b>87.01214</b> | <b>27.58023</b> | <b>20.1</b> | <b>20.02</b> | <b>19.57</b>        | <b>6.23</b> |
| a1b3 (FILTRAT)     | 87.01214        | 4.35276         | 20.1        | 20.67        | 19.57               | 0.95        |
|                    | 87.01214        | 4.39765         | 20.1        | 20.67        | 19.57               | 0.96        |
|                    | 87.01214        | 4.37902         | 20.1        | 20.67        | 19.57               | 0.96        |
| <b>Rata - rata</b> | <b>87.01214</b> | <b>4.376477</b> | <b>20.1</b> | <b>20.67</b> | <b>19.57</b>        | <b>0.96</b> |
| a2b1               | 87.01214        | 13.99442        | 20.1        | 20.1         | 19.57               | 3.15        |
|                    | 87.01214        | 13.99711        | 20.1        | 20.1         | 19.57               | 3.15        |
|                    | 87.01214        | 14.08496        | 20.1        | 20.1         | 19.57               | 3.17        |
| <b>Rata - rata</b> | <b>87.01214</b> | <b>14.0255</b>  | <b>20.1</b> | <b>20.1</b>  | <b>19.57</b>        | <b>3.15</b> |
| a2b2               | 87.01214        | 14.58434        | 20.1        | 20           | 19.57               | 3.30        |
|                    | 87.01214        | 14.41463        | 20.1        | 20           | 19.57               | 3.26        |
|                    | 87.01214        | 14.64781        | 20.1        | 20           | 19.57               | 3.31        |
| <b>Rata - rata</b> | <b>87.01214</b> | <b>14.54893</b> | <b>20.1</b> | <b>20</b>    | <b>19.57</b>        | <b>3.29</b> |
| a2b3 (RESIDU)      | 87.01214        | 18.62208        | 20.1        | 20.01        | 19.57               | 4.21        |
|                    | 87.01214        | 18.43536        | 20.1        | 20.01        | 19.57               | 4.16        |
|                    | 87.01214        | 18.46364        | 20.1        | 20.01        | 19.57               | 4.17        |
| <b>Rata - rata</b> | <b>87.01214</b> | <b>18.50703</b> | <b>20.1</b> | <b>20.01</b> | <b>19.57</b>        | <b>4.18</b> |
| a2b3 (FILTRAT)     | 87.01214        | 6.81532         | 20.1        | 20.25        | 19.57               | 1.52        |
|                    | 87.01214        | 6.8002          | 20.1        | 20.25        | 19.57               | 1.52        |
|                    | 87.01214        | 6.85488         | 20.1        | 20.25        | 19.57               | 1.53        |
| <b>Rata - rata</b> | <b>87.01214</b> | <b>6.823467</b> | <b>20.1</b> | <b>20.25</b> | <b>19.57</b>        | <b>1.52</b> |

**Keterangan: ulangan ke 2**

| Sampel             | Luas Area       |                 | Berat       |              | Konsentrasi standar | Kadar       |
|--------------------|-----------------|-----------------|-------------|--------------|---------------------|-------------|
|                    | Standar         | Sampel          | Standar     | Sampel       |                     |             |
| a1b1               | 88.69662        | 15.58715        | 20.0        | 20.1         | 19.57               | 3.42        |
|                    | 88.69662        | 15.41923        | 20.0        | 20.1         | 19.57               | 3.39        |
|                    | 88.69662        | 15.62992        | 20.0        | 20.1         | 19.57               | 3.43        |
| <b>Rata - rata</b> | <b>88.69662</b> | <b>15.54543</b> | <b>20.0</b> | <b>20.1</b>  | <b>19.57</b>        | <b>3.41</b> |
| a1b2               | 88.69662        | 19.26471        | 20.0        | 20.05        | 19.57               | 4.24        |
|                    | 88.69662        | 19.45253        | 20.0        | 20.05        | 19.57               | 4.28        |
|                    | 88.69662        | 19.35978        | 20.0        | 20.05        | 19.57               | 4.26        |
| <b>Rata - rata</b> | <b>88.69662</b> | <b>19.35901</b> | <b>20.0</b> | <b>20.05</b> | <b>19.57</b>        | <b>4.26</b> |
| a1b3 (RESIDU)      | 88.69662        | 27.85536        | 20.0        | 20.1         | 19.57               | 6.12        |
|                    | 88.69662        | 27.27921        | 20.0        | 20.1         | 19.57               | 5.99        |
|                    | 88.69662        | 27.50489        | 20.0        | 20.1         | 19.57               | 6.04        |
| <b>Rata - rata</b> | <b>88.69662</b> | <b>27.54649</b> | <b>20.0</b> | <b>20.1</b>  | <b>19.57</b>        | <b>6.05</b> |
| a1b3 (FILTRAT)     | 88.69662        | 4.38816         | 20.0        | 20.3         | 19.57               | 0.95        |
|                    | 88.69662        | 4.41341         | 20.0        | 20.3         | 19.57               | 0.96        |
|                    | 88.69662        | 4.42723         | 20.0        | 20.3         | 19.57               | 0.96        |
| <b>Rata - rata</b> | <b>88.69662</b> | <b>4.4096</b>   | <b>20.0</b> | <b>20.3</b>  | <b>19.57</b>        | <b>0.96</b> |
| a2b1               | 88.69662        | 14.08183        | 20.0        | 20.1         | 19.57               | 3.09        |
|                    | 88.69662        | 14.05126        | 20.0        | 20.1         | 19.57               | 3.08        |
|                    | 88.69662        | 14.17236        | 20.0        | 20.1         | 19.57               | 3.11        |
| <b>Rata - rata</b> | <b>88.69662</b> | <b>14.10182</b> | <b>20.0</b> | <b>20.1</b>  | <b>19.57</b>        | <b>3.10</b> |
| a2b2               | 88.69662        | 14.6194         | 20.0        | 20           | 19.57               | 3.23        |
|                    | 88.69662        | 14.51349        | 20.0        | 20           | 19.57               | 3.20        |
|                    | 88.69662        | 14.68304        | 20.0        | 20           | 19.57               | 3.24        |
| <b>Rata - rata</b> | <b>88.69662</b> | <b>14.60531</b> | <b>20.0</b> | <b>20</b>    | <b>19.57</b>        | <b>3.22</b> |
| a2b3 (RESIDU)      | 88.69662        | 18.59598        | 20.0        | 20.05        | 19.57               | 4.09        |
|                    | 88.69662        | 18.44015        | 20.0        | 20.05        | 19.57               | 4.06        |
|                    | 88.69662        | 18.57234        | 20.0        | 20.05        | 19.57               | 4.09        |
| <b>Rata - rata</b> | <b>88.69662</b> | <b>18.53616</b> | <b>20.0</b> | <b>20.05</b> | <b>19.57</b>        | <b>4.08</b> |
| a2b3 (FILTRAT)     | 88.69662        | 6.88131         | 20.0        | 20.07        | 19.57               | 1.51        |
|                    | 88.69662        | 6.89251         | 20.0        | 20.07        | 19.57               | 1.52        |
|                    | 88.69662        | 6.85588         | 20.0        | 20.07        | 19.57               | 1.51        |
| <b>Rata - rata</b> | <b>88.69662</b> | <b>6.876567</b> | <b>20.0</b> | <b>20.07</b> | <b>19.57</b>        | <b>1.51</b> |

**Keterangan : ulangan ke 3**

### 3.2 Desmetoksikurkumin

| Sampel             | Luas Area       |                 | Berat       |              | Konsentrasi standar | Kadar       |
|--------------------|-----------------|-----------------|-------------|--------------|---------------------|-------------|
|                    | Standar         | Sampel          | Standar     | Sampel       |                     |             |
| a1b1               | 15.94833        | 5.01498         | 20.1        | 20           | 6.25                | 1.98        |
|                    | 15.94833        | 5.04721         | 20.1        | 20           | 6.25                | 1.99        |
|                    | 15.94833        | 5.05449         | 20.1        | 20           | 6.25                | 1.99        |
| <b>Rata - rata</b> | <b>15.94833</b> | <b>5.038893</b> | <b>20.1</b> | <b>20</b>    | 6.25                | <b>1.98</b> |
| a1b2               | 15.94833        | 5.54888         | 20.1        | 20.18        | 6.25                | 2.17        |
|                    | 15.94833        | 5.62193         | 20.1        | 20.18        | 6.25                | 2.19        |
|                    | 15.94833        | 5.60587         | 20.1        | 20.18        | 6.25                | 2.19        |
| <b>Rata - rata</b> | <b>15.94833</b> | <b>5.592227</b> | <b>20.1</b> | <b>20.18</b> | 6.25                | <b>2.18</b> |
| a1b3 (RESIDU)      | 15.94833        | 12.83632        | 20.1        | 20.02        | 6.25                | 5.05        |
|                    | 15.94833        | 12.54545        | 20.1        | 20.02        | 6.25                | 4.94        |
|                    | 15.94833        | 12.69447        | 20.1        | 20.02        | 6.25                | 4.99        |
| <b>Rata - rata</b> | <b>15.94833</b> | <b>12.69089</b> | <b>20.1</b> | <b>20.02</b> | 6.25                | <b>4.99</b> |
| a1b3 (FILTRAT)     | 15.94833        | 0.76726         | 20.1        | 21.08        | 6.25                | 0.29        |
|                    | 15.94833        | 0.78894         | 20.1        | 21.08        | 6.25                | 0.29        |
|                    | 15.94833        | 0.79275         | 20.1        | 21.08        | 6.25                | 0.30        |
| <b>Rata - rata</b> | <b>15.94833</b> | <b>0.782983</b> | <b>20.1</b> | <b>21.08</b> | 6.25                | <b>0.29</b> |
| a2b1               | 15.94833        | 3.84451         | 20.1        | 20.19        | 6.25                | 1.50        |
|                    | 15.94833        | 3.80989         | 20.1        | 20.19        | 6.25                | 1.49        |
|                    | 15.94833        | 3.88501         | 20.1        | 20.19        | 6.25                | 1.52        |
| <b>Rata - rata</b> | <b>15.94833</b> | <b>3.84647</b>  | <b>20.1</b> | <b>20.19</b> | 6.25                | <b>1.50</b> |
| a2b2               | 15.94833        | 5.39199         | 20.1        | 20.17        | 6.25                | 2.11        |
|                    | 15.94833        | 5.37769         | 20.1        | 20.17        | 6.25                | 2.10        |
|                    | 15.94833        | 5.40796         | 20.1        | 20.17        | 6.25                | 2.11        |
| <b>Rata - rata</b> | <b>15.94833</b> | <b>5.392547</b> | <b>20.1</b> | <b>20.17</b> | 6.25                | <b>2.11</b> |
| a2b3 (RESIDU)      | 15.94833        | 6.51009         | 20.1        | 20.04        | 6.25                | 2.56        |
|                    | 15.94833        | 6.44401         | 20.1        | 20.04        | 6.25                | 2.53        |
|                    | 15.94833        | 6.50573         | 20.1        | 20.04        | 6.25                | 2.56        |
| <b>Rata - rata</b> | <b>15.94833</b> | <b>6.48661</b>  | <b>20.1</b> | <b>20.04</b> | 6.25                | <b>2.55</b> |
| a2b3 (FILTRAT)     | 15.94833        | 0.95112         | 20.1        | 25.48        | 6.25                | 0.29        |
|                    | 15.94833        | 0.9732          | 20.1        | 25.48        | 6.25                | 0.30        |
|                    | 15.94833        | 0.94726         | 20.1        | 25.48        | 6.25                | 0.29        |
| <b>Rata - rata</b> | <b>15.94833</b> | <b>0.957193</b> | <b>20.1</b> | <b>25.48</b> | 6.25                | <b>0.30</b> |

Keterangan: ulangan ke 1



| Sampel             | Luas Area       |                 | Berat       |              | Konsentrasi standar | Kadar       |
|--------------------|-----------------|-----------------|-------------|--------------|---------------------|-------------|
|                    | Standar         | Sampel          | Standar     | Sampel       |                     |             |
| a1b1               | 15.87111        | 5.0498          | 20.1        | 20.01        | 6.25                | 2.00        |
|                    | 15.87111        | 4.98631         | 20.1        | 20.01        | 6.25                | 1.97        |
|                    | 15.87111        | 5.01679         | 20.1        | 20.01        | 6.25                | 1.98        |
| <b>Rata - rata</b> | <b>15.87111</b> | <b>5.017633</b> | <b>20.1</b> | <b>20.01</b> | <b>6.25</b>         | <b>1.98</b> |
| a1b2               | 15.87111        | 5.48476         | 20.1        | 20.14        | 6.25                | 2.16        |
|                    | 15.87111        | 5.57443         | 20.1        | 20.14        | 6.25                | 2.19        |
|                    | 15.87111        | 5.55417         | 20.1        | 20.14        | 6.25                | 2.18        |
| <b>Rata - rata</b> | <b>15.87111</b> | <b>5.537787</b> | <b>20.1</b> | <b>20.14</b> | <b>6.25</b>         | <b>2.18</b> |
| a1b3 (RESIDU)      | 15.87111        | 12.62215        | 20.1        | 20.02        | 6.25                | 4.99        |
|                    | 15.87111        | 12.35307        | 20.1        | 20.02        | 6.25                | 4.88        |
|                    | 15.87111        | 12.45724        | 20.1        | 20.02        | 6.25                | 4.93        |
| <b>Rata - rata</b> | <b>15.87111</b> | <b>12.48761</b> | <b>20.1</b> | <b>20.02</b> | <b>6.25</b>         | <b>4.94</b> |
| a1b3<br>(FILTRAT)  | 15.87111        | 0.80069         | 20.1        | 20.67        | 6.25                | 0.31        |
|                    | 15.87111        | 0.79798         | 20.1        | 20.67        | 6.25                | 0.31        |
|                    | 15.87111        | 0.80001         | 20.1        | 20.67        | 6.25                | 0.31        |
| <b>Rata - rata</b> | <b>15.87111</b> | <b>0.79956</b>  | <b>20.1</b> | <b>20.67</b> | <b>6.25</b>         | <b>0.31</b> |
| a2b1               | 15.87111        | 3.84451         | 20.1        | 20.1         | 6.25                | 1.51        |
|                    | 15.87111        | 3.80982         | 20.1        | 20.1         | 6.25                | 1.50        |
|                    | 15.87111        | 3.88129         | 20.1        | 20.1         | 6.25                | 1.53        |
| <b>Rata - rata</b> | <b>15.87111</b> | <b>3.845207</b> | <b>20.1</b> | <b>20.1</b>  | <b>6.25</b>         | <b>1.51</b> |
| a2b2               | 15.87111        | 5.32758         | 20.1        | 20           | 6.25                | 2.11        |
|                    | 15.87111        | 5.29843         | 20.1        | 20           | 6.25                | 2.10        |
|                    | 15.87111        | 5.39453         | 20.1        | 20           | 6.25                | 2.13        |
| <b>Rata - rata</b> | <b>15.87111</b> | <b>5.34018</b>  | <b>20.1</b> | <b>20</b>    | <b>6.25</b>         | <b>2.11</b> |
| a2b3 (RESIDU)      | 15.87111        | 6.38438         | 20.1        | 20.01        | 6.25                | 2.53        |
|                    | 15.87111        | 6.35033         | 20.1        | 20.01        | 6.25                | 2.51        |
|                    | 15.87111        | 6.38921         | 20.1        | 20.01        | 6.25                | 2.53        |
| <b>Rata - rata</b> | <b>15.87111</b> | <b>6.37464</b>  | <b>20.1</b> | <b>20.01</b> | <b>6.25</b>         | <b>2.52</b> |
| a2b3<br>(FILTRAT)  | 15.87111        | 0.95055         | 20.1        | 20.25        | 6.25                | 0.37        |
|                    | 15.87111        | 0.9581          | 20.1        | 20.25        | 6.25                | 0.37        |
|                    | 15.87111        | 0.96719         | 20.1        | 20.25        | 6.25                | 0.38        |
| <b>Rata - rata</b> | <b>15.87111</b> | <b>0.958613</b> | <b>20.1</b> | <b>20.25</b> | <b>6.25</b>         | <b>0.37</b> |

**Keterangan: ulangan ke 2**

| Sampel             | Luas Area       |                 | Berat       |              | Konsentrasi standar | Kadar       |
|--------------------|-----------------|-----------------|-------------|--------------|---------------------|-------------|
|                    | Standar         | Sampel          | Standar     | Sampel       |                     |             |
| a1b1               | 15.96632        | 5.07444         | 20.0        | 20.1         | 6.25                | 1.98        |
|                    | 15.96632        | 5.00947         | 20.0        | 20.1         | 6.25                | 1.95        |
|                    | 15.96632        | 5.10785         | 20.0        | 20.1         | 6.25                | 1.99        |
| <b>Rata - rata</b> | <b>15.96632</b> | <b>5.06392</b>  | <b>20.0</b> | <b>20.1</b>  | <b>6.25</b>         | <b>1.97</b> |
| a1b2               | 15.96632        | 5.56953         | 20.0        | 20.05        | 6.25                | 2.17        |
|                    | 15.96632        | 5.64665         | 20.0        | 20.05        | 6.25                | 2.20        |
|                    | 15.96632        | 5.58904         | 20.0        | 20.05        | 6.25                | 2.18        |
| <b>Rata - rata</b> | <b>15.96632</b> | <b>5.60174</b>  | <b>20.0</b> | <b>20.05</b> | <b>6.25</b>         | <b>2.19</b> |
| a1b3 (RESIDU)      | 15.96632        | 12.79881        | 20.0        | 20.1         | 6.25                | 4.99        |
|                    | 15.96632        | 12.52373        | 20.0        | 20.1         | 6.25                | 4.88        |
|                    | 15.96632        | 12.64573        | 20.0        | 20.1         | 6.25                | 4.93        |
| <b>Rata - rata</b> | <b>15.96632</b> | <b>12.65609</b> | <b>20.0</b> | <b>20.1</b>  | <b>6.25</b>         | <b>4.93</b> |
| a1b3 (FILTRAT)     | 15.96632        | 0.80955         | 20.0        | 20.3         | 6.25                | 0.31        |
|                    | 15.96632        | 0.82461         | 20.0        | 20.3         | 6.25                | 0.32        |
|                    | 15.96632        | 0.81591         | 20.0        | 20.3         | 6.25                | 0.31        |
| <b>Rata - rata</b> | <b>15.96632</b> | <b>0.81669</b>  | <b>20.0</b> | <b>20.3</b>  | <b>6.25</b>         | <b>0.31</b> |
| a2b1               | 15.96632        | 3.9235          | 20.0        | 20.1         | 6.25                | 1.53        |
|                    | 15.96632        | 3.89463         | 20.0        | 20.1         | 6.25                | 1.52        |
|                    | 15.96632        | 3.93919         | 20.0        | 20.1         | 6.25                | 1.53        |
| <b>Rata - rata</b> | <b>15.96632</b> | <b>3.919107</b> | <b>20.0</b> | <b>20.1</b>  | <b>6.25</b>         | <b>1.53</b> |
| a2b2               | 15.96632        | 5.49322         | 20.0        | 20           | 6.25                | 2.15        |
|                    | 15.96632        | 5.42476         | 20.0        | 20           | 6.25                | 2.12        |
|                    | 15.96632        | 5.48631         | 20.0        | 20           | 6.25                | 2.15        |
| <b>Rata - rata</b> | <b>15.96632</b> | <b>5.468097</b> | <b>20.0</b> | <b>20</b>    | <b>6.25</b>         | <b>2.14</b> |
| a2b3 (RESIDU)      | 15.96632        | 6.50992         | 20.0        | 20.05        | 6.25                | 2.54        |
|                    | 15.96632        | 6.4686          | 20.0        | 20.05        | 6.25                | 2.53        |
|                    | 15.96632        | 6.50583         | 20.0        | 20.05        | 6.25                | 2.54        |
| <b>Rata - rata</b> | <b>15.96632</b> | <b>6.494783</b> | <b>20.0</b> | <b>20.05</b> | <b>6.25</b>         | <b>2.54</b> |
| a2b3 (FILTRAT)     | 15.96632        | 0.98658         | 20.0        | 20.07        | 6.25                | 0.38        |
|                    | 15.96632        | 0.98263         | 20.0        | 20.07        | 6.25                | 0.38        |
|                    | 15.96632        | 0.98755         | 20.0        | 20.07        | 6.25                | 0.39        |
| <b>Rata - rata</b> | <b>15.96632</b> | <b>0.985587</b> | <b>20.0</b> | <b>20.07</b> | <b>6.25</b>         | <b>0.38</b> |

**Keterangan: ulangan ke 3**

### 3.3 Bisdesmetoksikurkumin

| Sampel             | Luas Area |            | Berat   |        | Konsentrasi standar | Kadar   |
|--------------------|-----------|------------|---------|--------|---------------------|---------|
|                    | Standar   | Sampel     | Standar | Sampel |                     |         |
| a1b1               | 3.38112   | 4.85474    | 20.1    | 20.18  | 0.63                | 0.90    |
|                    | 3.38112   | 4.92121    | 20.1    | 20.18  | 0.63                | 0.91    |
|                    | 3.38112   | 4.93281    | 20.1    | 20.18  | 0.63                | 0.92    |
| <b>Rata - rata</b> | 3.38112   | 4.90292    | 20.1    | 20.18  | 0.63                | 0.91    |
| a1b2               | 3.38112   | 5.31946    | 20.1    | 20     | 0.63                | 1.00    |
|                    | 3.38112   | 5.27693    | 20.1    | 20     | 0.63                | 0.99    |
|                    | 3.38112   | 5.35406    | 20.1    | 20     | 0.63                | 1.00    |
| <b>Rata - rata</b> | 3.38112   | 5.31681667 | 20.1    | 20     | 0.63                | 0.99563 |
| a1b3 (FILTRAT)     | 3.38112   | 0.3236     | 20.1    | 21.08  | 0.63                | 0.06    |
|                    | 3.38112   | 0.30486    | 20.1    | 21.08  | 0.63                | 0.05    |
|                    | 3.38112   | 0.35016    | 20.1    | 21.08  | 0.63                | 0.06    |
| <b>Rata - rata</b> | 3.38112   | 0.32620667 | 20.1    | 21.08  | 0.63                | 0.06    |
| a1b3 (RESIDU)      | 3.38112   | 12.05651   | 20.1    | 20.02  | 0.63                | 2.26    |
|                    | 3.38112   | 11.85461   | 20.1    | 20.02  | 0.63                | 2.22    |
|                    | 3.38112   | 11.94877   | 20.1    | 20.02  | 0.63                | 2.24    |
| <b>Rata - rata</b> | 3.38112   | 11.9532967 | 20.1    | 20.02  | 0.63                | 2.24    |
| a2b1               | 3.38112   | 2.62038    | 20.1    | 20.19  | 0.63                | 0.49    |
|                    | 3.38112   | 2.60475    | 20.1    | 20.19  | 0.63                | 0.48    |
|                    | 3.38112   | 2.59272    | 20.1    | 20.19  | 0.63                | 0.48    |
| <b>Rata - rata</b> | 3.38112   | 2.60595    | 20.1    | 20.19  | 0.63                | 0.48    |
| a2b2               | 3.38112   | 3.26493    | 20.1    | 20.17  | 0.63                | 0.61    |
|                    | 3.38112   | 3.28538    | 20.1    | 20.17  | 0.63                | 0.61    |
|                    | 3.38112   | 3.27962    | 20.1    | 20.17  | 0.63                | 0.61    |
| <b>Rata - rata</b> | 3.38112   | 3.27664333 | 20.1    | 20.17  | 0.63                | 0.61    |
| a2b3 (RESIDU)      | 3.38112   | 4.87665    | 20.1    | 20.04  | 0.63                | 0.91    |
|                    | 3.38112   | 4.77384    | 20.1    | 20.04  | 0.63                | 0.89    |
|                    | 3.38112   | 4.76659    | 20.1    | 20.04  | 0.63                | 0.89    |
| <b>Rata - rata</b> | 3.38112   | 4.80569333 | 20.1    | 20.04  | 0.63                | 0.90    |
| a2b3 (FILTRAT)     | 3.38112   | 0.46121    | 20.1    | 25.48  | 0.63                | 0.07    |
|                    | 3.38112   | 0.51161    | 20.1    | 25.48  | 0.63                | 0.08    |
|                    | 3.38112   | 0.50094    | 20.1    | 25.48  | 0.63                | 0.07    |
| <b>Rata - rata</b> | 3.38112   | 0.49125333 | 20.1    | 25.48  | 0.63                | 0.07    |

**Keterangan: ulangan ke 1**

| Sampel             | Luas Area |            | Berat   |        | Konsentrasi standar | Kadar |
|--------------------|-----------|------------|---------|--------|---------------------|-------|
|                    | Standar   | Sampel     | Standar | Sampel |                     |       |
| a1b1               | 3.35202   | 5.23832    | 20.1    | 20.01  | 0.63                | 0.99  |
|                    | 3.35202   | 5.23654    | 20.1    | 20.01  | 0.63                | 0.99  |
|                    | 3.35202   | 5.27969    | 20.1    | 20.01  | 0.63                | 1.00  |
| <b>Rata - rata</b> | 3.35202   | 5.25151667 | 20.1    | 20.01  | 0.63                | 0.99  |
| a1b2               | 3.35202   | 4.86731    | 20.1    | 20.14  | 0.63                | 0.91  |
|                    | 3.35202   | 4.90396    | 20.1    | 20.14  | 0.63                | 0.92  |
|                    | 3.35202   | 4.8719     | 20.1    | 20.14  | 0.63                | 0.91  |
| <b>Rata - rata</b> | 3.35202   | 4.88105667 | 20.1    | 20.14  | 0.63                | 0.92  |
| a1b2 (RESIDU)      | 3.35202   | 12.00079   | 20.1    | 20.02  | 0.63                | 2.26  |
|                    | 3.35202   | 11.68040   | 20.1    | 20.02  | 0.63                | 2.20  |
|                    | 3.35202   | 11.84827   | 20.1    | 20.02  | 0.63                | 2.24  |
| <b>Rata - rata</b> | 3.35202   | 11.84315   | 20.1    | 20.02  | 0.63                | 2.23  |
| a1b3 (FILTRAT)     | 3.35202   | 0.34269    | 20.1    | 20.67  | 0.63                | 0.06  |
|                    | 3.35202   | 0.34871    | 20.1    | 20.67  | 0.63                | 0.06  |
|                    | 3.35202   | 0.34682    | 20.1    | 20.67  | 0.63                | 0.06  |
| <b>Rata - rata</b> | 3.35202   | 0.34607333 | 20.1    | 20.67  | 0.63                | 0.06  |
| a2b1               | 3.35202   | 2.56477    | 20.1    | 20.1   | 0.63                | 0.48  |
|                    | 3.35202   | 2.55428    | 20.1    | 20.1   | 0.63                | 0.48  |
|                    | 3.35202   | 2.59272    | 20.1    | 20.1   | 0.63                | 0.49  |
| <b>Rata - rata</b> | 3.35202   | 2.57059    | 20.1    | 20.1   | 0.63                | 0.48  |
| a2b2               | 3.35202   | 3.15469    | 20.1    | 20     | 0.63                | 0.60  |
|                    | 3.35202   | 3.13945    | 20.1    | 20     | 0.63                | 0.59  |
|                    | 3.35202   | 3.08533    | 20.1    | 20     | 0.63                | 0.58  |
| <b>Rata - rata</b> | 3.35202   | 3.12649    | 20.1    | 20     | 0.63                | 0.59  |
| a2b3 (RESIDU)      | 3.35202   | 4.76261    | 20.1    | 20.01  | 0.63                | 0.90  |
|                    | 3.35202   | 4.7709     | 20.1    | 20.01  | 0.63                | 0.90  |
|                    | 3.35202   | 4.76659    | 20.1    | 20.01  | 0.63                | 0.90  |
| <b>Rata - rata</b> | 3.35202   | 4.7667     | 20.1    | 20.01  | 0.63                | 0.90  |
| a2b3 (FILTRAT)     | 3.35202   | 0.46176    | 20.1    | 20.25  | 0.63                | 0.09  |
|                    | 3.35202   | 0.47848    | 20.1    | 20.25  | 0.63                | 0.09  |
|                    | 3.35202   | 0.47138    | 20.1    | 20.25  | 0.63                | 0.09  |
| <b>Rata - rata</b> | 3.35202   | 0.47054    | 20.1    | 20.25  | 0.63                | 0.09  |

**Keterangan: ulangan ke 2**

| Sampel             | Luas Area |            | Berat   |        | Konsentrasi standar | Kadar |
|--------------------|-----------|------------|---------|--------|---------------------|-------|
|                    | Standar   | Sampel     | Standar | Sampel |                     |       |
| a1b1               | 3.48017   | 5.4411     | 20.0    | 20.1   | 0.63                | 0.98  |
|                    | 3.48017   | 5.38184    | 20.0    | 20.1   | 0.63                | 0.97  |
|                    | 3.48017   | 5.48877    | 20.0    | 20.1   | 0.63                | 0.99  |
| <b>Rata - rata</b> | 3.48017   | 5.43723667 | 20.0    | 20.1   | 0.63                | 0.98  |
| a1b2               | 3.48017   | 5.03647    | 20.0    | 20.05  | 0.63                | 0.91  |
|                    | 3.48017   | 5.08156    | 20.0    | 20.05  | 0.63                | 0.92  |
|                    | 3.48017   | 5.03888    | 20.0    | 20.05  | 0.63                | 0.91  |
| <b>Rata - rata</b> | 3.48017   | 5.05230333 | 20.0    | 20.05  | 0.63                | 0.91  |
| a1b3 (RESIDU)      | 3.48017   | 12.17719   | 20.0    | 20.1   | 0.63                | 2.19  |
|                    | 3.48017   | 11.8568    | 20.0    | 20.1   | 0.63                | 2.14  |
|                    | 3.48017   | 11.97281   | 20.0    | 20.1   | 0.63                | 2.16  |
| <b>Rata - rata</b> | 3.48017   | 12.0022667 | 20.0    | 20.1   | 0.63                | 2.16  |
| a1b3               | 3.48017   | 0.40531    | 20.0    | 20.3   | 0.63                | 0.07  |
|                    | 3.48017   | 0.40744    | 20.0    | 20.3   | 0.63                | 0.07  |
|                    | 3.48017   | 0.42746    | 20.0    | 20.3   | 0.63                | 0.08  |
| <b>Rata - rata</b> | 3.48017   | 0.41340333 | 20.0    | 20.3   | 0.63                | 0.07  |
| a2b1               | 3.48017   | 2.69315    | 20.0    | 20.1   | 0.63                | 0.49  |
|                    | 3.48017   | 2.69899    | 20.0    | 20.1   | 0.63                | 0.49  |
|                    | 3.48017   | 2.70739    | 20.0    | 20.1   | 0.63                | 0.49  |
| <b>Rata - rata</b> | 3.48017   | 2.69984333 | 20.0    | 20.1   | 0.63                | 0.49  |
| a2b2               | 3.48017   | 3.46172    | 20.0    | 20     | 0.63                | 0.63  |
|                    | 3.48017   | 3.45779    | 20.0    | 20     | 0.63                | 0.63  |
|                    | 3.48017   | 3.48166    | 20.0    | 20     | 0.63                | 0.63  |
| <b>Rata - rata</b> | 3.48017   | 3.46705667 | 20.0    | 20     | 0.63                | 0.63  |
| a2b3 (RESIDU)      | 3.48017   | 4.94518    | 20.0    | 20.05  | 0.63                | 0.89  |
|                    | 3.48017   | 4.91094    | 20.0    | 20.05  | 0.63                | 0.89  |
|                    | 3.48017   | 4.94587    | 20.0    | 20.05  | 0.63                | 0.89  |
| <b>Rata - rata</b> | 3.48017   | 4.93399667 | 20.0    | 20.05  | 0.63                | 0.89  |
| a2b3               | 3.48017   | 0.58571    | 20.0    | 20.07  | 0.63                | 0.11  |
|                    | 3.48017   | 0.58607    | 20.0    | 20.07  | 0.63                | 0.11  |
|                    | 3.48017   | 0.57696    | 20.0    | 20.07  | 0.63                | 0.10  |
| <b>Rata - rata</b> | 3.48017   | 0.58291333 | 20.0    | 20.07  | 0.63                | 0.11  |

**Keterangan : ulangan ke 3**

**Lampiran 4.** Hasil pengujian Kadar Air awal metode gravimetri

Berat cawan kosong (W1):

Cawan 1 = 52,6246 gram

Cawan 2 = 48,5440 gram

Berat cawan + sampel (W2):

Cawan 1 + umbi induk = 56,6446 gram

Cawan 2 + rimpang kunyit = 52,5652 gram

Berat cawan + sampel setelah pemanasan 2 jam + 10 menit dalam desikator:

Cawan 1 + umbi induk = 53,5389 gram

Cawan 2 + rimpang kunyit = 49,3481 gram

Berat cawan + sampel setelah pemanasan kembali 15 menit + 10 menit dalam desikator:

Cawan 1 + umbi induk = 53,5378 gram

Cawan 2 + rimpang kunyit = 49,3479 gram

Berat cawan + sampel rata – rata (W3):

Cawan 1 =  $(53,5389 + 53,5378) / 2$   
= 53,5384 gram

Cawan 2 =  $(49,3481 + 49,3479) / 2$   
= 49,3480 gram

% Kadar air :

$$\begin{aligned} \text{\% Kadar air umbi induk} &= \frac{W_2 - W_3}{W_2 - W_1} \times 100 \% \\ &= \frac{56,6446 - 53,5384}{56,6446 - 52,6246} \times 100 \% \\ &= 77,27 \% \end{aligned}$$

$$\begin{aligned}\% \text{ Kadar air rimpang kunyit} &= \frac{W_2 - W_3}{W_2 - W_1} \times 100 \% \\ &= \frac{52,5652 - 49,3480}{52,5652 - 48,5440} \times 100 \% \\ &= 80,03 \%\end{aligned}$$

**Lampiran 5.** Hasil perhitungan analisis variansi (anova)

**1. Analisis Kadar Kurkuminoid (Kurkumin)**

| Jenis kunyit       | Perlakuan Penepungan | Kelompok ulangan |              |              | Total        | Rata - rata  | Standar deviasi |
|--------------------|----------------------|------------------|--------------|--------------|--------------|--------------|-----------------|
|                    |                      | 1                | 2            | 3            |              |              |                 |
| <b>A</b>           | <b>B</b>             |                  |              |              |              |              |                 |
| a1                 | b1                   | 3.50             | 3.52         | 3.41         | 10.43        | 3.48         | 0.06            |
|                    | b2                   | 4.33             | 4.36         | 4.26         | 12.95        | 4.32         | 0.05            |
|                    | b3                   | 6.20             | 6.23         | 6.05         | 18.48        | 6.16         | 0.10            |
| <b>Sub Total</b>   |                      | <b>14.03</b>     | <b>14.11</b> | <b>13.72</b> | <b>41.86</b> | <b>13.95</b> | <b>0.21</b>     |
| <b>Rata - rata</b> |                      | <b>4.68</b>      | <b>4.70</b>  | <b>4.57</b>  | <b>13.95</b> | <b>4.65</b>  | <b>0.07</b>     |
| a2                 | b1                   | 3.13             | 3.15         | 3.10         | 9.38         | 3.13         | 0.03            |
|                    | b2                   | 3.24             | 3.29         | 3.22         | 9.75         | 3.25         | 0.04            |
|                    | b3                   | 4.17             | 4.18         | 4.08         | 12.43        | 4.14         | 0.06            |
| <b>Sub Total</b>   |                      | <b>10.54</b>     | <b>10.62</b> | <b>10.40</b> | <b>31.56</b> | <b>10.52</b> | <b>0.12</b>     |
| <b>Rata - rata</b> |                      | <b>3.51</b>      | <b>3.54</b>  | <b>3.47</b>  | <b>10.52</b> | <b>3.51</b>  | <b>0.04</b>     |
| <b>Total</b>       |                      | <b>24.57</b>     | <b>24.73</b> | <b>24.12</b> | <b>73.42</b> | <b>24.47</b> | <b>0.32</b>     |
| <b>Rata - rata</b> |                      | <b>12.29</b>     | <b>12.37</b> | <b>12.06</b> | <b>36.71</b> | <b>8.73</b>  | <b>0.16</b>     |

| Jenis Kunyit | Perlakuan penepungan |       |       | Jumlah | Rata-rata |
|--------------|----------------------|-------|-------|--------|-----------|
|              | b                    |       |       |        |           |
| a            | b1                   | b2    | b3    |        |           |
| a1           | 10.43                | 12.95 | 18.48 | 41.86  | 13.95     |
| a2           | 9.38                 | 9.75  | 12.43 | 31.56  | 10.52     |
| Jumlah       | 19.81                | 22.70 | 30.91 | 73.42  | 24.47     |
| Rata - Rata  | 9.91                 | 11.35 | 15.46 |        |           |

Perhitungan Anava

$$\begin{aligned}
 \text{Faktor Koreksi (FK)} &= \frac{(\text{Total})^2}{r \times b \times a} \\
 &= \frac{(73,42)^2}{3 \times 3 \times 2} \\
 &= 299,27
 \end{aligned}$$

$$\begin{aligned}
 \text{JK Total (JKT)} &= [(a_1b_1)^2 + \dots + (a_2b_4)^2] - \text{FK} \\
 &= [(3,50)^2 + \dots + (4,08)^2] - 299,27 \\
 &= 19,0852
 \end{aligned}$$



$$\begin{aligned}
 \text{JK Kelompok (JKK)} &= \left[ \frac{(\sum \text{kel1})^2 + (\sum \text{kel2})^2 + (\sum \text{kel3})^2}{a \times b} \right] - \text{FK} \\
 &= \left[ \frac{(24,57)^2 + (24,73)^2 + (24,12)^2}{2 \times 3} \right] - 299,27 \\
 &= 0,0333
 \end{aligned}$$

$$\begin{aligned}
 \text{JK(a)} &= \left[ \frac{(\sum a1)^2 + (\sum a2)^2}{r \times b} \right] - \text{FK} \\
 &= \left[ \frac{(41,86)^2 + (31,56)^2}{3 \times 3} \right] - 299,27 \\
 &= 5,8939
 \end{aligned}$$

$$\begin{aligned}
 \text{JK(b)} &= \left[ \frac{(\sum b1)^2 + (\sum b2)^2 + (\sum b3)^2}{r \times a} \right] - \text{FK} \\
 &= \left[ \frac{(19,81)^2 + (22,70)^2 + (30,91)^2}{3 \times 2} \right] - 299,27 \\
 &= 11,0537
 \end{aligned}$$

$$\begin{aligned}
 \text{JK(ab)} &= \left[ \frac{(\sum a1b1)^2 + \dots + (\sum a2b3)^2}{r} \right] - \text{FK} - \text{JKa} - \text{JKb} \\
 &= \left[ \frac{(19,81)^2 + \dots + (30,91)^2}{3} \right] - 299,27 - 5,8938 - 48,8697 \\
 &= 2,0969
 \end{aligned}$$

$$\begin{aligned}
 \text{JKG} &= \text{JKT} - \text{JKK} - \text{JK(a)} - \text{JK(b)} - \text{JK (ab)} \\
 &= 57,2802 - 0,0274 - 0,02736 - 3,33015 - 11,0537 - \\
 &\quad 2,0969 \\
 &= 0,0073
 \end{aligned}$$

### Hasil analisis variansi (ANAVA)

| Sumber variansi | JK       | db | KT        | F HIT     | F TABEL |
|-----------------|----------|----|-----------|-----------|---------|
| A               | 5.893889 | 1  | 5.8938889 | 9659.181* | 4.49    |
| B               | 11.05368 | 2  | 5.5268389 | 9057.642* | 3.24    |
| AB              | 2.096944 | 2  | 1.0484722 | 1718.285* | 3.24    |
| Sisa            | 0.007322 | 12 | 0.0006102 |           |         |
| total           | 19.08518 | 17 |           |           |         |

Keterangan : tn = tidak berpengaruh nyata

\* = berpengaruh nyata

Kesimpulan : Berdasarkan tabel ANAVA, dapat disimpulkan bahwa faktor A (Bagian kunyit), faktor B (metode proses penepungan) dan interaksi AB berpengaruh nyata terhadap kandungan kurkumin pada tepung kunyit sehingga perlu dilakukan uji lanjut Duncan.

## Uji Lanjut Duncan

$$\begin{aligned}
 SE &= \sqrt{\frac{KTG}{Perlakuan}} \\
 &= \sqrt{\frac{0.0006102}{6}} \\
 &= 0,0101
 \end{aligned}$$

| SSR<br>5 % | LSR<br>5 % | Kode | Rata -<br>rata | Perlakuan |      |      |      |      |   | Taraf<br>nyata |
|------------|------------|------|----------------|-----------|------|------|------|------|---|----------------|
|            |            |      |                | 1         | 2    | 3    | 4    | 5    | 6 |                |
|            |            | a2b1 | 3.13           |           |      |      |      |      |   | a              |
| 3.08       | 0.03106    | a2b2 | 3.25           | 0.12      |      |      |      |      |   | b              |
| 3.23       | 0.03257    | a1b1 | 3.48           | 0.35      | 0.23 |      |      |      |   | c              |
| 3.31       | 0.03338    | a2b3 | 4.14           | 1.01      | 0.89 | 0.66 |      |      |   | d              |
| 3.37       | 0.03398    | a1b2 | 4.32           | 1.19      | 1.07 | 0.84 | 0.18 |      |   | e              |
| 3.41       | 0.03439    | a1b3 | 6.16           | 3.03      | 2.91 | 2.68 | 2.02 | 1.84 |   | f              |

Interaksi antara Bagian kunyit dan Perlakuan penepungan terhadap Kadar Kurkumin pada tepung kunyit

## Uji Lanjut Duncan

$$\begin{aligned}
 SE &= \sqrt{\frac{KTG}{Perlakuan}} \\
 &= \sqrt{\frac{0.0006102}{6}} \\
 &= 0,0101
 \end{aligned}$$

Interaksi a1 terhadap b

| SSR<br>5 % | LSR<br>5 % | Kode | Rata-<br>rata | Perlakuan |      |   |   | Taraf<br>nyata |
|------------|------------|------|---------------|-----------|------|---|---|----------------|
|            |            |      |               | 1         | 2    | 3 | 4 |                |
|            |            | a1b1 | 3.48          |           |      |   |   | a              |
| 3.08       | 0.03111    | a1b2 | 4.32          | 0.84      |      |   |   | b              |
| 3.23       | 0.03262    | a1b3 | 6.16          | 2.68      | 1.84 |   |   | c              |

## Interaksi a2 terhadap b

| SSR<br>5 % | LSR<br>5 % | Kode | Rata-<br>rata | Perlakuan |      |   |   | Taraf<br>nyata |
|------------|------------|------|---------------|-----------|------|---|---|----------------|
|            |            |      |               | 1         | 2    | 3 | 4 |                |
|            |            | a2b1 | 3.13          |           |      |   |   | a              |
| 3.08       | 0.03111    | a2b2 | 3.25          | 0.12      |      |   |   | b              |
| 3.23       | 0.03262    | a2b3 | 4.14          | 1.01      | 0.89 |   |   | c              |

## Interaksi b1 terhadap a

| SSR<br>5 % | LSR<br>5 % | Kode | Rata-<br>rata | Perlakuan |   | Taraf<br>nyata |
|------------|------------|------|---------------|-----------|---|----------------|
|            |            |      |               | 1         | 2 |                |
|            |            | a2b1 | 3.13          |           |   | a              |
| 3.08       | 0.03111    | a1b1 | 3.48          | 0.35      |   | b              |

## Interaksi b2 terhadap a

| SSR<br>5 % | LSR<br>5 % | Kode | Rata-<br>rata | Perlakuan |   | Taraf<br>nyata |
|------------|------------|------|---------------|-----------|---|----------------|
|            |            |      |               | 1         | 2 |                |
|            |            | a2b2 | 3.25          |           |   | a              |
| 3.08       | 0.03111    | a1b2 | 4.32          | 1.07      |   | b              |

## Interaksi b3 terhadap a

| SSR<br>5 % | LSR<br>5 % | Kode | Rata-<br>rata | Perlakuan |   | Taraf<br>nyata |
|------------|------------|------|---------------|-----------|---|----------------|
|            |            |      |               | 1         | 2 |                |
|            |            | a2b3 | 4.14          |           |   | a              |
| 3.08       | 0.03111    | a1b3 | 6.16          | 2.02      |   | b              |

## 2. Analisis Kadar Kurkuminoid (Desmethoxycurcumin)

| Jenis kunyit       | Perlakuan Penepungan | Kelompok ulangan |              |              | Total        | Rata - rata  | Standar deviasi |
|--------------------|----------------------|------------------|--------------|--------------|--------------|--------------|-----------------|
|                    |                      | 1                | 2            | 3            |              |              |                 |
| <b>A</b>           | <b>B</b>             |                  |              |              |              |              |                 |
| a1                 | b1                   | 1.98             | 1.98         | 1.97         | 5.93         | 1.98         | 0.01            |
|                    | b2                   | 2.18             | 2.18         | 2.19         | 6.55         | 2.18         | 0.01            |
|                    | b3                   | 4.99             | 4.94         | 4.93         | 14.86        | 4.95         | 0.03            |
| <b>Sub Total</b>   |                      | <b>9.15</b>      | <b>9.10</b>  | <b>9.09</b>  | <b>27.34</b> | <b>9.11</b>  | <b>0.04</b>     |
| <b>Rata - rata</b> |                      | <b>3.05</b>      | <b>3.03</b>  | <b>3.03</b>  | <b>9.11</b>  | <b>3.04</b>  | <b>0.01</b>     |
| a2                 | b1                   | 1.50             | 1.51         | 1.53         | 4.54         | 1.51         | 0.02            |
|                    | b2                   | 2.11             | 2.11         | 2.14         | 6.36         | 2.12         | 0.02            |
|                    | b3                   | 2.55             | 2.52         | 2.54         | 7.61         | 2.54         | 0.02            |
| <b>Sub Total</b>   |                      | <b>6.16</b>      | <b>6.14</b>  | <b>6.21</b>  | <b>18.51</b> | <b>6.17</b>  | <b>0.05</b>     |
| <b>Rata - rata</b> |                      | <b>2.05</b>      | <b>2.05</b>  | <b>2.07</b>  | <b>6.17</b>  | <b>2.06</b>  | <b>0.02</b>     |
| <b>Total</b>       |                      | <b>15.31</b>     | <b>15.24</b> | <b>15.30</b> | <b>45.85</b> | <b>15.28</b> | <b>0.04</b>     |
| <b>Rata - rata</b> |                      | <b>7.66</b>      | <b>7.62</b>  | <b>7.65</b>  | <b>22.93</b> | <b>5.59</b>  | <b>0.02</b>     |

| Jenis Kunyit | Perlakuan penepungan |       |       | Jumlah | Rata-rata |
|--------------|----------------------|-------|-------|--------|-----------|
|              | b                    |       |       |        |           |
| a            | b1                   | b2    | b3    |        |           |
| a1           | 5.93                 | 6.55  | 14.86 | 27.34  | 9.11      |
| a2           | 4.54                 | 6.36  | 7.61  | 18.51  | 6.17      |
| Jumlah       | 10.47                | 12.91 | 22.47 | 45.85  | 15.28     |
| Rata - Rata  | 5.24                 | 6.46  | 11.24 |        |           |

Perhitungan Anava

$$\begin{aligned}
 \text{Faktor Koreksi (FK)} &= \frac{(\text{Total})^2}{r \times b \times a} \\
 &= \frac{(45,85)^2}{3 \times 3 \times 2} \\
 &= 116,7901
 \end{aligned}$$

$$\begin{aligned}
 \text{JK Total (JKT)} &= [(a_1b_1)^2 + \dots + (a_2b_4)^2] - \text{FK} \\
 &= [(1,98)^2 + \dots + (2,54)^2] - 116,7901 \\
 &= 22,5004
 \end{aligned}$$

$$\begin{aligned}
 \text{JK Kelompok (JKK)} &= \left[ \frac{(\sum kel1)^2 + (\sum kel2)^2 + (\sum kel3)^2}{a \times b} \right] - \text{FK} \\
 &= \left[ \frac{(15,31)^2 + (15,24)^2 + (15,30)^2}{2 \times 3} \right] - 116,7901 \\
 &= 0,0005
 \end{aligned}$$

$$\begin{aligned}
 \text{JK(a)} &= \left[ \frac{(\sum a1)^2 + (\sum a2)^2}{r \times b} \right] - \text{FK} \\
 &= \left[ \frac{(27,54)^2 + (18,51)^2}{3 \times 3} \right] - 116,7901 \\
 &= 4,3316
 \end{aligned}$$

$$\begin{aligned}
 \text{JK(b)} &= \left[ \frac{(\sum b1)^2 + (\sum b2)^2 + (\sum b3)^2}{r \times a} \right] - \text{FK} \\
 &= \left[ \frac{(10,47)^2 + (12,91)^2 + (22,47)^2}{3 \times 2} \right] - 116,7901 \\
 &= 13,4082
 \end{aligned}$$

$$\begin{aligned}
 \text{JK(ab)} &= \left[ \frac{(\sum a1b1)^2 + \dots + (\sum a2b4)^2}{r} \right] - \text{FK} - \text{JKa} - \text{JKb} \\
 &= \left[ \frac{(5,93)^2 + \dots + (7,61)^2}{3} \right] - 116,7901 - 4,3316 - 13,4082 \\
 &= 4,7568
 \end{aligned}$$

$$\begin{aligned}
 \text{JKG} &= \text{JKT} - \text{JK(a)} - \text{JK(b)} - \text{JK (ab)} \\
 &= 22,5004 - 3,634817 - 13,4082 - 4,7568 \\
 &= 0,0033
 \end{aligned}$$

Hasil analisis variansi (ANOVA)

| Sumber variansi | JK      | db | KT      | F HIT   | F TABEL |
|-----------------|---------|----|---------|---------|---------|
| A               | 4.33161 | 1  | 4.33161 | 15966.3 | 4.49    |
| B               | 13.4082 | 2  | 6.70409 | 24711.3 | 3.24    |
| AB              | 4.75684 | 2  | 2.37842 | 8766.88 | 3.24    |
| Sisa            | 0.00326 | 12 | 0.00027 |         |         |
| total           | 22.5004 | 17 |         |         |         |

Keterangan : tn = tidak berpengaruh nyata

\* = berpengaruh nyata

Kesimpulan : Berdasarkan tabel ANOVA, dapat disimpulkan bahwa faktor A (Bagian kunyit), faktor B (metode proses penepungan) dan interaksi AB berpengaruh nyata terhadap kandungan desmethoxycurcumin pada tepung kunyit sehingga perlu dilakukan uji lanjut Duncan.

## Uji Lanjut Duncan

$$\begin{aligned}
 SY &= \sqrt{\frac{KTG}{Perlakuan}} \\
 &= \sqrt{\frac{0.00027}{6}} \\
 &= 0,0067
 \end{aligned}$$

| SSR<br>5 % | LSR<br>5 % | Kode | Rata -<br>rata | Perlakuan |      |      |      |      |   | Taraf<br>nyata |
|------------|------------|------|----------------|-----------|------|------|------|------|---|----------------|
|            |            |      |                | 1         | 2    | 3    | 4    | 5    | 6 |                |
|            |            | a2b1 | 1.52           |           |      |      |      |      |   | a              |
| 3.08       | 0.02071    | a1b1 | 1.98           | 0.46      |      |      |      |      |   | b              |
| 3.23       | 0.02172    | a2b2 | 2.12           | 0.60      | 0.14 |      |      |      |   | c              |
| 3.31       | 0.02226    | a1b2 | 2.18           | 0.66      | 0.20 | 0.06 |      |      |   | d              |
| 3.37       | 0.02266    | a2b3 | 2.54           | 1.02      | 0.56 | 0.42 | 0.36 |      |   | e              |
| 3.41       | 0.02293    | a1b3 | 4.95           | 3.43      | 2.97 | 2.83 | 2.77 | 2.41 |   | f              |

Interaksi antara Bagian kunyit dan Perlakuan penepungan terhadap Kadar Desmethoxycurcumin pada tepung kunyit

$$\begin{aligned}
 SY &= \sqrt{\frac{KTG}{Perlakuan}} \\
 &= \sqrt{\frac{0.00027}{6}} \\
 &= 0,0067
 \end{aligned}$$

Interaksi a1 terhadap b

| SSR<br>5 % | LSR<br>5 % | Kode | Rata-<br>rata | Perlakuan |      |   |   | Taraf<br>nyata |
|------------|------------|------|---------------|-----------|------|---|---|----------------|
|            |            |      |               | 1         | 2    | 3 | 4 |                |
|            |            | a1b1 | 1.98          |           |      |   |   | a              |
| 3.08       | 0.02064    | a1b2 | 2.18          | 0.2       |      |   |   | b              |
| 3.23       | 0.02164    | a1b3 | 4.95          | 2.97      | 2.77 |   |   | c              |

## Interaksi a2 terhadap b

| SSR<br>5 % | LSR<br>5 % | Kode | Rata-<br>rata | Perlakuan |      |   |   | Taraf<br>nyata |
|------------|------------|------|---------------|-----------|------|---|---|----------------|
|            |            |      |               | 1         | 2    | 3 | 4 |                |
|            |            | a2b1 | 1.52          |           |      |   |   | a              |
| 3.08       | 0.02064    | a2b2 | 2.12          | 0.6       |      |   |   | b              |
| 3.23       | 0.02164    | a2b3 | 2.54          | 1.02      | 0.42 |   |   | c              |

## Interaksi b1 terhadap a

| SSR<br>5 % | LSR<br>5 % | Kode | Rata-<br>rata | Perlakuan |   | Taraf<br>nyata |
|------------|------------|------|---------------|-----------|---|----------------|
|            |            |      |               | 1         | 2 |                |
|            |            | a2b1 | 1.52          |           |   | a              |
| 3.08       | 0.02064    | a1b1 | 1.98          | 0.46      |   | b              |

## Interaksi b2 terhadap a

| SSR<br>5 % | LSR<br>5 % | Kode | Rata-<br>rata | Perlakuan |   | Taraf<br>nyata |
|------------|------------|------|---------------|-----------|---|----------------|
|            |            |      |               | 1         | 2 |                |
|            |            | a2b2 | 2.13          |           |   | a              |
| 3.08       | 0.02064    | a1b2 | 2.18          | 0.05      |   | b              |

## Interaksi b3 terhadap a

| SSR<br>5 % | LSR<br>5 % | Kode | Rata-<br>rata | Perlakuan |   | Taraf<br>nyata |
|------------|------------|------|---------------|-----------|---|----------------|
|            |            |      |               | 1         | 2 |                |
|            |            | a2b3 | 2.54          |           |   | a              |
| 3.08       | 0.02064    | a1b3 | 4.95          | 2.41      |   | b              |

### 3. Analisis Kadar Kurkumin (Bisdemethoxycurcumin)

| Jenis kunyit       | Perlakuan Penepungan | Kelompok ulangan |             |             | Total        | Rata - rata | Standar deviasi |
|--------------------|----------------------|------------------|-------------|-------------|--------------|-------------|-----------------|
|                    |                      | 1                | 2           | 3           |              |             |                 |
| <b>A</b>           | <b>B</b>             |                  |             |             |              |             |                 |
| a1                 | b1                   | 1                | 0.99        | 0.98        | 2.97         | 0.99        | 0.01            |
|                    | b2                   | 0.91             | 0.92        | 0.91        | 2.74         | 0.91        | 0.01            |
|                    | b3                   | 2.24             | 2.23        | 2.16        | 6.63         | 2.21        | 0.04            |
| <b>Sub Total</b>   |                      | <b>4.15</b>      | <b>4.14</b> | <b>4.05</b> | <b>12.34</b> | <b>4.11</b> | <b>0.06</b>     |
| <b>Rata - rata</b> |                      | <b>1.38</b>      | <b>1.38</b> | <b>1.35</b> | <b>4.11</b>  | <b>1.37</b> | <b>0.02</b>     |
| a2                 | b1                   | 0.48             | 0.48        | 0.49        | 1.45         | 0.48        | 0.01            |
|                    | b2                   | 0.61             | 0.59        | 0.63        | 1.83         | 0.61        | 0.02            |
|                    | b3                   | 0.9              | 0.9         | 0.89        | 2.69         | 0.90        | 0.01            |
| <b>Sub Total</b>   |                      | <b>1.99</b>      | <b>1.97</b> | <b>2.01</b> | <b>5.97</b>  | <b>1.99</b> | <b>0.03</b>     |
| <b>Rata - rata</b> |                      | <b>0.66</b>      | <b>0.66</b> | <b>0.67</b> | <b>1.99</b>  | <b>0.66</b> | <b>0.01</b>     |
| <b>Total</b>       |                      | <b>6.14</b>      | <b>6.11</b> | <b>6.06</b> | <b>18.31</b> | <b>6.10</b> | <b>0.04</b>     |
| <b>Rata - rata</b> |                      | <b>3.07</b>      | <b>3.06</b> | <b>3.03</b> | <b>9.16</b>  | <b>2.39</b> | <b>0.02</b>     |

| Jenis Kunyit | Perlakuan penepungan |      |      | Jumlah | Rata-rata |
|--------------|----------------------|------|------|--------|-----------|
|              | b                    |      |      |        |           |
| a            | b1                   | b2   | b3   |        |           |
| a1           | 2.97                 | 2.74 | 6.63 | 12.34  | 4.11      |
| a2           | 1.45                 | 1.83 | 2.69 | 5.97   | 1.99      |
| Jumlah       | 4.42                 | 4.57 | 9.32 | 18.31  | 6.10      |
| Rata - Rata  | 2.21                 | 2.29 | 4.66 |        |           |

Perhitungan Anava

$$\begin{aligned}
 \text{Faktor Koreksi (FK)} &= \frac{(\text{Total})^2}{r \times b \times a} \\
 &= \frac{(18,31)^2}{3 \times 3 \times 2} \\
 &= 18,6253
 \end{aligned}$$

$$\begin{aligned}
 \text{JK Total (JKT)} &= [(a_1 b_1)^2 + \dots + (a_2 b_4)^2] - \text{FK} \\
 &= [(1,00)^2 + \dots + (0,89)^2] - 18,6253 \\
 &= 5,7040
 \end{aligned}$$



$$\begin{aligned}
 \text{JK Kelompok (JKK)} &= \left[ \frac{(\sum \text{kel1})^2 + (\sum \text{kel2})^2 + (\sum \text{kel3})^2}{a \times b} \right] - \text{FK} \\
 &= \left[ \frac{(6,14)^2 + (6,11)^2 + (6,06)^2}{2 \times 3} \right] - 18,6253 \\
 &= 0,0005
 \end{aligned}$$

$$\begin{aligned}
 \text{JK(a)} &= \left[ \frac{(\sum a1)^2 + (\sum a2)^2}{r \times b} \right] - \text{FK} \\
 &= \left[ \frac{(12,34)^2 + (5,97)^2}{3 \times 3} \right] - 18,6253 \\
 &= 2,2543
 \end{aligned}$$

$$\begin{aligned}
 \text{JK(b)} &= \left[ \frac{(\sum b1)^2 + (\sum b2)^2 + (\sum b3)^2}{r \times a} \right] - \text{FK} \\
 &= \left[ \frac{(4,42)^2 + (4,57)^2 + (9,32)^2}{3 \times 2} \right] - 18,6253 \\
 &= 2,5886
 \end{aligned}$$

$$\begin{aligned}
 \text{JK(ab)} &= \left[ \frac{(\sum a1b1)^2 + \dots + (\sum a2b4)^2}{r} \right] - \text{FK} - \text{JKa} - \text{JKb} \\
 &= \left[ \frac{(2,97)^2 + \dots + (2,69)^2}{3} \right] - 18,6253 - 2,2543 - 2,5886 \\
 &= 0,8561
 \end{aligned}$$

$$\begin{aligned}
 \text{JKG} &= \text{JKT} - \text{JKK} - \text{JK(a)} - \text{JK(b)} - \text{JK(ab)} \\
 &= 5,7040 - 0,0005 - 2,2543 - 2,5886 - 0,8561 \\
 &= 0,0045
 \end{aligned}$$

Hasil analisis variansi (Anava)

| Sumber variansi | JK      | db | KT      | F HIT    | F TABEL |
|-----------------|---------|----|---------|----------|---------|
| A               | 2.25427 | 1  | 2.25427 | 6071.36* | 4.49    |
| B               | 2.58861 | 2  | 1.29431 | 3485.91* | 3.24    |
| AB              | 0.85608 | 2  | 0.42804 | 1152.82* | 3.24    |
| Sisa            | 0.00446 | 12 | 0.00037 |          |         |
| total           | 5.70396 | 17 |         |          |         |

Keterangan : tn = tidak berpengaruh nyata

\* = berpengaruh nyata

Kesimpulan : Berdasarkan tabel ANAVA, dapat disimpulkan bahwa faktor A (Bagian kunyit), faktor B (metode proses penepungan) dan interaksi AB berpengaruh nyata terhadap kandungan bisdemetoksikurkumin pada tepung kunyit sehingga perlu dilakukan uji lanjut Duncan.

## Uji Lanjut Duncan

$$\begin{aligned}
 SY &= \sqrt{\frac{KTG}{Perlakuan}} \\
 &= \sqrt{\frac{0.00037}{6}} \\
 &= 0,0079
 \end{aligned}$$

| SSR<br>5 % | LSR<br>5 % | Kode | Rata -<br>rata | Perlakuan |      |      |      |      |   | Taraf<br>nyata |
|------------|------------|------|----------------|-----------|------|------|------|------|---|----------------|
|            |            |      |                | 1         | 2    | 3    | 4    | 5    | 6 |                |
|            |            | a2b1 | 0.48           |           |      |      |      |      |   | a              |
| 3.08       | 0.02423    | a2b2 | 0.6            | 0.12      |      |      |      |      |   | b              |
| 3.23       | 0.02541    | a2b3 | 0.9            | 0.42      | 0.30 |      |      |      |   | c              |
| 3.31       | 0.02604    | a1b2 | 0.91           | 0.43      | 0.31 | 0.01 |      |      |   | c              |
| 3.37       | 0.02651    | a1b1 | 0.99           | 0.51      | 0.39 | 0.09 | 0.08 |      |   | d              |
| 3.41       | 0.02682    | a1b3 | 2.21           | 1.73      | 1.61 | 1.31 | 1.30 | 1.22 |   | e              |

Interaksi antara Bagian kunyit dan Perlakuan penepungan terhadap Kadar bisdesmetoksikurkumin pada tepung kunyit

$$\begin{aligned}
 SY &= \sqrt{\frac{KTG}{Perlakuan}} \\
 &= \sqrt{\frac{0.00037}{6}} \\
 &= 0,0079
 \end{aligned}$$

Interaksi a1 terhadap b

| SSR<br>5 % | LSR<br>5 % | Kode | Rata-<br>rata | Perlakuan |      |   |   | Taraf<br>nyata |
|------------|------------|------|---------------|-----------|------|---|---|----------------|
|            |            |      |               | 1         | 2    | 3 | 4 |                |
|            |            | a1b2 | 0.91          |           |      |   |   | a              |
| 3.08       | 0.02433    | a1b1 | 0.99          | 0.08      |      |   |   | b              |
| 3.23       | 0.02552    | a1b3 | 2.21          | 1.3       | 1.22 |   |   | c              |

## Interaksi a2 terhadap b

| SSR<br>5 % | LSR<br>5 % | Kode | Rata-<br>rata | Perlakuan |     |   |   | Taraf<br>nyata |
|------------|------------|------|---------------|-----------|-----|---|---|----------------|
|            |            |      |               | 1         | 2   | 3 | 4 |                |
|            |            | a2b1 | 0.48          |           |     |   |   | a              |
| 3.08       | 0.02433    | a2b2 | 0.6           | 0.12      |     |   |   | b              |
| 3.23       | 0.02552    | a2b3 | 0.9           | 0.42      | 0.3 |   |   | c              |

## Interaksi b1 terhadap a

| SSR<br>5 % | LSR<br>5 % | Kode | Rata-<br>rata | Perlakuan |   | Taraf<br>nyata |
|------------|------------|------|---------------|-----------|---|----------------|
|            |            |      |               | 1         | 2 |                |
|            |            | a2b1 | 0.48          |           |   | a              |
| 3.08       | 0.02433    | a1b1 | 0.99          | 0.51      |   | b              |

## Interaksi b2 terhadap a

| SSR<br>5 % | LSR<br>5 % | Kode | Rata-<br>rata | Perlakuan |   | Taraf<br>nyata |
|------------|------------|------|---------------|-----------|---|----------------|
|            |            |      |               | 1         | 2 |                |
|            |            | a2b2 | 0.60          |           |   | a              |
| 3.08       | 0.02433    | a1b2 | 0.91          | 0.31      |   | b              |

## Interaksi b3 terhadap a

| SSR<br>5 % | LSR<br>5 % | Kode | Rata-<br>rata | Perlakuan |   | Taraf<br>nyata |
|------------|------------|------|---------------|-----------|---|----------------|
|            |            |      |               | 1         | 2 |                |
|            |            | a2b3 | 0.90          |           |   | a              |
| 3.08       | 0.02433    | a1b3 | 2.21          | 1.31      |   | b              |

## 4. Analisis kadar air

| Jenis kunyit       | Perlakuan Penepungan | Kelompok ulangan |              |              | Total         | Rata - rata  | Standar deviasi |
|--------------------|----------------------|------------------|--------------|--------------|---------------|--------------|-----------------|
|                    |                      | 1                | 2            | 3            |               |              |                 |
| <b>A</b>           | <b>B</b>             |                  |              |              |               |              |                 |
| a1                 | b1                   | 9.16             | 9.09         | 9.22         | 27.47         | 9.16         | 0.07            |
|                    | b2                   | 7.84             | 7.78         | 7.90         | 23.52         | 7.84         | 0.06            |
|                    | b3                   | 7.16             | 7.20         | 7.06         | 21.42         | 7.14         | 0.07            |
| <b>Sub Total</b>   |                      | <b>24.16</b>     | <b>24.07</b> | <b>24.18</b> | <b>72.41</b>  | <b>24.14</b> | <b>0.20</b>     |
| <b>Rata - rata</b> |                      | <b>8.05</b>      | <b>8.02</b>  | <b>8.06</b>  | <b>24.14</b>  | <b>8.05</b>  | <b>0.07</b>     |
| a2                 | b1                   | 8.71             | 8.67         | 8.56         | 25.94         | 8.65         | 0.08            |
|                    | b2                   | 7.91             | 7.60         | 7.78         | 23.29         | 7.76         | 0.16            |
|                    | b3                   | 7.17             | 7.25         | 7.08         | 21.50         | 7.17         | 0.09            |
| <b>Sub Total</b>   |                      | <b>23.79</b>     | <b>23.52</b> | <b>23.42</b> | <b>70.73</b>  | <b>23.58</b> | <b>0.32</b>     |
| <b>Rata - rata</b> |                      | <b>7.93</b>      | <b>7.84</b>  | <b>7.81</b>  | <b>23.58</b>  | <b>7.86</b>  | <b>0.11</b>     |
| <b>Total</b>       |                      | <b>47.95</b>     | <b>47.59</b> | <b>47.60</b> | <b>143.14</b> | <b>47.71</b> | <b>0.21</b>     |
| <b>Rata - rata</b> |                      | <b>23.98</b>     | <b>23.80</b> | <b>23.80</b> | <b>71.57</b>  | <b>16.00</b> | <b>0.10</b>     |

| Jenis Kunyit | Perlakuan penepungan |       |       | Jumlah | Rata-rata |
|--------------|----------------------|-------|-------|--------|-----------|
|              | b                    |       |       |        |           |
| a            | b1                   | b2    | b3    |        |           |
| a1           | 27.47                | 23.52 | 21.42 | 72.41  | 24.14     |
| a2           | 25.94                | 23.29 | 21.50 | 70.73  | 23.58     |
| Jumlah       | 53.41                | 46.81 | 42.92 | 143.14 | 47.71     |
| Rata - Rata  | 26.71                | 23.41 | 21.46 |        |           |

Perhitungan Anava

$$\begin{aligned}
 \text{Faktor Koreksi (FK)} &= \frac{(\text{Total})^2}{r \times b \times a} \\
 &= \frac{(143,14)^2}{3 \times 3 \times 2} \\
 &= 1138,28
 \end{aligned}$$

$$\begin{aligned}
 \text{JK Total (JKT)} &= [(a_1 b_1)^2 + \dots + (a_2 b_3)^2] - \text{FK} \\
 &= [(9,16)^2 + \dots + (7,08)^2] - 1138,28 \\
 &= 9,8751
 \end{aligned}$$

$$\text{JK Kelompok (JKK)} = \left[ \frac{(\sum \text{kel1})^2 + (\sum \text{kel2})^2 + (\sum \text{kel3})^2}{a \times b} \right] - \text{FK}$$

$$= \left[ \frac{(47,95)^2 + (47,59)^2 + (47,60)^2}{2 \times 3} \right] - 1138,28$$

$$= 0,0140$$

$$\text{JK(a)} = \left[ \frac{(\sum a_1)^2 + (\sum a_2)^2}{r \times b} \right] - \text{FK}$$

$$= \left[ \frac{(72,41)^2 + (70,53)^2}{3 \times 3} \right] - 1138,28$$

$$= 0,1568$$

$$\text{JK(b)} = \left[ \frac{(\sum b_1)^2 + (\sum b_2)^2 + (\sum b_3)^2}{r \times a} \right] - \text{FK}$$

$$= \left[ \frac{(53,41)^2 + (46,81)^2 + (42,92)^2}{3 \times 2} \right] - 1138,28$$

$$= 9,3740$$

$$\text{JK(ab)} = \left[ \frac{(\sum a_1b_1)^2 + \dots + (\sum a_2b_3)^2}{r} \right] - \text{FK} - \text{JKa} - \text{JKb}$$

$$= \left[ \frac{(27,47)^2 + \dots + (21,50)^2}{3} \right] - 1138,28 - 0,1568 - 9,3740$$

$$= 0,2432$$

$$\text{JKG} = \text{JKT} - \text{JKK} - \text{JK(a)} - \text{JK(b)} - \text{JK(ab)}$$

$$= 9,8751 - 0,1568 - 9,3740 - 0,2432$$

$$= 0,0871$$

Tabel analisis variansi (anava)

| Sumber variansi | JK      | db | KT      | F HIT   | F TABEL |
|-----------------|---------|----|---------|---------|---------|
| A               | 0.1568  | 1  | 0.1568  | 21.6138 | 4.49    |
| B               | 9.37401 | 2  | 4.68701 | 646.071 | 3.24    |
| AB              | 0.24323 | 2  | 0.12162 | 16.764  | 3.24    |
| Sisa            | 0.08706 | 12 | 0.00725 |         |         |
| total           | 9.87511 | 17 |         |         |         |

Keterangan : tn = tidak berpengaruh nyata

\* = berpengaruh nyata

Kesimpulan : Berdasarkan tabel ANAVA, dapat disimpulkan bahwa faktor A (Bagian kunyit), faktor B (metode proses penepungan) dan interaksi AB berpengaruh nyata terhadap kadar air pada tepung kunyit sehingga perlu dilakukan uji lanjut Duncan.

## Uji Lanjut Duncan

| SSR<br>5 % | LSR<br>5 % | Kode | Rata -<br>rata | Perlakuan |      |      |      |      |   | Taraf nyata |
|------------|------------|------|----------------|-----------|------|------|------|------|---|-------------|
|            |            |      |                | 1         | 2    | 3    | 4    | 5    | 6 |             |
|            |            | a1b3 | 7.14           |           |      |      |      |      |   | a           |
| 3.08       | 0.1071     | a2b3 | 7.17           | 0.03      |      |      |      |      |   | a           |
| 3.23       | 0.11231    | a2b2 | 7.76           | 0.62      | 0.59 |      |      |      |   | a           |
| 3.31       | 0.1151     | a1b2 | 7.84           | 0.70      | 0.67 | 0.08 |      |      |   | a           |
| 3.37       | 0.11718    | a2b1 | 8.65           | 1.51      | 1.48 | 0.89 | 0.81 |      |   | b           |
| 3.41       | 0.11857    | a1b1 | 9.16           | 2.02      | 1.99 | 1.40 | 1.32 | 0.51 |   | c           |

$$\begin{aligned}
 SY &= \sqrt{\frac{KTG}{Perlakuan}} \\
 &= \sqrt{\frac{0.00725}{6}} \\
 &= 0,0348
 \end{aligned}$$

Interaksi antara Bagian kunyit dan Perlakuan penepungan terhadap Kadar air pada tepung kunyit

$$\begin{aligned}
 SY &= \sqrt{\frac{KTG}{Perlakuan}} \\
 &= \sqrt{\frac{0.00725}{6}} \\
 &= 0,0348
 \end{aligned}$$

Interaksi a1 terhadap b

| SSR<br>5 % | LSR<br>5 % | Kode | Rata-<br>rata | Perlakuan |      |   |   | Taraf<br>nyata |
|------------|------------|------|---------------|-----------|------|---|---|----------------|
|            |            |      |               | 1         | 2    | 3 | 4 |                |
|            |            | a1b3 | 7.14          |           |      |   |   | a              |
| 3.08       | 0.10718    | a1b2 | 7.84          | 0.7       |      |   |   | a              |
| 3.23       | 0.1124     | a1b1 | 9.16          | 2.02      | 1.32 |   |   | b              |

## Interaksi a2 terhadap b

| SSR<br>5 % | LSR<br>5 % | Kode | Rata-<br>rata | Perlakuan |      |   |   | Taraf<br>nyata |
|------------|------------|------|---------------|-----------|------|---|---|----------------|
|            |            |      |               | 1         | 2    | 3 | 4 |                |
|            |            | a2b3 | 7.17          |           |      |   |   | a              |
| 3.08       | 0.10718    | a2b2 | 7.76          | 0.59      |      |   |   | a              |
| 3.23       | 0.1124     | a2b1 | 8.65          | 1.48      | 0.89 |   |   | b              |

## Interaksi b1 terhadap a

| SSR<br>5 % | LSR<br>5 % | Kode | Rata-<br>rata | Perlakuan |   | Taraf<br>nyata |
|------------|------------|------|---------------|-----------|---|----------------|
|            |            |      |               | 1         | 2 |                |
|            |            | a2b1 | 8.65          |           |   | a              |
| 3.08       | 0.10718    | a1b1 | 9.16          | 0.51      |   | a              |

## Interaksi b2 terhadap a

| SSR<br>5 % | LSR<br>5 % | Kode | Rata-<br>rata | Perlakuan |   | Taraf<br>nyata |
|------------|------------|------|---------------|-----------|---|----------------|
|            |            |      |               | 1         | 2 |                |
|            |            | a1b3 | 7.76          |           |   | a              |
| 3.08       | 0.10718    | a2b3 | 7.84          | 0.08      |   | a              |

## Interaksi b3 terhadap a

| SSR<br>5 % | LSR<br>5 % | Kode | Rata-<br>rata | Perlakuan |   | Taraf<br>nyata |
|------------|------------|------|---------------|-----------|---|----------------|
|            |            |      |               | 1         | 2 |                |
|            |            | a2b3 | 7.14          |           |   | a              |
| 3.08       | 0.10718    | a1b3 | 7.17          | 0.03      |   | a              |

**Lampiran 6.** Hasil Uji Skoring Untuk Penentuan Perlakuan yang Terbaik dari Tepung kunyit.

1. Uji Skoring Untuk Kadar kurkuminoid (kurkumin)

$$\begin{aligned} \text{Rentang kelas} &= \text{nilai rata-rata tertinggi} - \text{nilai rata-rata terendah} \\ &= 6,16 - 3,13 \\ &= 3,03 \\ \text{Banyaknya kelas} &= 1 + 3,3 \log n \\ &= 1 + 3,3 \log 6 \\ &= 3,57 \approx 4 \\ \text{Panjang kelas} &= \frac{\text{Rentang kelas}}{\text{Banyaknya kelas}} \\ &= \frac{3,03}{4} \\ &= 0,76 \end{aligned}$$

| Range       | Skoring |
|-------------|---------|
| 3,03 – 3,79 | 1       |
| 3,80 – 4,56 | 2       |
| 4,57 – 5,33 | 3       |
| 5,34 – 6,16 | 4       |

| Perlakuan                     | Rata-rata | Skoring |
|-------------------------------|-----------|---------|
| a <sub>1</sub> b <sub>1</sub> | 3,48      | 1       |
| a <sub>1</sub> b <sub>2</sub> | 4,32      | 2       |
| a <sub>1</sub> b <sub>3</sub> | 6,16      | 4       |
| a <sub>2</sub> b <sub>1</sub> | 3,13      | 1       |
| a <sub>2</sub> b <sub>2</sub> | 3,25      | 1       |
| a <sub>2</sub> b <sub>3</sub> | 4,14      | 2       |

2. Uji Skoring Untuk Kadar kurkuminoid (desmetoksikurkumin)

$$\begin{aligned} \text{Rentang kelas} &= \text{nilai rata-rata tertinggi} - \text{nilai rata-rata terendah} \\ &= 4,95 - 1,51 \\ &= 3,09 \\ \text{Banyaknya kelas} &= 1 + 3,3 \log n \\ &= 1 + 3,3 \log 6 \\ &= 3,57 \approx 4 \end{aligned}$$



$$\begin{aligned}
 \text{Panjang kelas} &= \frac{\text{Rentang kelas}}{\text{Banyaknya kelas}} \\
 &= \frac{3,09}{4} \\
 &= 0,7725
 \end{aligned}$$

| Range         | Skoring |
|---------------|---------|
| 1,51 – 2,2825 | 1       |
| 2,29 – 3,0625 | 2       |
| 3,07 – 3,8425 | 3       |
| 3,85 – 4,95   | 4       |

| Perlakuan                     | Rata-rata | Skoring |
|-------------------------------|-----------|---------|
| a <sub>1</sub> b <sub>1</sub> | 1.98      | 1       |
| a <sub>1</sub> b <sub>2</sub> | 2.18      | 1       |
| a <sub>1</sub> b <sub>3</sub> | 4.95      | 4       |
| a <sub>2</sub> b <sub>1</sub> | 1.51      | 1       |
| a <sub>2</sub> b <sub>2</sub> | 2.12      | 1       |
| a <sub>2</sub> b <sub>3</sub> | 2.54      | 2       |

### 3. Uji Skoring Untuk Kadar kurkuminoid (bisdesmetoksikurkumin)

$$\begin{aligned}
 \text{Rentang kelas} &= \text{nilai rata-rata tertinggi} - \text{nilai rata-rata terendah} \\
 &= 2,21 - 0,48 \\
 &= 1,73
 \end{aligned}$$

$$\begin{aligned}
 \text{Banyaknya kelas} &= 1 + 3,3 \log n \\
 &= 1 + 3,3 \log 6 \\
 &= 3,57 \approx 4
 \end{aligned}$$

$$\begin{aligned}
 \text{Panjang kelas} &= \frac{\text{Rentang kelas}}{\text{Banyaknya kelas}} \\
 &= \frac{1,73}{4} \\
 &= 0,4325
 \end{aligned}$$

| Range         | Skoring |
|---------------|---------|
| 0,48 – 0,9125 | 1       |
| 0,92 – 1,3525 | 2       |
| 1,36 – 1,7925 | 3       |
| 1,80 – 2,23   | 4       |

| Perlakuan                     | Rata-rata | Skoring |
|-------------------------------|-----------|---------|
| a <sub>1</sub> b <sub>1</sub> | 0.99      | 2       |
| a <sub>1</sub> b <sub>2</sub> | 0.91      | 1       |
| a <sub>1</sub> b <sub>3</sub> | 2.21      | 4       |
| a <sub>2</sub> b <sub>1</sub> | 0.48      | 1       |
| a <sub>2</sub> b <sub>2</sub> | 0.61      | 1       |
| a <sub>2</sub> b <sub>3</sub> | 0.90      | 1       |

**Catatan:** untuk pertimbangan mengatur skor untuk kadar kurkuminoid (kurkumin, desmetoksikurkumin dan bisdesmetoksikurkumin), diambil dari masing – masing komponen dengan memperhatikan kadar yang paling besar. Artinya semakin besar nilai kadar semakin besar nilai skornya.

#### 4. Uji Skoring Untuk Kadar air

$$\begin{aligned} \text{Rentang kelas} &= \text{nilai rata-rata tertinggi} - \text{nilai rata-rata terendah} \\ &= 9,16 - 7,14 \\ &= 2,02 \end{aligned}$$

$$\begin{aligned} \text{Banyaknya kelas} &= 1 + 3,3 \log n \\ &= 1 + 3,3 \log 6 \\ &= 3,57 \approx 4 \end{aligned}$$

$$\begin{aligned} \text{Panjang kelas} &= \frac{\text{Rentang kelas}}{\text{Banyaknya kelas}} \\ &= \frac{2,02}{4} \\ &= 0,505 \end{aligned}$$

| Range        | Skoring |
|--------------|---------|
| 7,14 – 7,645 | 1       |
| 7,7 – 8,205  | 2       |
| 8,21 – 8,715 | 3       |
| 8,72 – 9,225 | 4       |

**Keterangan:** penilaian besar skor untuk kadar air dilihat dari range syarat kadar air tepung kunyit sekitar 8 – 10 % untuk mendapatkan inti kurkumin dengan kelarutan yang baik menurut Tien dan Sugiyono (2014) dan Naibaho dan Deny (2011).

| Perlakuan                     | Rata-rata | Skoring |
|-------------------------------|-----------|---------|
| a <sub>1</sub> b <sub>1</sub> | 9,16      | 4       |
| a <sub>1</sub> b <sub>2</sub> | 7,84      | 2       |
| a <sub>1</sub> b <sub>3</sub> | 7,14      | 1       |
| a <sub>2</sub> b <sub>1</sub> | 8,65      | 3       |
| a <sub>2</sub> b <sub>2</sub> | 7,76      | 2       |
| a <sub>2</sub> b <sub>3</sub> | 7,17      | 1       |

Jumlah skoring untuk setiap perlakuan adalah:

| Perlakuan                         | Skoring  |                    |                       |           | Jumlah skoring |
|-----------------------------------|----------|--------------------|-----------------------|-----------|----------------|
|                                   | Kurkumin | Desmetoksikurkumin | Bisdesmetoksikurkumin | Kadar air |                |
| a <sub>1</sub> b <sub>1</sub>     | 1        | 1                  | 2                     | 4         | 8              |
| a <sub>1</sub> b <sub>2</sub>     | 2        | 1                  | 1                     | 2         | 6              |
| <b>a<sub>1</sub>b<sub>3</sub></b> | <b>4</b> | <b>4</b>           | <b>4</b>              | <b>1</b>  | <b>13</b>      |
| a <sub>2</sub> b <sub>1</sub>     | 1        | 1                  | 1                     | 3         | 6              |
| a <sub>2</sub> b <sub>2</sub>     | 1        | 1                  | 1                     | 2         | 5              |
| a <sub>2</sub> b <sub>3</sub>     | 2        | 2                  | 1                     | 1         | 6              |

**Kesimpulan:** Berdasarkan hasil analisis kadar kurkuminoid (kurkumin, desmetoksikurkumin dan bisdesmetoksikurkumin) dan kadar air, menunjukkan bahwa **perlakuan terbaik** untuk tepung kunyit adalah **kode a<sub>1</sub>b<sub>3</sub>** yaitu perlakuan diiris diblender kemudian diperas.